STM JOURNALS

International Journal of
Electrical Machine Analysis and Design

Volume 1, Issue 1, 2023
January—June
DOI (Journal): 10.37591/IJEMAD

https://journals.stmjournals.com/ijemad

Case Study IJEMAD

Empowering Sustainability and Consumer Satisfaction on Electric Vehicles Among Young Adults in Sulthan Battery: A Review

K. Thamarai Selvi[1]*, Sterina A.S.[2]

Abstract

Electric vehicles are extremely eco-friendly while they require a small amount of fossil fuels (petrol or diesel), have fewer moving parts that are easier to maintain, and have low running costs. This vehicle is envisioned as a replacement for today's automobiles. It can be used to address concerns such as pollution, global warming, natural resource depletion, and so on. The electric car concept offers a clear-cut solution to the environmental problems of gasoline-powered automobiles. This study is conducted to determine how people feel about electric automobiles. The goal is to reduce vehicular pollution by switching to electric vehicles. This study focuses on consumer satisfaction of electric vehicles attitude of students of Nilgiri College of Arts and Science, Thaloor. The project commences with fixing the objective then samples were collected accordingly. A total of 300 samples from the community were taken, and the results of the analyses were then obtained. The project's goals were established at the outset, and they have been met. This study conclude that majority of students are interested to prefer electric vehicles. Almost all the responders in the present study are men. The institute play an important role for promoting entrepreneurship and develop their ideas. Hence the study can be concluded that students of Nilgiri College have a positive attitude towards entrepreneurship.

Keywords: Plug-in hybrid electric vehicles, ICE engine, extraction method, consumer satisfaction, automobile Industries

INTRODUCTION

Electric vehicles (EVs) originally appeared in the final decades of the nineteenth century because electricity was one of the preferred forms of motor vehicle power, offering a level of comfort and ease of use that petrol cars of the day were unable to match. For almost 100 years, internal combustion engines predominated as the primary means of propulsion for cars and trucks, but electric power remained prevalent in other vehicle types, such as trains and smaller vehicles of all kinds. In the United States and the European Union, government incentives to encourage adoption were first provided in the late 2000s, which resulted in a booming automotive market in the 2010s. The market for electric vehicles is anticipated to grow significantly because of rising public interest, awareness, and structural incentives, such as those incorporated into the green recovery from the COVID-19 epidemic. Lockdowns have decreased the amount of greenhouse gases in petrol or diesel automobiles during the Covid-19 pandemic [1–4].

***Author for Correspondence**
K. Thamarai Selvi
E-mail: selvithamarai118@gmail.com

[1]Assistant Professor, Nilgiri College of Arts and Science, Thaloor, The Nilgiris, Tamil Nadu, India
[2]PG Student, Department of commerce, Nilgiri College of Arts and Science, Thaloor, The Nilgiris, Tamil Nadu, India

Received Date: June 23, 2023
Accepted Date: October 10, 2023
Published Date: October 25, 2023

Citation: K. Thamarai Selvi, Sterina A.S. Empowering Sustainability and Consumer Satisfaction on Electric Vehicles Among Young Adults in Sulthan Battery: A Review. International Journal of Electrical Machine Analysis and Design. 2023; 1(1): 1–10p.

In 2021, the International Energy Agency urged nations to take more measures to achieve climate targets, including regulations for large electric cars. By 2030, sales of electric vehicles may rise from a 2% global share in 2016 to 30%. The global EV market was valued at $280 billion as of July 2022, [5] and by 2026, it is anticipated to reach $1 trillion. A 2020 literature analysis found that while the use of electric 4-wheeled vehicles appears economically implausible in emerging nations, the usage of electric 2-wheelers is likely to increase. Most of this growth is anticipated in markets like North America, Europe, and China. More 2- and 3-wheel EVs are available than any other kind.

A Variety of Electrical Vehicle Models

Three basic categories of electric cars are typically mentioned when discussing EVs: Hybrid electric vehicles (HEV), Plug-in hybrid electric vehicles (PHEV), Battery electric vehicles (BEV).

