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# Understanding College Students' Perspectives and Adoption Patterns of Electric Vehicles in Bangalore.

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**A B S T R A C T**

The growing emphasis on sustainable transportation has led to increased interest in electric vehicles (EVs), particularly young consumers. The study explores the college student perspectives and adoption of electric vehicles in Bangalore, as they represent a key demographic for future EV adoption So the objective is to examine their willingness to adopt EVs and also correlation between age and preference A quantitative research approach was employed utilizing a structured questionnaire to collect primary data. Total 80 responses were gathered from the college students in Bangalore. The result indicates that the total sample of students achieved an average score of 22 out of possible score 32. The collected data was analysed to identify the trends in EV perception, adoption and correlation between age and preference

This study uses quantitative methods, through statistical analysis and with the help of IBM SPSS Software and did the descriptive statistics and Pearson correlation to study the relationship between age and preference. While there is a weak positive trend where age does not have a significant impact on students' EV adoption preferences in this study. The finding highlights the need for enhanced awareness campaigns, improved infrastructure, and targeted policy measures to encourage EV adoption among college students.

Keywords: electric vehicles, college students , adoption patterns , sustainable transportation.

## Introduction

Climate change issues and its consequences have gained a lot of importance on political agendas worldwide. Carbon dioxide, one of the greenhouse gases has had a magnanimous impact on our environment that has resulted in water supply reduction, rise in coastal flooding and an increase in malnutrition. Due to the increasing awareness of environmental concerns, in view of climatic changes and global warming, consumers have been adopting green measures in order to improve air quality by reducing greenhouse gas (GHG) emissions. About 12 percent of the greenhouse gas emissions across the globe are contributed by private vehicles. On the whole, the transportation sector contributes to an approximate value of 22 percent of the GHG emissions. Efforts to reduce these emissions from this sector are growing at a fast pace (Moataz Mohamed et al., Citation2016). The automobile industry has begun to rethink the conventional forms of mobility due to the climate change and resource shortage. One such measure that is gaining popularity among consumers is the switch from using internal combustion engines (ICE) to electric vehicles, EVs (Degirmenci & Breitner, Citation2017).

The re-emergence of electric vehicles in the market are due to reasons such as improved battery technology and governments' policies to maintain vehicle efficiency and the air quality standards. Electric Vehicles are an important technology which would help in reducing greenhouse gas emissions, local air pollution and vehicular noise pollution (Brady & O'Mahony, Citation2011; Hawkins et al., Citation2013). Being cognizant of these benefits, countries around the world are setting EV adoption targets (Coffman et al.**, Citation2016**).

Achieving high environmental benefits offered by EVs relies thoroughly on the consumers' adoption and preferable understanding of the influential factors that lead to diffusion of EVs in the market. Some of the previously identified factors include economical, technological, political, social and environmental factors. Driving range anxiety, charging time, price sensitivity, lack of infrastructure (charging facilities), personal characteristics, government policies, demographics, environmental concern and market are some of these factors.

Due to the growing concerns environmental sustainability, electric vehicles (EVs) are considered as an option for reducing or preventing the cause of these issues. However, such a transformation will not be easy to achieve in an emerging or developing countries, as it demands the rise in knowledge, awareness and change in attitude EVs (Ajzen, Citation1991; P. Larson et al., Citation2014).

Theory of planned proposed by Ajzen says, “Knowledge and experience are the key factors determining the buyer behaviour”. A study shows that buyers need more trustworthy and objective information, including word of mouth, in order to make better-versed buying decisions. Currently, the buyers are being educated mainly through media coverage and advertisements. Additionally, except for experienced users, buyers have taken little interest to look for information about EVs (P. Larson et al., Citation2014). The buyers are more willing to pay a higher price for the vehicles as their knowledge about EVs increases (Gyimesi & Viswanathan, Citation2011). According to P. Larson et al., Citation2014, “Awareness is greater than familiarity which is greater than knowledge. On the basis of the purchasing funnel—knowledge implies familiarity, which implies awareness; but not vice versa”. The interest in purchasing an EV is much higher among HEV owners. This interest among HEV owners seems to be based on experience and knowledge (Neenan et al., Citation2010). Krause et al. (Citation2013) suggest that updating the buyers about the benefits of EV technologies and available incentives is promising steps toward commercialization of EVs.

