

REPORT ON ELECTRIC VEHICLE MARKET SEGMENTATION ANALYSIS.

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Description:

The electric vehicle market in India is experiencing significant growth and development, driven by a range of factors including government policies, environmental concerns, and declining costs. However, despite these positive trends, the market still faces several challenges, including a lack of consumer awareness and education about electric vehicles. The main aim of this report is to conduct a segmentation analysis of the electric vehicle market in India in order to identify key consumer segments and understand their attitudes, behaviours, and preferences towards electric vehicles. This analysis will help businesses and policymakers develop targeted strategies for promoting electric vehicle adoption and addressing the challenges facing the market.

In this report we analyse the Electric Vehicles Market in India using segments such as price, top speed, range, battery capacity, fuel types, fast charging, and much more.

1. Properly Breakdown the Problem Statement using Fermi Estimation (problem breakdown)

We can breakdown the problem statement in many several ways such as Geographic, Demographic, Psychographic, Behavioral segments and, etc.

I have segmented into:

- 1. Demographic segmentation**
- 2. Psychographic segmentation**

2. SOURCES OF DATA

In the data collection step I have gone through many websites, The Data was scraped from the website <https://e-amrit.niti.gov.in/home>

DATA DESCRIPTION:

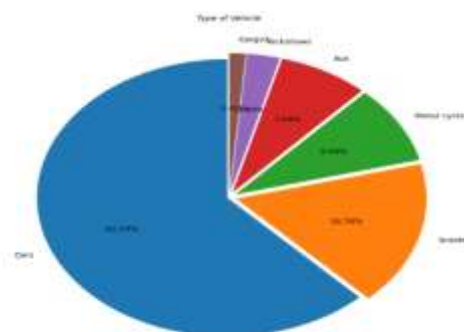
- Vehicle full name - Name of vehicle
- Manufacturing - Manufacturing company of vehicle
- Model - Model of vehicle
- Top speed (km/hr) - Maximum speed of vehicle in (km/hr)
- Price (INR) - Price of vehicle
- Fuel Type - Type of fuel (Electrical, Hybrid)
- Wheelers type - Type of wheelers (Two, Three, Four wheelers)
- Battery capacity [kWh] - Capacity of battery in (kwh)
- Full charging time (HR) - Total charging time 100% in (hr)
- Kerb weight (KG) - Total weight of vehicle in (kg)

- Range (km/hr) - Maximum kilometers covered per charging in (km/hr)
- Fast Charging - Vehicle have fast charging or not
- Drive Type - Type of Drive
- Number of Seats - Number of Seats in vehicle
- boot space (L) - Space for luggages in (Liter)
- Number of Airbags - Airbags for safety
- Type of brakes - Type of brakes
- Max Torque (N-M) - Max torque (n-m)
- Type of Vehicle - Vehicle types (Scooter, Cars, etc.)
- Income - Price range of vehicle (Thousands, Lakhs, Crore)

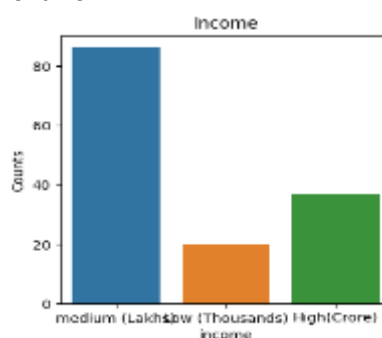
3.DATA PRE-PROCESSING

In data preprocessing step mostly we used pandas and NumPy for Analysing the dataset for non-numerical and null values, Changing non-numerical values to numerical values, checking for null values Removing Null Values or filling null values and Understanding the attributes of dataset. Adding new attributes, visualization using seaborn and matplotlib.

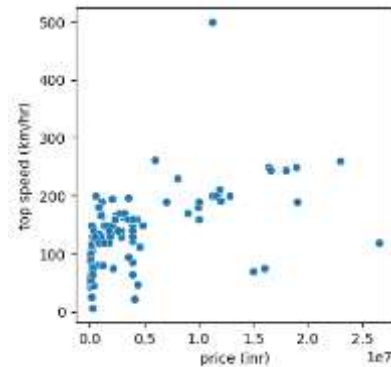
Analysis:



