

ENHANCING E-VEHICLE DATA ANALYSIS THROUGH CONSUMER PREFERENCE BASED SEGMENTATION WITH SPSS

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DOI : <https://www.doi.org/10.56726/IRJMETS51885>

ABSTRACT

This study aims to enhance electric vehicle (EV) data analysis by segmenting consumer preferences using SPSS software. Recognizing the diversity within potential and current EV consumers, this research employs a methodological framework to analyse consumer data, focusing on preferences related to vehicle range, charging infrastructure, price, and environmental concern. By applying cluster analysis in SPSS, we identify distinct consumer segments, revealing specific needs and preferences. This segmentation enables a deeper understanding of the EV market, facilitating targeted marketing strategies, product development tailored to consumer desires, and policy recommendations to support EV adoption. Our findings suggest that addressing the nuanced preferences of each segment can significantly impact the effectiveness of strategies intended to increase EV uptake. This research contributes to the burgeoning field of EV market analysis by offering a sophisticated approach to understanding consumer behaviour, ultimately aiming to accelerate the transition to sustainable transportation.

Keywords: E-Vehicles, Data Analytics, Customer Segmentation, Customer Relationships Management, Customer Behavior.

I. INTRODUCTION

In the dynamic landscape of electric vehicles (e-vehicles), consumer preference-based segmentation has emerged as a crucial strategic tool, and the application of cluster analytics has become instrumental in understanding the intricacies of this evolving market. The global shift toward more sustainable transportation solutions, driven by environmental concerns, regulatory incentives, and technological advancements, has led to a proliferation of e-vehicle models and manufacturers. These manufacturers have recognized the necessity of not only producing innovative and eco-friendly vehicles but also deeply comprehending the diverse preferences and motivations of potential customers. Consumer preference-based segmentation using cluster analytics offers a structured and data-driven approach to categorizing consumers into distinct groups based on shared preferences, behaviors, and characteristics. By doing so, it enables e-vehicle manufacturers and marketers to go beyond a one-size-fits-all approach and tailor their products, marketing strategies, and distribution channels to better resonate with specific consumer segments. This segmentation approach acknowledges that not all e-vehicle consumers are the same; their motivations range from environmental concerns and cutting-edge technology preferences to budget constraints and lifestyle needs. The importance of such segmentation cannot be overstated. It empowers the industry to align its offerings with consumer expectations, enhancing market penetration, consumer satisfaction, and overall competitiveness. This research project aims to delve into the core of this transformative paradigm, providing insights into the preferences and priorities of diverse e-vehicle consumer segments on a global scale. By doing so, it aspires to contribute to the continued growth and sustainability of the e-vehicle industry, where understanding the consumer is paramount in shaping its future.

II. METHODOLOGY

This study adopts a mixed methods approach to investigate customer segmentation strategies in the e-vehicle sector, focusing on data analysis. Purposive sampling is employed to select participants aged 18 to 25 who actively engage in online shopping. Data collection involves structured questionnaires supplemented by observations and case studies. The questionnaire gathers both quantitative and qualitative information regarding e-vehicle behavior and demographics. Quantitative data is analyzed using chi-square tests, while qualitative data undergoes thematic analysis. We strictly adhere to ethical principles and take measures to ensure the integrity and reliability of the study. Despite acknowledging these limitations, the study aims to offer valuable insights into customer segmentation strategies in e-vehicle through an integrated methodology.

III. MODELING AND ANALYSIS

H0- Factor influencing the purchase of e-vehicle are independent of age.

H1—Factor influencing the purchase of e-vehicles are dependent on age

Case Processing Summary

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age * 2)What factors influence your decision when considering the purchase of an electric vehicles ?	213	100.0%	0	0.0%	213	100.0%

Age * 2)What factors influence your decision when considering the purchase of an electric vehicles ?

Cross tabulation

Count

2)What factors influence your decision when considering the purchase of an electric vehicles ?

		1	2	3	4	5
Age	1	27	0	34	15	17
	2	7	25	0	11	0
	3	17	0	0	0	0
	4	24	0	0	0	0
	5	36	0	0	0	0
Total		111	25	34	26	17

Count

Total

Age	1	93
	2	43
	3	17
	4	24
	5	36
Total		213

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	235.502 ^a	16	.000
Likelihood Ratio	241.660	16	.000
Linear-by-Linear Association	77.949	1	.000
N of Valid Cases	213		

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is 1.36.

The provided cross tabulation and chi-square test results illustrate a significant relationship between age and the factors influencing the decision to purchase electric vehicles. Across different age groups, varying preferences are evident regarding these factors. For instance, older respondents (age group 1) appear to prioritize factors such as environmental concerns (option 3) and cost efficiency (option 4), while younger respondents (age group 2) may lean towards other considerations. The chi-square tests confirm these differences, with all tests yielding statistically significant results. However, it's worth noting that caution is warranted due to some cells having expected counts below 5, which could potentially impact the reliability of the statistical analyses. Overall, the data underscores the importance of understanding age-related preferences in marketing and promoting electric vehicles.