Countries around the world are establishing aggressive EV adoption goals to lower carbon footprints and promote green initiatives due to the awareness of climate change, advancements in battery technology, government incentives, and infrastructure development. India has a number of initiatives to promote the use of EVs, including manufacturing hybrids and faster adoption. Due to urbanization and an environmentally conscious populace, Bangalore is actually renowned as India's IT hub and a major market for EVs.

The significance is that the exploration lies in the eventuality to contribute to India transition toward the sustainable transportation. The country aims to increase EV penetration and reduce depending on the reactionary energies, its pivotal in shaping unborn polies and business strategies

## Literature review

Rong-Chan Jou2022. The majority of the countries have taken significant steps to enhance the use of electric vehicles over the past few years; for example, developed countries such as Norway and the Netherlands in Europe and America have boosted people's enthusiasm to use electric vehicles by providing proper subsidies and suppression of private vehicles. In Asia, Taiwan has been aggressively promoting the policy of replacing traditional fuel two-wheeled vehicles (FTWVs) with electric two-wheeled vehicles (ETWVs) and reinforcing the policy by actions such as retiring a significant number of old FTWVs and subsidizing ETWV purchases. surveyed college students in Taiwan using Questionnaire to assess a mixed logit (MXL) model. Findings from the research indicated that youth, affluent groups , former ETWV adopters, and EV supportive environments had higher probabilities of adoption of ETWVS

Ona Egbue, Suzanna Long 27 June 2012. Electric Vehicles (EVs) are promoted as a near-term automotive technology solution to reduce dependence on fossil fuels and attendant greenhouse gas (GHG) emissions of traditional vehicles (CVs). Although EVs have advantages, there are several barriers that need to be overcome before EVs gain popularity. One of the most powerful barriers is that individuals oppose new and foreign or untested technology and thus policy-making that considers their fears will be more effective. examined EV adoption barriers utilizing a questionnaire on consumer attitudes and explored socio technical issues . The findings showed that technology enthusiasts adopted EVs early on if they believed that they were superior to conventional vehicles.

Furqan A. Bhat a 1, Meghna Verma b, Ashish Verma a 9 January 2024.. The present study uses a multi-item questionnaire to collect data from young educated Indian students, which is used to examine the determinants affecting the adoption of electric vehicles among potential vehicle buyers. Confirmatory factor analysis revealed ten latent factors that determine the adoption of electric vehicles, eight of which, i.e., social image, social influence, anxiety (or perceived risks), perceived environmental benefits, performance expectancy, effort expectancy, facilitating conditions, and attitude, are used for segmenting and profiling prospective buyers of vehicles into clusters, and the other two latent factors viz. environmental interest and technological f different clusters. surveyed young Indian students using a multi item questionnaire (no sample size mentioned) and employed confirmatory factor analysis and k-means clustering. The study identified ten factors affecting EV adoption divided buyers into three clusters based on their adoption tendency.

Chaturvedi et. (2023) 1 December 2023. The current study aims to investigate the various consumption reasons (hedonic, gain and normative) responsible for increasing consumers' intentions towards purchase behaviour for electric vehicle (EV).411 usable survey responses were collected by conducting a structured questionnaire. Data were submitted to confirmatory factor analysis and structural equation modelling with a view to anal zing the empirical fit of the hypothesized model their questionnaire and used confirmatory factor analysis and structural equation modelling. The study revealed that Hedonic gain, and normative motivations significantly influenced EV buying intentions, with hedonic motivations exerting the highest influence.

Rajeev Goswami November 15, 2022. Electric vehicle (EV) adoption can potentially tackle greenhouse gases emissions, energy dependency, and resource scarcity. The government of India has introduced policies and incentives for EV adoption. Given the Indian context, a conceptual EV purchase model is developed incorporating different demographic and behavioural variables. A survey of six Indian cities (Delhi, Bengaluru, Mumbai, Nagpur, Kolkata, and Dehradun) was conducted. Applying logistic regression (LR) techniques and three-way contingency chi-square a new EV purchasing model is established. Surveyed six Indian cities with the assistance of a questionnaire analysed data through logistic regression and tests of chi square . It was revealed that EV buying decisions were influenced by age, eco-awareness, cost, brand perception, education, and marital status.

