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CONSUMER BUYING BEHAVIOUR OF ELECTRIC VEHICLES IN DEHRADUN DISTRICT

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Abstract

In this study, the consumer buying behaviour of vehicle users was measured with the help of the consumer buying behaviour structural model. This model considers four points: Infrastructure facility, economic factor, product quality, and geographic situation. Primary data were collected from Dehradun through a structural questionnaire. The collected data were analysed with the help of SPSS Software and Ms-Excel. A Consumer buying behavior regression model was prepared to analyze the consumer buying behavior of vehicle users in the study area. It is observed from the regression Model of vehicles that Consumer buying behaviour was taken as the dependent variable (y), and x_1, x_2,x_3, and x_4 were the independent variables related to infrastructure facility(x_1), economic factor of the household (x_2), types of product (x_3) and geographic condition of the area (x_4) were independent variable in case of electric vehicles buying model. It has been seen from the table that the value of coefficients of multiple determinants (R2) was 0.7169, indicating the 71.69% variation in R^2 was joined by the effect of all four independent variables.

It may be concluded from the results that the interest in using electric vehicles is increasing among vehicle users and shifting their desire to have electric vehicles. The population in the survey area is very much conscious about a clean environment and better health issues. There is a bright future in the market for electric vehicles, and they are contributing a significant role

in reducing carbon dioxide levels and air pollution. Electric vehicles are a better option than fuel-based vehicles to protect the environment and health of human beings. It may be concluded that consumer buying behaviour toward electric vehicles depends on various factors, such as whether those are multiple factors such as whether those are favourable and not favourable for electric vehicles where consumers live.

Keywords: Consumer Buying Behaviour**,** Infrastructure facility, Economic factor, Geographical situation, Electric vehicles.

Introduction

Batteries power electric vehicles and are becoming increasingly popular due to their eco-friendly nature and lower operating costs. An electric (EV) vehicle uses a battery to power its electric motor, which can be charged from an external source. An electric vehicle (EV), also called an electric drive vehicle, uses one or more motors or traction motors for propulsion. EVs are mainly categorized as follows: Electric two-wheelers(E2WS) are used for both electric bicycles and electric scooters; Electric four-wheeler (E4WS) is used for electric cars; E3W is used to refer to electric 3-wheeler(including E-Rikshaw) and E-buses used for Electric buses. The first electric car appeared in India in the late 19th century, but it wasn't until the 1960s that battery technology improved enough to make EVs practical for everyday use. Unfortunately, a lack of infrastructure and government support hindered their widespread adoption.

To encourage the adoption of EVs, the Indian government has introduced various incentives and regulations. For instance, the FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) scheme provides subsidies for purchasing EVs and hybrids. At the same time, some states offer additional benefits like road tax exemptions or free parking. Some cities, like Bangalore and Delhi, have also implemented EV-friendly policies, such as designated charging zones and reserved lanes for EVs.

Consumer buying behaviour refers to the actions and decision-making processes when purchasing a product or service. Several factors can influence consumer buying behavior, such as demographics, psychographic information, and cultural and social aspects. Demographic factors such as age, gender, income, and occupation, while psychographic factors such as personality traits, values, and interests. Cultural and social factors, such as social norms and peer pressure. Business people can use marketing research systems to understand consumer buying behavior.

Consumer Buying Behavior refers to consumers' actions before buying a product or service. Consumer buying behavior is a sum of attitude, preference, intention, and decision regarding their behavior and marketplace when purchasing products or services. In this study, the consumer buying behavior regarding electric vehicles was measured with the help of factors such as:

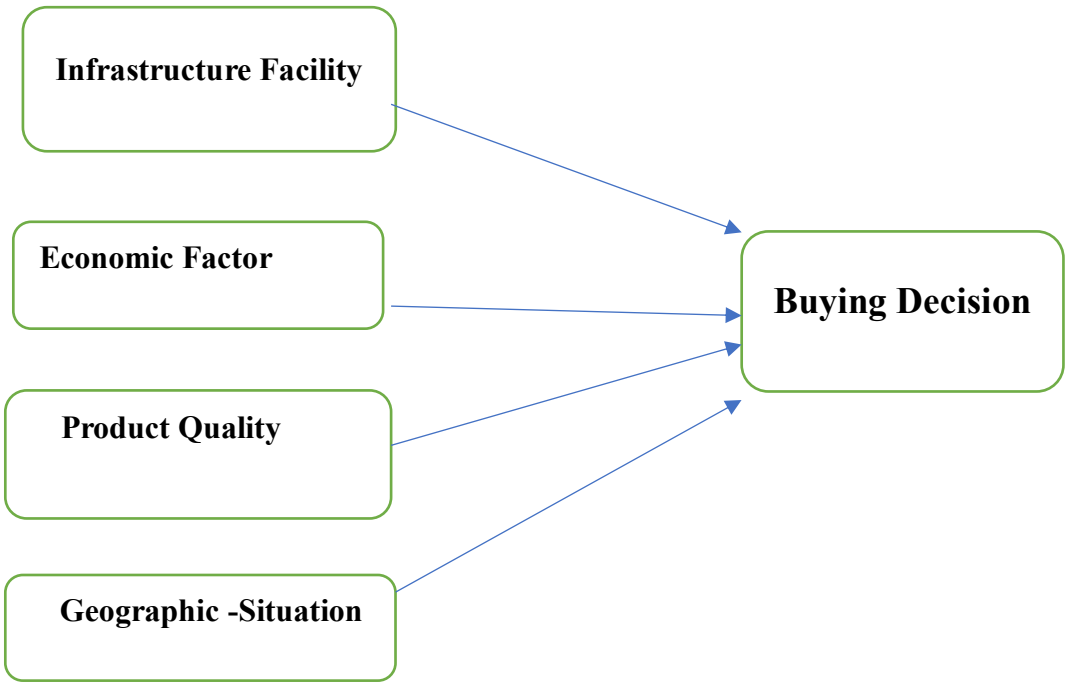
Infrastructure Facility: The factor influencing consumer buying power of vehicles is infrastructure, which is the core component of whether the proper facility is well developed for cars.

Economic Factor: The second factor is the price of a vehicle, which is another major factor in purchasing a car. Purchase price influences the consumer's buying capacity for the product. Comparative low cost of the Vehicle is favorable to consumers.

Product Quality: This refers to the degree of excellence and craftsmanship invested in the production process, including materials used, manufacturing techniques, and attention to detail. Elements contributing to the buying decision of vehicles include durability, functionality, and reliability.

Geographic Situation: Calculation of consumer buying decision based on area.

STRUCTURAL MODEL OF CONSUMER BUYING DECISION



Source: Prepared by Authors

Review of Literature

Muhammad .M (2016) studies the relationship between customer satisfaction and e-banking service quality for five conventional scheduled banks in Bangladesh. The study used primary data collected randomly from seven divisions of Bangladesh through questionnaires. Logistic regression is used to find the relationship. Data were analyzed using a statistical package for social science (SPSS) version 22, Logistic regression, to determine the importance of the factors that influence customer satisfaction. A Chi-square test was applied to analyze how well the data fit in the logistic regression model. The study's finding is that three independent variables (Information quality, service quality, and system quality) are positively related to customer satisfaction. The study results provide a positive relation between banks' customer service quality. The study recommended that the bank improve their information quality about e-banking services all over Bangladesh.

Mandel. N & et al. (2017) systematically organize and integrate the literature on the use of consumer behaviour to regulate self-discrepancies, or the incongruities between how one currently perceives oneself and how one desires to view oneself (Higgins,1987). The study introduced a compensatory consumer behaviour model to explain the psychological consequences of self-discrepancies on consumer behaviour. The model delineates five distinct strategies by which consumers cope with self-discrepancies: direct resolution, symbolic self-completion, dissociation, escapism, and fluid compensation. The study review provides a primer on compensatory consumer behaviour and a set agenda for future research.