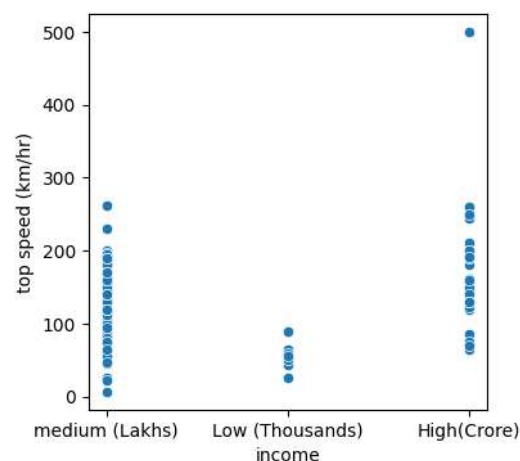
- The Above piechart shows percentages of Electrical vehicles types in india. It shows a manufacturing market percentage of every type of vehicle. In that we can see that the market of Cars is high. A lot of EV startup companies are manufacturing or focused on only Electricals Cars. Also there is less market for Cargo and Rickshaws. A very less number of companies are focusing on Cargo and Rickshaws.



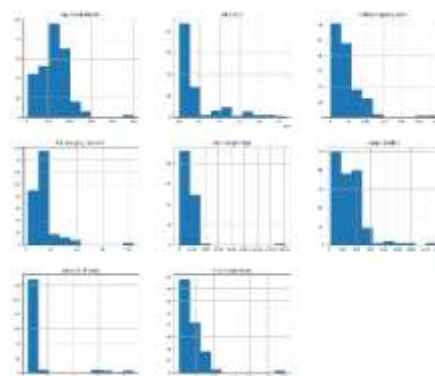
- Above plot shows information about Income feature. we categorized Income features in three different types as, first in Low means the price of EV is in thousands (Less than 1 lakhs), second in Medium means the price of EV is in lakhs (Between 1 lakh to 1 crore) and Third in High means the price of EV is in crore (Greater than 1 crore). As from the above count plot we can conclude that the maximum EV's price is in lakhs (Medium).



- Above scatter plot between Top speed vs Price shows the relation between them. As from this scatter plot ,we can conclude that if the Top Speed of EV is increasing then the Price of EV is also increasing.

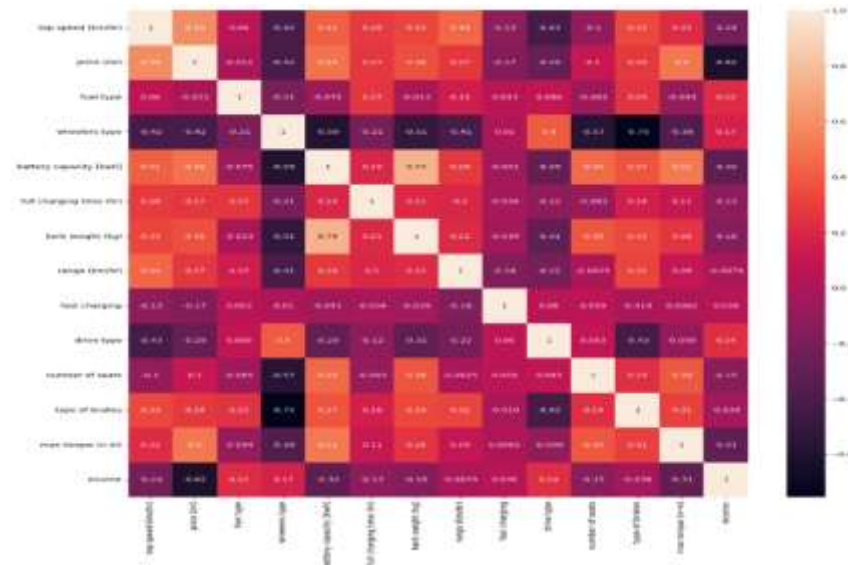


- This figure shows a relationship between Income and Top speed. We can see that if the price of EV in Low (thousands) then your top speed lies within 0-110 km/hr. As the price increases your vehicle's top speed also increases.



- In the above figure we plot histograms of every single feature. As from that we can see that mostly Price ranges between thousands to lakhs. In Top speed maximum average value is

around 150km/hr, same as for Battery capacity ranges around 0-50Kwh. As a Kerb weight it averages at 0-2000kg. Most EV has Range between 0-100km/hr. For boot space we can conclude that most EVs have 300 liter boot space. Also for maximum Torque and number of Seats, we can see torque lies between 0-400 and average EVs have 5 seats.