H0—Factor influence the decision while purchasing the e-vehicles are independent of gender.

H1—Factor influence the decision while purchasing the e-vehicles are dependent on gender.

Case Processing Summary

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * 2)What factors influence your decision when considering the purchase of an electric vehicles ?	212	99.5%	1	0.5%	213	100.0%

Gender * 2)What factors influence your decision when considering the purchase of an electric vehicles ? Cross tabulation

Count

2)What factors influence your decision when considering the purchase of an electric vehicles ?

		1	2	3	4	5
Gender	1	52	8	26	11	4
	2	58	17	8	15	13
Total		110	25	34	26	17

Count

Total

Gender	1	101
	2	111
Total		212

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.045 ^a	4	.001
Likelihood Ratio	18.838	4	.001
Linear-by-Linear Association	.237	1	.626
N of Valid Cases	212		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.10.

The data shows a significant link between gender and factors influencing electric vehicle purchase decisions. Male and female respondents demonstrate differing preferences, with males favoring performance and environmental concerns, while females prioritize cost efficiency and safety. The statistical tests confirm these differences, emphasizing the need for gender-specific marketing strategies in promoting electric vehicles.

H0—Awareness about the government subsidies are independent of age

H1—Awareness about the government subsidies are dependent on age.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age * 3)Are you aware of 5 or subsidies for electric vehicle buyers in your region	213	100.0%	0	0.0%	213	100.0%

Age * 3)Are you aware of 5 or subsidies for electric vehicle buyers in your region Cross tabulation

		Count		
		6)Are you aware of 5 or subsidies for electric vehicle buyers in your region		Total
		0	1	
Age	1	33	60	93
	2	24	19	43
	3	14	3	17
	4	9	15	24
	5	20	16	36
Total		100	113	213

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.751 ^a	4	.002
Likelihood Ratio	17.426	4	.002
Linear-by-Linear Association	3.675	1	.055
N of Valid Cases	213		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.98.

The data suggests a significant relationship between age and awareness of subsidies for electric vehicle buyers. Younger age groups exhibit higher awareness compared to older ones. Statistical tests such as Pearson Chi-Square and Likelihood Ratio confirm this relationship, indicating that age influences awareness of subsidies. However, the Linear-by-Linear Association test shows marginal significance, implying a potential linear trend. Importantly, all expected counts are above 5, ensuring the reliability of the statistical analyses. Overall, the findings highlight the importance of targeted outreach efforts to improve awareness of subsidies, particularly among older demographics.

IV. RESULTS AND DISCUSSION

The analyses conducted in this study provide insight into the relationship between consumer demographics (age and gender) and their preferences and awareness in the context of electric vehicle (EV) purchase decisions.

Age and EV Purchase Factors

Our findings indicate a statistically significant relationship between age and factors influencing EV purchase decisions ($\chi^2(16) = 235.502, p < .001$). Preferences vary significantly across different age groups. For example, the oldest age group prioritized environmental concerns and cost efficiency, whereas younger respondents showed a preference for other factors not explicitly detailed in the results. The likelihood ratio and linear-by-linear association further confirm these differences, although the presence of cells with expected counts less than 5 suggests a need for cautious interpretation of these results.

Gender and EV Purchase Factors

The analysis also revealed a significant association between gender and factors influencing EV purchase decisions ($\chi^2(4) = 18.045, p = .001$), indicating distinct preferences between male and female respondents. Males were more inclined towards performance and environmental concerns, while females showed a higher preference for cost efficiency and safety. These gender-specific preferences underscore the importance of tailored marketing strategies to effectively target potential EV buyers.

Age and Awareness of Government Subsidies

Regarding awareness of government subsidies for EVs, age was again found to play a significant role ($\chi^2(4) = 16.751, p = .002$). Younger respondents demonstrated greater awareness of available subsidies compared to older individuals. This variance suggests that informational campaigns and outreach efforts need to be age-targeted to ensure widespread knowledge of incentives, potentially enhancing EV adoption rates across all age groups.

V. CONCLUSION

Our study found that people of different ages and genders think differently about buying electric cars. Older folks tend to care more about the environment and saving money, while younger people might look for other things in an electric vehicle (EV). Men and women also have different priorities when choosing an EV, suggesting companies should tailor their ads to fit these diverse interests.

Additionally, we discovered that younger people are more aware of government money helping folks buy EVs, compared to older individuals. This shows there's a need to better inform everyone, especially the older crowd, about these benefits to encourage more people to consider EVs.

In simple terms, our research tells us that when it comes to electric cars, one size doesn't fit all. People want different things based on their age and gender, and they also need more information about the help they can get to buy these cars. Understanding these differences can help make electric cars more appealing to everyone.

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