Maqsood H. & et al. (2021), examined the factors affecting adoption in developing countries' electric vehicle purchase intention and consumers' willingness to pay. The theory of planned behaviour was tested with two new variables: environmental concern and willingness to pay (WTP) a premium. Data were collected from respondents and were analysed using partial least square structural equation modeling. The findings showed the significant effects of the theory-of-planned-behavior variables and environmental concern on EV technology on purchase intention. These studies provide theoretical contributions and policy guidelines concerning the high vs. low sensitivity of consumer attitudes toward EV technology.

Takumi Kato et. al (2021) examined the loyalty factors covering the corporate brand image products, dealers, sales staff, and after-sale services. The target person belongs to the 30-60 age group, owns a new car, has a brand, and frequently drives at least once a month. The sample size was 200 for each brand and a total of 1200. The evaluation was done with the help of a structure equation model. According to the analysis procedure, factors were extracted from the

observed variable using exploratory factor analysis (EFA), and After that, ProMax rotation was applied. The most effective factors were product and emotional value observed by design and usability, which were more important than the functional value. For sales staff, familiarity was more effective than a specialty. Loyalty has a positive effect on repurchase and Willingness to purchase. It has been reported that premises and products contributed the most to loyalty, followed by staff and brand image, which was significant at a 5 percent level of significance. The dealer and after-sale services have no considerable effect.

Qianxi. L & et al. (2022), the study examined the correlation between customer satisfaction and consumer loyalty and sought the relationship between diverse promotional activities and customer loyalty. The research was conducted in China, and the analysis unit was a customer of Luckin Coffee. Factor analysis was used to analyse the collected sample data, followed by Karl Pearson correlation linear correlation and linear regression to analyse the integrated data. To confirm the variability among several correlated dependent and independent variables. It was found that promotions positively impact customer satisfaction and play a mediating role among them. The study concludes that there is a positive relationship between customer satisfaction and customer loyalty.

Objectives

- To study the consumer buying behaviour of electric vehicles in Dehradun
- To find out factors influencing for purchasing electric vehicles in Dehradun

Research Methodology

In the present study, primary data are used and collected from the sample households are original. The multi-stage sampling technique selected area, state, district, respondents, and data collection. The total sample size of the present study was 250 sample households or respondents in Dehradun District in Uttarakhand. The list of electric vehicle owners and other conventional vehicle holders was collected from the RTO office of the study area.

Data collection was transferred to a paper sheet containing the details of sample households of different parameters related to vehicles and vehicle owners. The data was collected with the help of the survey schedules and questionnaires. The primary data were collected from the selected households by personal interviews with the vehicle owner through the survey method.

The data was transferred to the master sheet and coded in SPSS and MS Excel for further analysis.

In this study, there is one dependent variable, i.e., Consumer Buying, and four independent variables, i.e., Infrastructure Facility(X1), Economic Factor(X2), Product Quality(X3), and geographic situation (X_4). With the help of the Consumer Buying Decision Regression Model, measure the factors that influence consumers to buy electric vehicles in the Dehradun district. To analyze the detail of the above, we compute consumer buying power of vehicles with the help of a 5-point Likert scale indicating very strongly disagree (1), disagree (2), neutral(3), agree(4), and strongly agree(5) and then followed analysis for the study details.

Consumer Buying Decision Regression Model.