### *Objectives*

To examine college students perspectives and adoption pattern of electric vehicles in Bangalore

## Research methodology

This study employs quantitative research approach to understand college students adoption Patterns of electric vehicles EVs in Bangalore. Data was collected through a structured questionnaire created in google form consisting 11 Question. A total of 81 responses were obtained. The collected data was then coded and Google form using SPSS, focusing on descriptive Analysis, Correlation, crosstabulation. The results indicate that the total sample of students achieved an average score of 22 out of a possible 32. Since the score is well above the halfway mark, it suggests a positive Inclination toward EV adoption among students

**Sample**

The sample for this research study are belonging to ages 18-25. The sample includes male and female participants who belong in Bangalore India.

**Sampling Method**

Participants for the study were selected from using the convenience and snowball sampling method to explore college students adoption patterns of electric vehicle in Bangalore.

**Sample size**

The sample consisted of N = 80 participants.

**Inclusion Criteria**

Participants for the study were included based on their status as college students in Bangalore and their familiarity with electric vehicles.

**Exclusion Criteria**

The study excluded who were not college students in Bangalore**.**

**Procedure for Data Collection** The online questionnaire with 11 questions and from which the participants could choose their responses. It was administered to the sample via Google Forms and circulated through online platforms like WhatsApp.

**Ethical Considerations**

Informed consent was obtained from all participants. There was no compulsion in obtaining responses, and they were all assured that the data collected would be treated with the utmost confidentiality and used for research purposes only.

## RESULTS AND DISCUSSIONS

**Primary data**

Descriptive Statistics

The study found in descriptive analysis that 80 college students responses show that there is a positive inclination towards EV adoption with an average score was 22.57 out of 32.while many students are aware of EVs the mean was 3.19,SD=0.843, but the government incentives is limited so in this mean was 1.57 and SD was 0.671 .Here it proves that many were never driven an EV .And the charging infrastructure concerns stay dominant .however students realize the environmental benefit of the EVs and a sizeable number also demonstrates the desire to purchase one within five years . so here it shows low standard deviation and the score shows there is homogenous attitude toward the EV adoption that shows there is increased adoption with better infrastructure and awareness campaigns .

**Pearson correlation**

The study found out in correlation was between the age and total EV adoption preference that score reveals that Pearson correlation (r) of 0.200 this indicates that there is a weak positive correlation between the two variables . this indicates that as age increases within the samples (18-25),the preference score adoption slightly increases ,but the relationship is not strong .The p-value (SIG=0.076) is greater than 0.05, that means the correlation is not statistically significant at the 5%level ,so as there is a weak positive trend ,age does not a significant impact on the students EV adoption preferences in this study.

**Correlations**

| | | 1. How familiar are you with electric vehicles. | 7. Would you consider buying an EV in the next 5 years? |
|---|---|---|---|
| 1. How familiar are you with electric vehicles. | Pearson Correlation | 1 | .314** |
| | Sig. (2-tailed) | | .005 |
| | N | 80 | 80 |
| 7. Would you consider buying an EV in the next 5 years? | Pearson Correlation | .314** | 1 |
| | Sig. (2-tailed) | .005 | |
| | N | 80 | 80 |

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation between familiarity with electric vehicle and likelihood of purchase

The pearson correlation is coefficient (r) between familiarity with the electric vehicles (EVs) and there likelihood of purchasing an EV next five years is around 0.314. this shows that there is a positive but also moderate correlation between the two variables ..

The p-value (sig-2- tail) is 0.005 ,which is less than 0.01 that means the correlation is statiscally significant significant at the 99% there is confidence level .this suggests that there is a familiarity with EVs increases , the likelihood of considering the EV purchase also tends to increase . however , the correlation is not strong.

**Correlations**

| | | Age | TOTAL SCORE |
|---|---|---|---|
| Age | Pearson Correlation | 1 | .200 |
| | Sig. (2-tailed) | | .076 |
| | N | 80 | 80 |
| TOTAL SCORE | Pearson Correlation | .200 | 1 |
| | Sig. (2-tailed) | .076 | |
| | N | 80 | 80 |

**Anayzing relationship between government incentive and willingness to purchase an ev with the help of cross tabulation** .