HEV: Hybrid Electric Vehicles

To reduce fuel consumption, a hybrid electric vehicle (HEV) combines an internal combustion engine (ICE) with an electric motor and battery pack. HEVs accomplish this by utilising an electric motor to propel the vehicle when an ICE would be most inefficient, such as while accelerating from a stop. When it is more efficient to do so, such as when travelling at highway speeds, hybrids may also favour the ICE engine [6–7]. When it becomes more economical to do so, such as when travelling at highway speeds, hybrids may also favour the ICE engine. Since owners may only refuel hybrid vehicles with conventional fuels (often petrol), they are most comparable to drive to regular ICE automobiles.

Drivers don't need to check the battery charge or plug the cars into power outlets since HEV technology continually charges the batteries through a process known as "regenerative braking" and turns on the electric motor system when the conditions are right.

PHEV: Plug-in hybrid electric vehicles

Like a hybrid, a plug-in hybrid electric vehicle (PHEV) combines an internal combustion engine (ICE) with an electric motor and battery pack [8]. However, there are some key differences. Since the electric system performs most of the work when driving, PHEVs often have larger battery packs and more potent electric motors than hybrids. This implies that PHEVs can operate exclusively on electricity, turning off the ICE completely [9–10]. As the automobile will automatically recharge the battery and transition between ICE and electric power dependent on conditions, driving a plug-in hybrid is comparable to driving a hybrid. Drivers can choose to refuel PHEVs with both fuel and electricity, though. If the battery is completely depleted, a PHEV can run only on petrol, and the opposite is true if the gasoline is completely consumed.

BEV: Battery electric vehicles

An 'all-electric' or 'full-electric' car is referred to as a battery electric vehicle (BEV). BEVs only use electricity, with onboard battery packs serving as a source of current for the electric motors in each vehicle. BEVs lack all ICE components.

BEVs often feature substantially greater capacity batteries and kilowatt-hour (kWh) outputs than equivalent hybrid and plug-in hybrid electric vehicles due to their sole reliance on electricity. BEVs often cost more than other types of EVs because of the additional battery technology.

To operate, BEVs need to be charged. This can be accomplished using a rapid charging station, a home charger, or energy recovered during regenerative braking.

Statement of Problem

The topic of the project is ‘a study on customer satisfaction on electric vehicles with special reference to youngsters. The study’s goal is to examine the current state of electric car potential, as well as customer attitudes and preferences regarding electric vehicles, particularly among young people. The research would also aid in concentrating on the numerous elements that may have influenced the use of

electric vehicles. The market share of electric car production is anticipated to increase significantly as it gains popularity every day. By 2023, the GDP of India is anticipated to expand by an astounding 25%. The best aspect is that EVs can reduce oil imports by around $60 billion by 2030 in addition to lowering environmental impact. This is a fantastic idea to lessen environmental harm and improve public health. Better air quality and fewer health issues will result from reduced exhaustion of hazardous pollutants.

Objectives of the Study

- To analyze the customer awareness towards electronic vehicles
- To examine the customer perception of towards electronic vehicles
- To compare the attitude of customer environmental consciousness on buying electric vehicles.

Scope of the Study

The scope of the study is to understand the satisfaction on electronic vehicles with special reference to youngsters and the future estimated consumption. Thus, this would aid in the statistical examination of people's desire for electric vehicles. The study would also be useful in determining the opinions and experiences of various electric vehicle users. As a result, statistical study of people's desire for electric vehicles would be possible and also aid in deducing the experiences and perspectives of various electric vehicle customers and to analyze the possibilities of electric vehicles in the present scenario and the attitude of customers especially youth towards electric vehicles and their preferences. Focusing on the numerous elements that might have influenced the use of electric vehicles is helpful.

Sources of Data

The location from where the data that is being used comes is known as the data source. A data source could be the place where data first appears or the place where physical information is first converted to digital form, but even the most specialised data could function as a source if another process can access and use it.