Y=f (X_1+X_2+X_3+X_4…….Xn+€)

Whereas, Y=Dependent Variable, f=function, X_1, X_2, X_3,….. Xn =Independent variables

β1, β2…… βn=Correlation Coefficient, €=Error

Y= Consumer Buying Decision weightage score (CBWS)

X_1 = Infrastructure Facility weightage score of Customer view (INSC)

X_2 = Economic Factor weightage score of Customer view (EFSC)

X_3= Product Quality weightage score of Customer view (PQSC)

X_4= Geographic-Situation weightage score of Customer view (GSSC)

€ = Error

Multivariate Regression Model Equation

CBWS = **β1** INWS +**β2** EFSC +**β3** PQSC +**β4** GSSC +**€**

DATA ANALYSIS AND INTERPRETATION

Table-1 Occupation-wise Classification of Respondent

Occupation	**Dehradun**		
	Male	**Female**	**Total**
Commercial Based Driving	170 (68)	0(00)	170 (68)
Personal purposes	62 (24.8)	18(7.2)	80 (32)
Total	232 (92.8)	18(7.2)	250 (100)

1.(Source: Author's Primary survey data) 2. Figures in parentheses Indicate the percentage to the total

Table No-1 shows the distribution of sample respondents based on their full-time engagement in driving operations who adopted their driving skills as a source of income for their personal vehicles as well as hiring out their services to other vehicles. The other category in the table is the respondents driving their vehicles, especially for need-based, for which they are not getting any remuneration for their work. It is further seen from the table none of the females in the survey area are driving any vehicle and not utilizing any vehicles as a source of income for the family in the survey area, but the reverse situation is observed in the case of the personal work where females were also helping in various types need-based activities like taking children to school, local markets and other petty activities in which the vehicles are required they utilize their vehicles by self-driving. This indicates that hardly any females were allowed by their family members to drive jobs on a hire basis.

In the overall situation, 68 percent of sample households are engaged in full-time driving time jobs in survey areas.

Table-2 Classification of Respondents on the basis of Income

Income	**No. of Respondents**		**Total**
	Male	**Female**	
Less than 25000	160 (64)	1 (0.4)	161 (64.4)
25000-50000	14 (5.6)	2 (0.8)	16 (6.4)
50000-75000	25 (10)	5 (2)	30 (12)
75000-100000	18 (7.2)	6 (2.4)	24 (9.6)
More than 100000	15 (6)	4 (1.6)	19 (7.6)
Total	**232 (92.8)**	**18 (7.2)**	**250 (100)**

1.(Source: Author's Primary survey data) 2. Figures in parentheses Indicate the percentage to total

The respondents who have vehicles at home for their personal/private use and commercial use were classified according to their family income during the survey year. It is seen from the table there are five income groups of the respondents who have vehicles in their possession. It is seen from the table that overall, nearly 65 percent of sample households have a monthly income of less than Rs.25,000 per month, whereas in the case of district level, the Dehradun. It is further noticed from the table that nearly income between 12 percent of households have monthly income in-between categories more than Rs 50,000 but less than 75000 per month, followed by 10 percent of household respondents having a monthly income in-between category more than Rs.75000 and less than Rs 100000. It is observed from the table that 8

percent of respondents come from the group where their family monthly income is more than 1 lakh. It is interesting to mention here that the females were also employed in any reputed organization that earned or contributed to the family income in the survey area. This indicates females also have liberty in the households and are allowed to work in offices and contribute their potential to family development. It is also necessary to notify here that in families with a monthly income between 25000-75000 ranges, the females in such families also contribute to ordering jobs somewhere and helping in the family development activities so that their family may stand strongly against forthcoming challenges in the family.

Table-3 Reliability Test using Cronbach Alpha Method

Reliability Statistics			
Factor	**Cronbach's Alpha**	**Cronbach's Alpha Based on Standardized Items**	**Number of Items**
Consumer Buying Behaviour	.804	.791	24

1.(Source: Author's Primary survey data)

Reliability test of Consumer Buying Behaviour towards electric vehicles in which 24 questions were asked from the respondents based on the suggested 5-point Likert scale and a sample size of 250 respondents. The result was 0.804, which was greater than 0.7 and is considered to be good for internal consistency. The result suggested that for internal consistency, the vehicle features may be better for the use of buyers. However, the values above 0.51 were also considered to be up to the mark (**Straub et al., 2004**). A Cronbach Alpha value of more than 0.720 suggests a strong consistency level of the vehicles **(Gliem & Gliem, 2003).**

