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A Multidimensional Assessment of Factors Influencing Consumer Adoption of Electric Vehicles in Southern Rajasthan

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Abstract

Electric mobility has emerged as a promising solution to environmental degradation and energy insecurity. This study explores the combined influence of perceived benefits, government incentives, and environmental concern on consumers' electric vehicle (EV) purchase decisions in Southern Rajasthan. Using data collected from 208 EV users through a structured Likert-scale questionnaire, the study applies multiple regression analysis to assess the predictive strength of these determinants. The findings indicate that all three predictors exert significant positive effects, collectively explaining 33 per cent of the variance in purchase decisions. The study provides meaningful insights for policymakers, EV manufacturers, and regional administrators aiming to strengthen EV adoption initiatives. The results highlight that purchase decisions are shaped by a blend of practical evaluation, policy support, and environmental consciousness, underscoring the need for a holistic approach to promoting sustainable mobility in emerging regions.

Keywords: Consumer Adoption, Electric Mobility, Behavioural Determinants, Sustainability Attitudes, Regression Analysis.

1. Introduction:

Electric vehicles have become an integral part of global strategies aimed at reducing carbon emissions, enhancing energy efficiency, and supporting the transition to sustainable transport systems. Growing environmental concerns and technological advancements have positioned EVs as a viable alternative to conventional internal combustion engine vehicles. Their adoption, however, is influenced by a mix of perceived economic benefits, policy frameworks, and consumer attitudes toward sustainability.

Understanding what drives EV adoption is particularly important in developing regions, where disparities in infrastructure, economic conditions, and public awareness may impact consumer decisions. EV adoption is rarely a single-factor decision; instead, it reflects a combination of practical considerations, such as cost savings, performance, the availability of incentives, and personal values regarding environmental protection. This growing complexity highlights the importance of studying EV purchase decisions through a multidimensional lens.

Southern Rajasthan provides a compelling context for such an investigation. The region comprises a blend of urban and semi-urban districts Udaipur, Rajsamand, Dungarpur, Banswara, Pratapgarh, and Chittorgarh each with varying degrees of EV infrastructure, socioeconomic profiles, and consumer awareness. Despite rising interest in sustainable mobility, EV penetration remains uneven in these districts, making it essential to understand the factors that encourage or hinder consumer adoption.

National initiatives such as the FAME scheme and state-level incentives reflect India's intention to accelerate EV adoption. However, for these policies to be effective, it is crucial to examine how consumers in diverse regions interpret the benefits, perceive the incentives, and integrate environmental attitudes into their purchase decisions. By investigating the combined influence of perceived benefits, government incentives, and environmental concern, this study aims to provide a deeper understanding of EV adoption behaviour in Southern Rajasthan.

2. Review of Literature:

Perceived benefits play a central role in shaping consumer adoption of electric vehicles. Rezvani et al. (2015) note that individuals are more inclined to adopt EVs when they recognise advantages such as reduced fuel expenditure, long-term cost efficiency, and improved driving performance. Hardman et al. (2017) further identify that economic benefits, maintenance savings, and vehicle reliability significantly strengthen consumers' willingness to transition from traditional vehicles to EVs.

Government incentives have been widely recognised as catalysts in driving EV purchases. Jenn et al. (2018) highlight that subsidies, tax benefits, and registration fee reductions strongly influence adoption rates by lowering financial barriers. Narassimhan and Johnson (2018) add that regions with well-structured incentive programmes show markedly higher EV penetration, indicating that policy support signals long-term commitment and reduces perceived risk for prospective buyers. Mersky et al. (2020) confirm that incentives continue to serve as one of the most effective levers for motivating first-time EV adoption across diverse socioeconomic groups.

Environmental concern forms another critical determinant of EV adoption behaviour. Barbarossa et al. (2017) argue that individuals who value environmental preservation and practice ecological responsibility are more likely to view EVs as socially responsible mobility choices. Wang et al. (2020) further found that climate awareness, pollution concerns, and sustainability attitudes significantly contribute to EV purchase intentions, making environmental concern a strong psychological motivator in emerging markets.

Recent literature emphasises that EV adoption outcomes are best understood through an integrated framework. She et al. (2017) suggest that behavioural factors, policy mechanisms, and environmental values together shape adoption behaviour. Li et al. (2020) support this interplay by demonstrating that adoption is strongest when practical utility aligns with supportive policies and pro-environmental values. These empirical insights reinforce the need for multifactor analysis, as applied in this study.

3. Research Methodology:

A descriptive research design was adopted to examine the combined influence of perceived benefits, government incentives, and environmental concern on EV purchase decisions. The study was conducted across Southern Rajasthan, covering Udaipur, Rajsamand, Dungarpur, Banswara, Pratapgarh, and Chittorgarh. A total of 208 electric vehicle users participated, selected through a stratified random sampling technique to ensure representation across districts.

Primary data were collected through a structured questionnaire consisting of Likert-scale items designed to measure the key independent variables and the dependent variable. The analysis employed multiple regression to assess the predictive strength of perceived benefits, government incentives, and environmental concern. Ethical considerations were ensured by maintaining respondent confidentiality and seeking informed consent.