Primary Source

Primary data involves getting direct information from the subjects which are needed for the purpose of your study. Data from the primary source has been collected mainly by conducting survey with the help of questionnaire.

Secoundary Source

On the other hand, secondary data includes making use of data that has already been collected by others. Data from primary source has been collected from books, magazines, and websites.

Tools Used for Data Analysis

The study's statistical methods were employed. Simple statistical analysis using the % method is often known as percentage analysis and factor analysis.

Percentage Analysis

The method of representing a raw stream of information as a proportion for a greater comprehension is called percentage analysis. A percentage is a particular form of ratio that is used to compare two or more data sets. Since the percentage reduce everything as common based and allow the meaningful comparison to be made. Percentage is used to describe the relationship. Bar chart, pie chart is used to explain the tabulation clearly. It involves inspecting, focusing, manipulating, and modelling data from an enormous volume of information or data. One of the key elements of data analysis, the percentage aids in extracting meaning from a vast amount of data and information.

Data Interpretation

The process of reviewing data and drawing pertinent conclusions while utilising a variety of analytical techniques is known as data interpretation. Researchers can categorise, alter, and summarise

data with the use of interpretation to find answers to important questions. It is clear how important data interpretation is, which is why it must be done correctly. It is extremely likely that data will come from many sources and that it will enter the analysis process in a random order. Data analysis is frequently very arbitrary. Depending on the sort of data being analysed, different businesses will have different interpretation needs and goals. Although there are many different techniques that can be used depending on the specifics of each piece of data, "quantitative and qualitative analysis" are the two biggest and most used subcategories. The various scales consist of:

1. *Nominal Scale:* Non-numerical classifications that cannot be quantitatively ranked or contrasted. Variables are both limiting and comprehensive.
2. *Ordinal Scale:* Exhaustive, exclusive categories that are arranged logically. Ordinal scales (good, very good, fair, etc. or agree, strongly agree, disagree, etc.) are used to rate quality and agreement.
3. *Interval:* A unit of measurement scale that divides data into categories with evenly spaced and orderly gaps between them. The zero number is always arbitrary.

Percentage Analysis

Figure 1 shows that 22% of respondents (33) are from below 20. 60% of respondents (89) are in the age group 21-30. 18% of the respondents (27) are from the age group 31-40. And 1 % of the respondents (1) are from the age group above 40 out of total population 150.

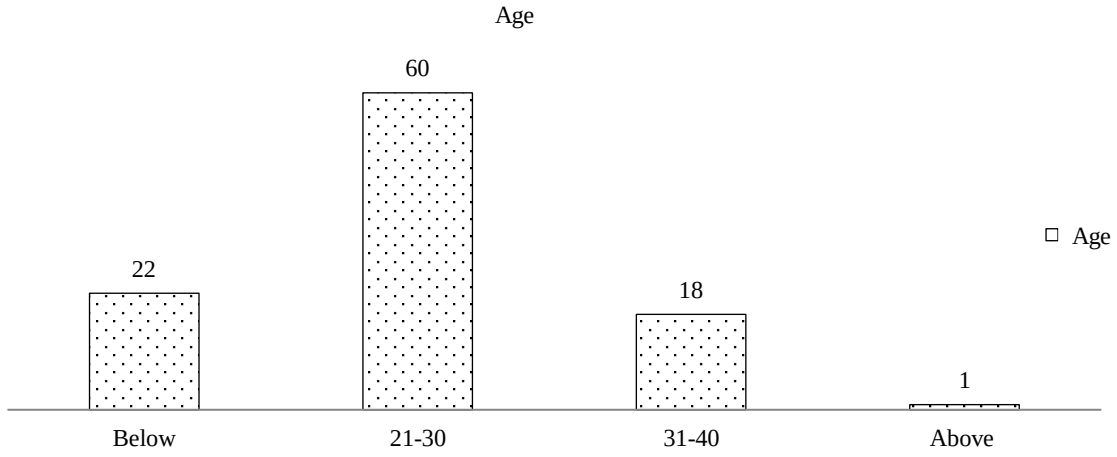

Figure 1. Classification based on age.