Table -4 Distribution of Respondents on 5-Point Likert Scale for Consumer Buying Decision in Percentage

Factors	**Percentage of respondents**				
	Strongly Disagree (%)	**Disagree (%)**	**Neutral (%)**	**Agree(%)**	**Strongly Agree(%)**
Infrastructure Facility	2.8	14.13	4.13	68.27	10.67
Economic Factor	4.27	17.73	5.6	56.67	15.73
Product Quality	1.47	5.33	1.6	77.87	13.73

Geographic-Situation	2.8	10.8	3.33	68	15.07
Buying Decision	2.83	11.5	3.5	73.83	8.33

Source: Authors' Calculation

Consumer Buying Decision for purchasing electric vehicles have a relation with different factors, i.e., infrastructure facility, economic status, product quality, geographical situation, and buying decision have different questions which were asked from the respondents, and their opinions were recorded in five-point Likert scale weightage from 1 to 5 and analysis were presented in the table. It has been seen from the table that strongly disagree, disagree, neutral, agree, and strongly agree scales the opinion of respondents showing in the table and found that the majority of households agreed on the scale followed the neutral opinion of respondents, and very few respondents strongly agree with a different factor related to the question. This indicates that respondents of the Dehradun sample household expressed their feeling about purchasing or were in favour of purchasing electric vehicles and disagreed with purchasing electric vehicles due to the lack of facilities in the area for the customers.

Table-5 Dehradun Buying Decision Summary Output

Regression Statistics	
Multiple R	0.846734
R Square	0.716958
Adjusted R	0.70915
Standard Error	0.008709
Observation	250

Source: Authors' Calculation

Table-6 ANOVA Dehradun Consumer Buying Decision

	Df	SS	MS	F	Significant F
Regression	4	0.027861	0.006965	91.82286	9.62E-39
Residual	245	0.010999	7.59E-05		
Total	249	0.03886			

Source: Authors' Calculation

Table-7 Consumer Buying Decision Regression Model Dehradun

Particular	Details	Correlation Coefficients				R^2
Intercept	1.003726	x_1	x_2	x_3	x_4	0.7169
Variable	4	0.3734 (0.0996)	-0.1752 (0.0967)	-0.2858 (0.0263)	-0.5723 (0.0353)	
D.F	245					
Calculated t Value		3.7462	-1.8119	-10.8688	-16.2011	

Source: Authors' Calculation

The Consumer Buying Decision regression model for electric vehicles was analyzed, and four independent parameters were selected to help consumers make buying decisions for their required commodities, items, or vehicles. In the present case, consumer buying decisions which are closely related to four independent parameters, namely infrastructure facilities, economic condition or status of buyers, types of products, and geographical areas or factors, were taken into account, which have a joint effect on the power of consumer buying decisions. In the present situation, all the qualitative data were recorded using the five-point Likert scale method in which weightage is given by consumers in the range of 1 to 5 provided by the respondents as per their psychological acceptability of the statement related to electric vehicles. These weightage values were used as a parameter and utilized in the log-linear regression model. It is further clarified here that at the first stage, there were four regression models: linear regression model, log-linear regression model or double log, semi-log (log of the independent variable), and semi-log (log of the dependent variable). Their result was compared after one regression model was chosen based on the criteria followed wherein the higher number of correlation coefficients statistically significant at any level 1%,5%, and 10 %, then the higher value of coefficient multiple determinants (R^2) was

the criteria for choosing the best-fit model and which was finalized for further analysis of the data. In the present case, the log-linear/double log multiple regression model was found to be the best fit and selected for second-stage regression analysis, and their result was used for interpretation.