Crosstabulation reveals that youngish individualities, particularly those aged 20- 21, show the loftiest amenability to buy an EV, with 52 repliers, of whom 27 are largely willing. The 18- 19 age group also demonstrates interest, with 6 out of 10 repliers showing a strong inclination. In discrepancy, the 22- 23 age group has a more balanced distribution, while the 24- 25 group exhibits the least enthusiasm, with only 3 repliers. This pattern suggests that youngish individualities ( 18- 21) are more open to EV relinquishment, probably due to advanced mindfulness and interest in new technologies. Targeting this demographic with government impulses and mindfulness juggernauts could be an effective strategy to promote EV relinquishment.

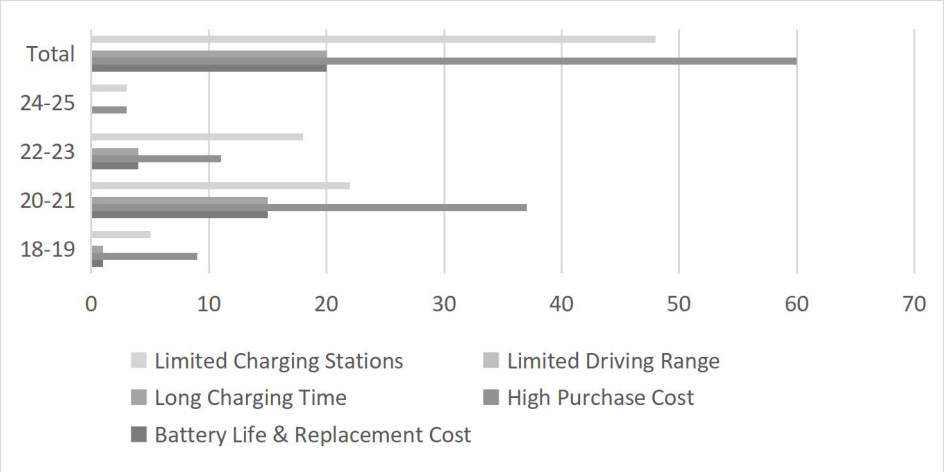
| **Count of 7. Would you consider buying an EV in the next 5 years?** | **government incentives** | | | |
|---|---|---|---|---|
| **willingness to purchase** | **1** | **2** | **3** | **Grand Total** |
| 18-19 | 6 | 4 | | 10 |
| 20-21 | 27 | 21 | 4 | 52 |
| 22-23 | 7 | 5 | 3 | 15 |
| 24-25 | 2 | | 1 | 3 |

| | | | | |
|---|---|---|---|---|
| **Grand Total** | **42** | **30** | **8** | **80** |

**Age-wise Distribution of EV Purchase Concerns**

The analysis shows age wise concerns that is regarding EV adoption indicates that the 20-21 age group have the highest concerns across most of factors ,particularly regarding the high purchase costs and limited charging stations .The 18-19 age group primarily worries about high purchase costs and there is limited charging stations , while the age group 22-23 follows a similar trend with purchase costs and also limited charging stations .The 24-25 age group shows there a least concern across all categories . Interestingly there is no respondents expressed any concern regarding limited driving range . suggesting that the range anxiety may not be a major barrier for young consumers in this study.