58% of male respondents (86) and the 42% of the female (64) out of total population 150. 13% of the respondents (20) are up to school level, 29% respondents (43) are undergraduate, 31% of respondents (46) are post graduate and 27% respondents (41) are professional out of total population 150 as shown in Table 1.

Table 1. Education Basis categorization of population.

S.N.	Particular	Number of respondents	Percentage
1	Up to school level	20	13%
2	UG	43	29%
3	PG	46	31%
4	Professional	41	27%
5	Total	150	100

Figure 2 shows 10% of the respondents are under the government sector. 30% of respondents are in the private sector, 18% respondents are self-entrepreneurs, and 42% respondents are students.

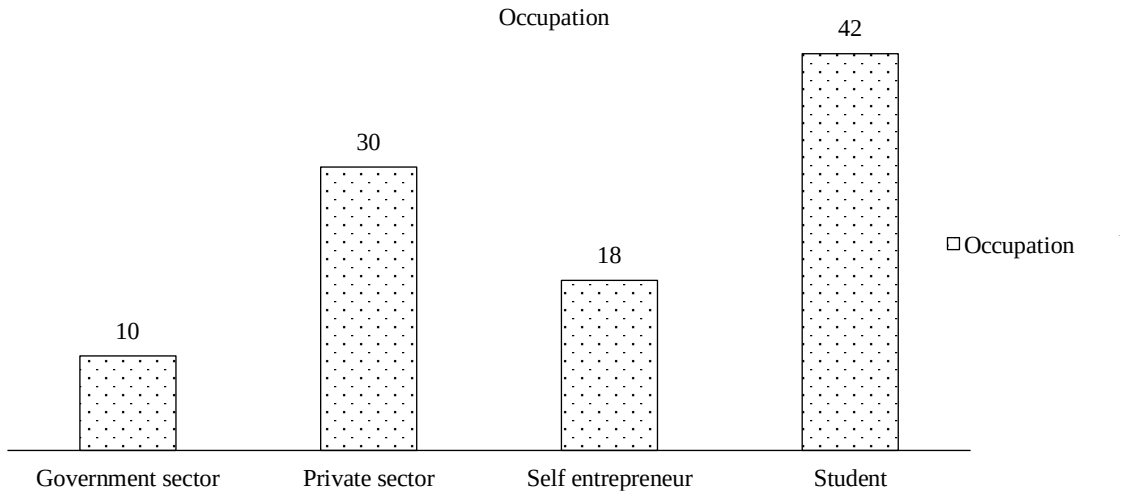

Figure 2. Classification based on occupation.

Table 2 shows that 54% of the respondents have an income in range of 10000-25000. 30% of the respondents have an income from 26000-50000. 10% of the respondents have the income level 51000-55000. 6% of the respondents have an income level above 50000.

Table 2. Classification based on income.

S.N.	Particulars	Number of respondents	Percentage
1	10000-25000	82	54%
2	26000-50000	44	30%
3	51000-55000	15	10%
4	Above 50000	9	6%
5	Total	150	100

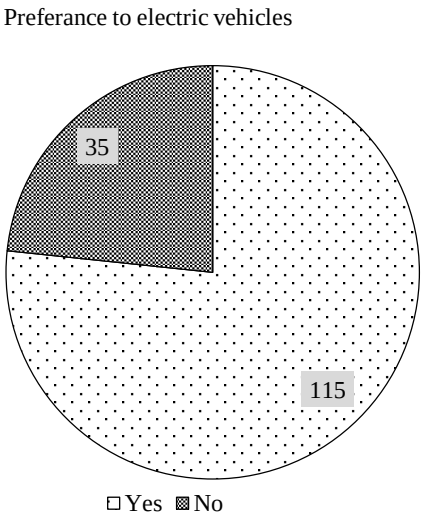

Figure 3. Electric vehicles acceptability.