In the table, consumer buying decision was taken as the independent variable (y), and $\mathbf{x_1}$, $\mathbf{x_2}$, $\mathbf{x_3}$, and $\mathbf{x_4}$ were the independent variable related to infrastructure facility ($\mathbf{x_1}$), economic factor of the household ($\mathbf{x_2}$), types of product ($\mathbf{x_3}$) and geographic situation of the area ($\mathbf{x_4}$) were major independent variable in case of electric vehicles purchasing. It has been seen from the table that the value of the correlation coefficient of multiple determinants (R_2) was 0.7169,

indicating the 71.69% variation in R2 jointly with the effect of all four independent variables mentioned above. It is further seen from the table that among four independent variables, only the infrastructure (x_1) variable was found positive and significant at a 1 percent level of significance as the value given in table 0.3734 indicated that if a 1 percent level of infrastructure facility increases 37.34 percent consumer buying decision increases. This may be because electric vehicles are small and suitable only for the good metal or RCC (Reinforced Cement Concrete) roads in the survey areas. Surprisingly, explanatory variables x2 (economic), x3 (product), and x4 (geographic situation) were found to have a negative relation but were statistically significant at a 1 percent level of significance. This indicated that due to the poor economic condition of the respondents, electric vehicles ' size and shape were not suitable as per the expectation of the sample households, and the geographical condition included undulated land surface and being a hilly area of Dehradun. All the conditions are responsible for having a negative association with the dependent variable, i.e., consumer buying decisions. It may be evident from all the facts that the quality of product requirements, as per the expectation of consumers, will be suitable for the economically low level of households, and comparatively higher power electric motors or batteries may increase the consumer buying decision level.

Hypothesis Testing

There is no significant difference between customers' age groups and vehicles' safety measures.

Table-8 Model Summary

Regression Statistics	
Particulars	**Dehradun**
Multiple R	0.024929
R Square	0.000621
Adjusted R	-0.00341
Standard Error	1.208629
Observations.	250

Source: Authors' Calculation

Table -9 ANOVA table for Age groups of respondents and safety measures

Particulars	df	SS	MS	F	Significant F
Regression	1	0.225272	0.225272	0.154213	0.694879
Residual	248	362.2747	1.460785		
Total	249	362.5	32.41115		

Source: Authors' Calculation

It can be inferred from the above Table-9 that the values of R and R2 are very low, showing below satisfactory coordination between explanatory variables, which are explained in the study area. It is further revealed that the F value 0.694879 in the above districts was greater than 0.05, explaining that there is no significant relationship between age groups and safety measures of the vehicles. Due to the high value of residual variables, the null hypothesis is rejected. The higher age group of respondents was alerted about the safety measures at the time of purchase of vehicles.

Finding

- It was found from the study that none of the females in the survey area drove any type of vehicle and did not utilize any car as a source of income for the family.
- The Reliability test of Consumer Buying Behaviour towards electric vehicles is 0.804, which suggests the good internal consistency of the vehicle's features.
- It is found from the study that the majority of sample households agreed with the scale, followed by the neutral opinion of respondents.
- It has been found from the study that the value of the correlation coefficient of multiple determinants (R^2) was 0.7169 jointly effect of all independent variables only the infrastructure ($\mathbf{x_1}$) variable was found positive and significant at a 1 percent level of significance as the value given in the table 0.3734 indicated that if 1 percent level of infrastructure facility increases 37.34 percent consumer buying decision increases.
- The result of the hypothesis is that there is no significant relationship between the age group and the safety measures of the vehicles.

Conclusion

It may be concluded from the study that interest in using electric vehicles increasing among the vehicle users and awareness about the environment of the survey area; the respondents are is very conscious of a clean environment and better health issues. As per the expectation of the sample, households are not satisfied with the geographical conditions, including the undulated land surface and the hilly area of Dehradun. It may be concluded that electric vehicle prices are minimized, and the number of vehicle users is increased due to poor economic conditions. Electric vehicles are a better option than fuel-based vehicles to protect the environment and health of human beings. It may be concluded that consumer buying behavior toward electric vehicles depends on various factors, such as whether those are multiple factors such as whether those are favorable and not favorable for electric vehicles where consumers live. There is a bright future in the market for electric vehicles, and they are contributing a significant role in reducing carbon dioxide levels and air pollution

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