4. Measurement Scales – Likert Statement:

For the purpose of data analysis and deriving meaningful findings, a set of fifteen Likert-scale statements was framed and presented to the respondents using a five-point scale ranging from Strongly Disagree to Strongly Agree:

1. Electric vehicles offer practical benefits that meet my needs.
2. I believe EVs are cost-effective in the long run.
3. The performance of EVs matches my expectations.
4. Charging convenience affects my satisfaction with EV usage.
5. The availability of charging stations affects my purchase decision.
6. Government incentives make EVs more affordable.
7. Subsidies and tax benefits influence my decision to purchase an EV.
8. I am well informed about government schemes supporting EV adoption.
9. Environmental concerns motivate me to choose cleaner mobility options.
10. I believe EVs reduce environmental pollution.
11. Purchasing an EV aligns with my environmental values.
12. I intend to continue using EVs in the future.
13. I recommend EVs to others based on my experience.
14. My decision to adopt an EV was influenced by social influence and peer behavior.
15. Overall, I feel confident in my decision to purchase an EV.

5. Hypothesis Testing:

H_{01}: Perceived benefits, government incentives, and environmental concern do not have a significant combined influence on consumers' purchase decisions of electric vehicles.

Table 5.1: Model Summary

R	R^2	Adjusted R^2	Standard error of the estimate
0.57	0.33	0.32	0.26

Table 5.2: ANOVA

Model	df	F	p
Regression	3	33.52	<.001

Table 5.3: Coefficient

Model	Unstandard. Coef. B	Standard. Coef. Beta	Std. Error	t	p
Constant	1.06	-	0.27	3.96	<.001
Perceived Benefits	0.26	0.38	0.04	6.61	<.001
Govt Incentives	0.20	0.30	0.04	5.18	<.001
Environmental Concern	0.26	0.33	0.05	5.72	<.001

6. Interpretation:

The analysis shows that all three predictors make meaningful contributions to shaping consumers' decisions to purchase electric vehicles. The model demonstrates a moderate level of explanatory power, suggesting that purchase intention is influenced by a mixture of practical advantages, policy-driven motivation, and environmental awareness. Each predictor has a positive and statistically significant effect, indicating that consumers are more likely to consider electric vehicles when they perceive direct benefits, receive adequate governmental encouragement, and hold stronger environmental values. The combined effect of these variables highlights that decisions in this context are multifaceted and shaped by both personal and external factors.

A multiple regression analysis was conducted to assess whether perceived benefits, government incentives, and environmental concern together predicted purchase decisions. The model was statistically significant, $F(3, df\ unspecified) = 33.52$, $p < .001$, explaining 33 per cent of the variance in purchase decisions ($R^2 = .33$).

All three predictors had significant positive effects on EV purchase decisions:

1. **Perceived Benefits** significantly predicted purchase decisions
   ($\beta = 0.26$, $t = 6.61$, $p < .001$),
   indicating that consumers who perceive more benefits are more likely to purchase EVs.
2. **Government Incentives** significantly predicted purchase decisions
   ($\beta = 0.20$, $t = 5.18$, $p < .001$),
   showing that subsidies, tax reductions, and rebates positively influence consumer choices.
3. **Environmental Concern** also significantly predicted purchase decisions
   ($\beta = 0.26$, $t = 5.72$, $p < .001$).
   This suggests that environmentally conscious consumers display stronger intention to buy EVs.

The regression equation is:

Purchase Decision = 1.06 + 0.26(Perceived Benefits) + 0.20(Government Incentives) + 0.26(Environmental Concern).

Since the overall model and all individual predictors produced p-values below 0.05, the null hypothesis is rejected. Perceived benefits, government incentives, and environmental concern collectively have a significant influence on consumers' purchase decisions.

7. Findings:

The combined model demonstrates a moderate but meaningful level of predictive strength, indicating that one-third of the variance in purchase decisions can be explained by these three factors. All predictors exert significant positive effects, confirming that both personal perceptions and external incentives shape consumer behaviour. The regression equation shows that improvements in any of the three predictors are likely to enhance purchase decisions. These findings suggest that consumers' adoption of electric vehicles is driven by a blend of perceived advantages, policy support, and environmental awareness, reflecting a holistic decision-making process.

8. Conclusion:

The results confirm that perceived benefits, government incentives, and environmental concern together provide a significant explanation for consumers' electric vehicle purchase decisions. The influence of these factors illustrates how practical utility, supportive governmental measures, and ecological consciousness converge to shape consumer behaviour. The findings underline the importance of addressing all three dimensions when seeking to encourage wider adoption. Enhancing perceived value, strengthening policy incentives, and promoting environmental responsibility may collectively foster greater consumer readiness to transition towards sustainable mobility options.

9. Suggestions:

1. Expand public awareness campaigns highlighting the long-term benefits of EV ownership.
2. Simplify and publicise government incentive procedures and eligibility clearly.
3. Strengthen charging infrastructure across districts to improve accessibility.
4. Encourage dealerships to offer transparent guidance on incentives and maintenance.
5. Develop district-level policies tailored to local consumer needs.
6. Promote environmental education to reinforce pro-sustainability attitudes.
7. Improve digital portals to streamline subsidy applications and support.
8. Implement community-based demonstrations to familiarise consumers with EV technology.

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