Figure 3 shows that 77% of people liked electric vehicles and 23% of people did not like electric vehicles. Figure 4 shows that 37% of respondents (55) got knowledge about electric vehicles from advertisements 33% (49) from friends and family, 26% (39) from newspaper and 4% (7) from others out of population of 150 while 80% of the respondents have knowledge and 20% doesn't have knowledge about electric vehicles.

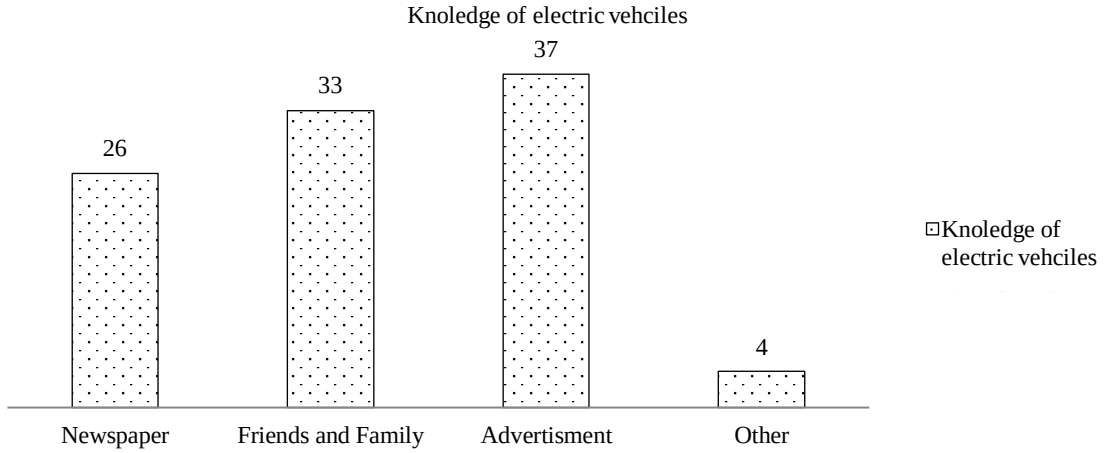

Figure 4. Respondents Knowledge.

Figure 5 shows that 58% of respondents have a positive attitude towards electric vehicles. 20% have a negative attitude, 20% have a neutral and 2% of respondents have another attitude towards electric vehicles.

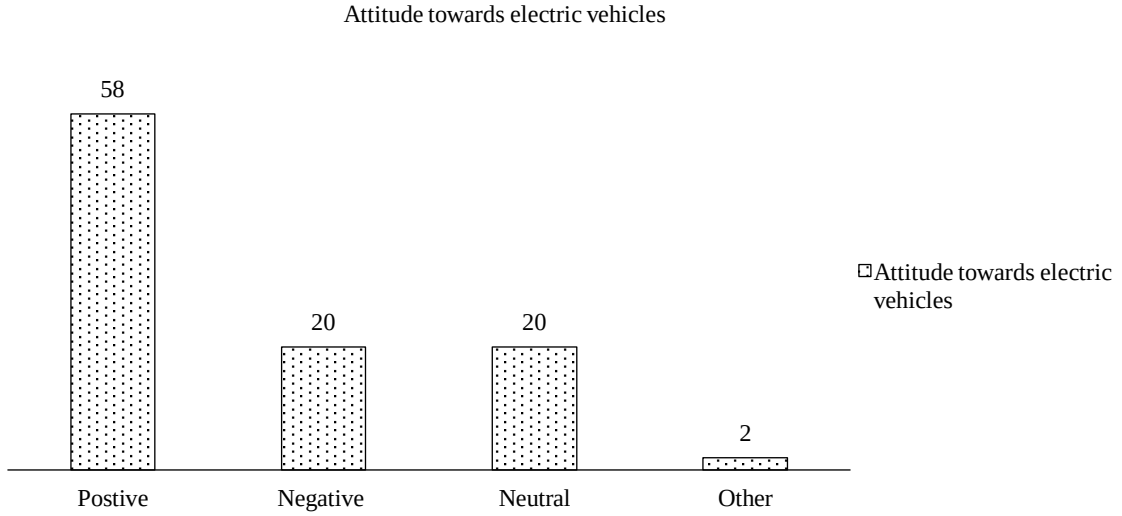

Figure 5. Classification based on attitude towards electric vehicles.