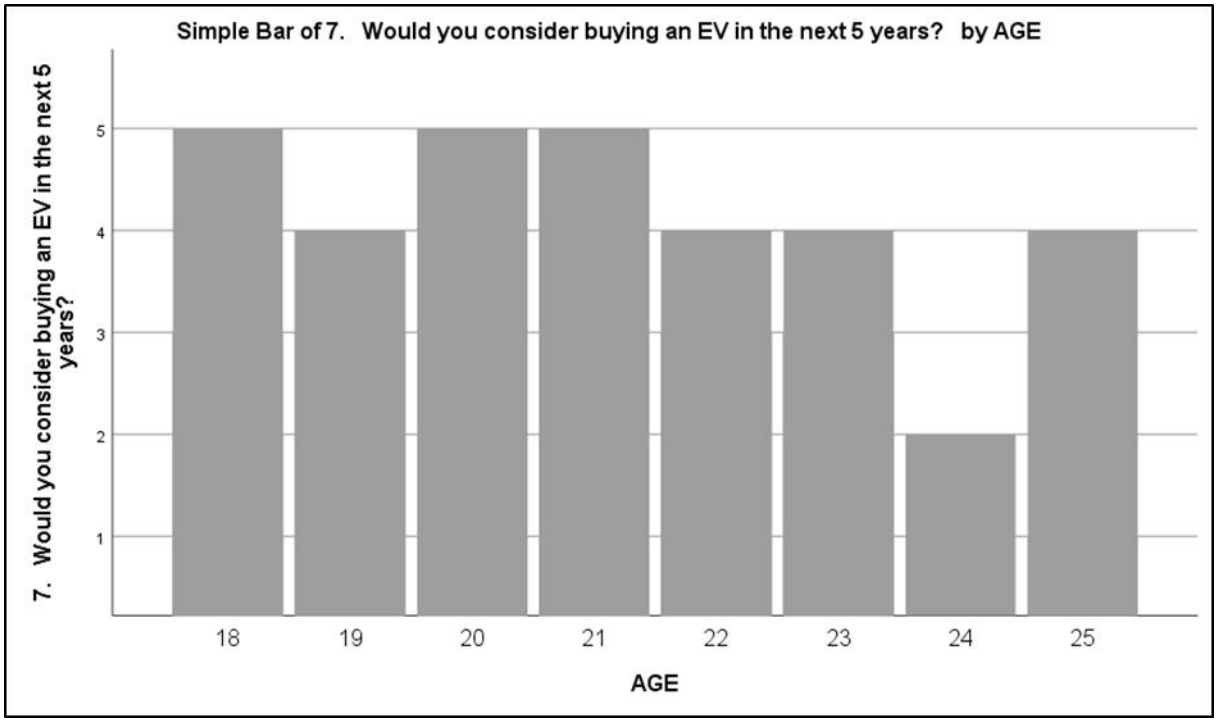
| Age Group | Battery Life & Replacement Cost | High Purchase Cost | Long Charging Time | Limited Driving Range | Limited Charging Stations |
|---|---|---|---|---|---|
| 18-19 | 1 | 9 | 1 | 0 | 5 |
| 20-21 | 15 | 37 | 15 | 0 | 22 |
| 22-23 | 4 | 11 | 4 | 0 | 18 |
| 24-25 | 0 | 3 | 0 | 0 | 3 |
| **Total** | **20** | **60** | **20** | **0** | **48** |




**DESCRIPTIVE STATISTICS : AGE AND FAMILIARITY**

The data reveals that the age group 20-21 making 65% respondents shows there is a higher participation but only 7.5% have actually used an EV. The 22-23 group follows with only 28.7% indicating that there is a limited experience , while 18-19 group reflects there is more direct exposure but still there is a limited usage . there is high interest in EVs actual adoption is still low , particularly among those whose haven't had the chance to experience them in firsthand . this indicates that there are potential barriers like cost , availability and accessibility efforts to increase EV awareness and wanted to reduce adoption barriers for the younger age groups could significantly boost EV uptake in the future.

| Age Range | Frequency (Age) | Percent (Age) | EV Experience: Used EV | Frequency (EV Experience) | Percent (EV Experience) |
|---|---|---|---|---|---|
| **18-19** | 10 | 12.5% | 1 (Used EV) | 6 | 7.5% |
| **20-21** | 52 | 65.0% | 2 (Not Used) | 39 | 48.8% |
| **22-23** | 15 | 18.8% | 3 (Somewhat Used) | 23 | 28.7% |
| **24-25** | 3 | 3.8% | 4 (Used EV, No Driving) | 7 | 8.8% |




## Conclusion

According to the study, college students , particularly those in the 18-21age range, there have a favourable propensity to embrace EVs .there is a lack of awareness of government incentives , and the worries about the infrastructure and high buying costs are still common . The chance of purchase is also told by familiarity with the EV, indicating that mindfulness enterprise and test drives could increase adoption rates .

It's advised to upgrade charging structure and lower costs in order to quicken the adoption of EVs, which will affect in targeted government incentives . The adoption rate of EVs among Bangalore college students is anticipated to increase in the upcoming years due to growing awareness and accessibility

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