Figure 6 shows that 42% of people have encouraged to consider buying electric vehicles for positive environmental effects, 25% due to lower fuel price, 22% due to low noise level and 11% of people following the trend.

Table 3. Kaiser-meyer-olkin measure.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.811
Bartlett's Test of Sphericity	Approx. Chi-Square	258.276
	DF	28
	Sig.	.000

From Table 3 the Kaiser-meyer-olkin measure of factor analysis revels that highly significant with .811 this clearly shows that all the values are significant at 5% level of significant. Similarly, the chi-square value secured the significance value of 258.276. Degree of freedom with the 150 respondents. Therefore, the study significant at p values was accepted and null hypothesis was rejected.

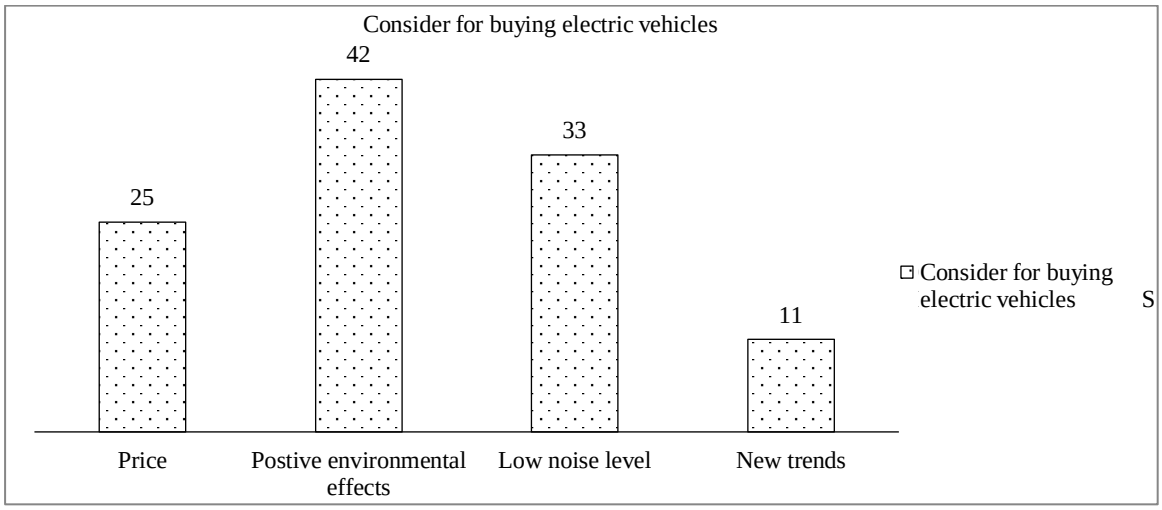

Figure 6. Classification based on consideration for buying electric vehicles.

Table 4. Communalities.

	Initial	**Extraction**
Electric vehicles can reduce pollution to certain extent?	1.000	.456
Do you2 with the statement that "price of electricity is high"?	1.000	.505
Do you2 with the statement that "performance of electric vehicles are high"?	1.000	.642
Do you2 with the statement that "electric vehicles can protect from global warming"?	1.000	.637
Do you2 with the statement that "electric vehicles are very expensive"?	1.000	.428
Do you2 with the statement that " number of charging station are less"?	1.000	.420
Electric vehicles are more convenient for long trip than short trip?	1.000	.520
Electric vehicles will give more popularity in future?	1.000	.574

Extraction method: principal component analysis.

Interpretation

The result in Table 4 reveals that communalities were listed with Initial and extraction values while their variance and comparison of their variance and cumulative % are described in table 5 and table 6 respectively. However, the Initial values should be greater than .1 and the Extraction value need to be greater than .2. Therefore, the communalities values were listed with accepted of significant value. Similarly, are you satisfied with electric vehicles, the electric vehicles can reduce pollution to certain extent, the price of electricity is high and electric vehicles can protect from global warming has the initial value as 1.000, 1.000, & 1.000 and extraction values as .456, .505, & .637.

Table 5. Total variance explained.

Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**	
	Total	***% of Variance***	***Cumulative %***	***Total***	***% of Variance***
1	3.166	39.577	39.577	3.166	39.577
2	1.015	12.693	52.271	1.015	12.693
3	.890	11.131	63.401	.890	11.131
4	.836	10.455	73.856	.836	10.455
5	.618	7.723	81.579		
6	.593	7.417	88.996		
7	.466	5.830	94.826		

8	.414	5.174	100.000		

Table 6. Total variance explained.

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	*Total*	*% of Variance*	*Cumulative %*
1	39.577	2.123	26.535	26.535
2	52.271	2.059	25.736	52.271
3	63.401	2.060	27.675	67.243
4	73.856	2.0.75	24.435	71.212

Extraction method: principal component analysis.

The principal component analysis clearly reveals the total variance allotted for the current study with 4 factors, with Initial Eigen values and cumulative percentage.

Factor with the variance of 39.577 percentages regarding Initial values on the sides Extraction sum of squired loading with the values of 2.059 & 51.159 as in Table 7.

Table 7. Rotated component matrix.

	Component	
	1	*2*
Electric vehicles can reduce polution to certain extent?	.217	.639
Do you2 with the statement that "price of electricity is high"?	.710	-.020
Do you2 with the statement that "performance of electric vehicles are high"?	.682	.420
Do you2 with the statement that "electric vehicles can protect from global warming"?	.005	.798
Do you2 with the statement that "electric vehicles are very expensive"?	.637	.149
Do you2 with the statement that " number of charging station are less"?	.611	.216
Electric vehicles are more convenient for long trip than short trip?	.519	.501
Electric vehicles will give more popularity in future?	.240	.719

From the above result, it is revealed that the Rotated component matrix was listed with highly significant values. Under Extraction method on principle component analysis. Electric vehicles can reduce pollution to a certain extent, the price of electricity is high, and performances of electric vehicles are high listed with values .217, .710 & .682. Electric vehicles can protect from global warming, electric vehicles are more convenient for long trips than short trip and electric vehicles will give more popularity in future are listed with values .798, .501& .719.

Findings

- Majority of the respondents (57%) are male.
- Out of the total respondents 60% of the respondents belong to the age group of 21-30, 22% of the respondents belong to the age group below 20, 18% of the respondents belongs to the age group 31-40.
- 30% of the respondents are from PG, 28% of the respondents are from UG,27% of the respondents are from professional, and 13% of the respondents are from up to school level.
- 10% of the respondents are in the government sector, 30% of the respondents parents are private sectors 19% of the respondents are self-employed. And 41% of the respondents are students.
- Out of the total respondents 54% of the respondent's annual income is between 10000 – 25000, 30% of the respondent's annual income is between 26000 - 50000. 10% of the respondent's

annual income is between 51000 – 55000 and 6% of the respondent's annual income is above 50000.

- 42% of the respondents are from bikes, 26% of the respondents are from scooter, 21% of the respondents are from car and 11% of the respondents are from all the vehicles.
- Out of respondents 58% of petrol, 25% of the respondents of charging (ev's),17% of the respondents of diesel used in vehicle.
- Out of the respondents 77% of respondents like electric vehicles, and 23% of respondents are dose not like electric vehicles.
- 58% of respondents has positive attitude towards electric vehicles, 20% of respondents has negative attitude towards electric vehicles, 20% of respondents has neutral attitude towards electric vehicles, and 2% of respondents have other attitude towards electric vehicles.
- Out of the respondents prefer the most of electrical model of respondents are cars 40%, 30% of respondents are bike, 25% of respondents are scooter, and 5% of respondents are others.
- Out of the respondents 77% of the respondents are planning to buy electric vehicles in future. And 23% of the respondents are dose not planning to buy electric vehicles in future.
- Based on the respondents 80% of the respondents are promote electric vehicles to others and 20% of the respondents are not to promote electric vehicles to others.
- 31% of the respondents are strongly agree that electric vehicles can protect from global warming, 35% of the respondents are agree that electric vehicles can promote from global warming, and 22% of the respondents are neutral that electric vehicles can promote from global warming.
- 31% of the respondents are strongly agree that electric vehicles are very expensive, 37% of the respondents are agree that electric vehicles are very expensive, and 25% of the respondents are neutral that electric vehicles are very expensive.
- Most of the respondents (42%) agree that positive environmental effects to consider buying electric vehicles.

Suggestions

- Increasing the availability of charging stations will increase interest in buying electric cars.
- To a certain extent, lower tax rates can entice purchasers to purchase electric cars.
- There will soon be a rising market for electric automobiles thanks to lower selling prices.
- To lessen pollution and greenhouse gas emissions, people should emphasise electric automobiles more.
- Companies should concentrate on informing the public about new car electric modes.
- Petrol prices are steadily rising. The problem of rising petrol prices can be addressed with electric vehicles. The government's promotion of electric vehicles will aid the country's future progress.
- For reducing environmental pollution, reducing greenhouse gases etc people should give more importance to electric vehicles.

CONCLUSION

Electric vehicles are being introduced in India by several new brands. Governments and manufacturers should work together to construct the infrastructure and create a favorable climate for electric vehicles. The respondents are aware of the state of the climate globally and are prepared to make changes, but price is a key consideration when buying electric cars. If sufficient infrastructure is available, respondents are willing to accept electric vehicles as a future buying option. Consumer confidence is constrained by the price of the initial purchase, the scarcity of charging stations, and the length of time it takes to recharge the battery. This study focuses on consumer satisfaction of electric vehicles attitude of students of Nilgiri College of Arts and Science, Thaloor. The project commences with fixing the objective then samples were collected accordingly. A total of 300 samples from the community were taken, and the results of the analyses were then obtained. The project's goals were established, and they have been accomplished. This study conclude that majority of students are interested to prefer electric vehicles. Most of the responders in this analysis are men. The institute play

an important role for promoting entrepreneurship and develop their ideas. Hence the study can be concluded that students of Nilgiri College have a positive attitude towards entrepreneurship.

REFERENCES

1. Lebeau, K., Van Mierlo, J., Lebeau, P., Mairesse, O., & Macharis, C. (2013). Consumer attitudes towards battery electric vehicles: a large-scale survey. International Journal of Electric and Hybrid Vehicles, 5(1), 28– 41.
2. Høyer, K. G. (2008). The history of alternative fuels in transportation: The case of electric and hybrid cars. Utilities Policy, 16(2), 63–71.
3. Bhalla, P., Ali, I. S., & Nazneen, A. (2018). A study of consumer perception and purchase intention of electric vehicles. European Journal of Scientific Research, 149(4), 362–368.
4. Pierre, M., Jemelin, C., & Louvet, N. (2011). Driving an electric vehicle. A sociological analysis on pioneer users. Energy Efficiency, 4(4), 511–522.
5. Egbue, O., & Long, S. (2012). Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. Energy policy, 48, 717–729.
6. Bhalla, P., Ali, I. S., & Nazneen, A. (2018). A study of consumer perception and purchase intention of electric vehicles. European Journal of Scientific Research, 149(4), 362–368.
7. Glerum, A., Stankovikj, L., Thémans, M., & Bierlaire, M. (2014). Forecasting the demand for electric vehicles: accounting for attitudes and perceptions. Transportation Science, 48(4), 483–499.
8. Adepetu, A., & Keshav, S. (2017). The relative importance of price and driving range on electric vehicle adoption: Los Angeles case study. Transportation, 44(2), 353–373.