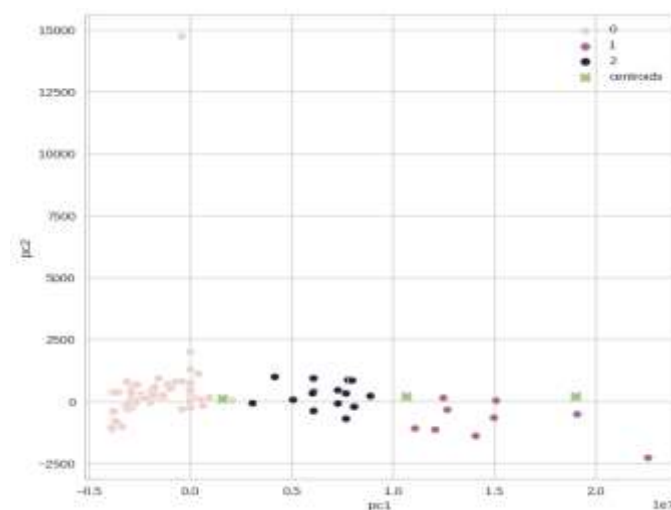


- Above figure shows the correlation between every individual variable. We can see that Kerb weight and Battery capacity have the highest correlation. Meaning if we want more battery capacity our EV weight will increase.

4.SEGMENT EXTRACTION

The ML techniques used in this segmentation are PCA, Kmeans clustering are some of the major clustering method used.

k-means clustering:



- In the above figure we create 3 clusters by using K-Means Clustering and visualize for better understanding with Centroids.

5.PROFILING AND DESCRIBING POTENTIAL SEGMENTS

1. Demographic segmentation

Demographic segmentation consists of dividing the market through different variables such as age, gender, nationality, education level, family size, occupation, income, etc. This is one of the most widely used forms of market segmentation, since it is based on knowing how customers use your products and services and how much they are willing to pay for them.

- **Income:** Income levels have a significant effect on consumer purchasing decisions. Those with higher-income levels may prefer luxury vehicles.

Conversely, individuals with lower income levels may prefer to get vehicles at the best deal and are likely to choose inexpensive products/services.

- **Family size:** Family size also determines consumers' purchase decisions. Those who have large family members may choose four wheelers and those who have less family members will choose two wheelers.

2. Psychographic segmentation

Psychographic segmentation consists of grouping the target audience based on their behavior, lifestyle, attitudes and interests. To understand the target audience, market research methods such as focus groups, surveys, interviews and case studies can be successful in compiling this type of conclusion.

- **Lifestyle:** A consumer whose profession is more time consuming than other average consumers, that consumer may select a vehicle who takes less time to charge a vehicle. This group of consumers only focus on the time required to charge an EV.
- **Interests :** Some consumers may have interest in particular manufacturing companies. Some consumers may like only vehicles made by the Tata company.
- **Behavior :** Behavior of consumers is the most important factor in the market segment. It shows what exactly consumers want from us? Some consumers may want an EV who will cover far distance per a charging. Customizing the Market Mix, The marketing mix refers to the set of actions, or tactics, that a company uses to promote its brand or product in the market.

6.SELECTION OF TARGET SEGMENT

Target marketing involves breaking a market into segments and then concentrating your marketing efforts on one or a few key segments consisting of the customers whose needs and desires most closely match your product or service offerings. It can be the key to attracting new business, increasing sales, and making your business a success.

It can be concluded from below analysis that Range, Top Speed, Full charging time, Income and Types of Vehicles can be the most important segment categories for consumer purchasing decisions. These are the key factors who make markets different and similar at the same time. These segments have formed with distinct features which may indicate that their preferences for EVs are motivated by different factors.

7.MARKETING MIX

The 4Ps make up a typical marketing mix - Price, Product, Promotion and Place.

- Price: Refers to the value that is put for a product. It depends on costs of production, segment targeted, ability of the market to pay, supply - demand and a host of other direct and indirect factors. There can be several types of pricing strategies, each tied in with an overall business plan.
- Product: Refers to the item actually being sold. The product must deliver a minimum level of performance; otherwise even the best work on the other elements of the marketing mix won't do any good.
- Place: Refers to the point of sale. In every industry, catching the eye of the consumer and making it easy for her to buy it is the main aim of a good distribution or 'place' strategy. Retailers pay a premium for the right location. In fact, the mantra of a successful retail business is 'location, location, location'.
- Promotion: This refers to all the activities undertaken to make the product or service known to the user and trade. This can include advertising, word of mouth, press reports, incentives, commissions and awards to the trade. It can also include consumer schemes, direct marketing, contests and prizes.

All the elements of the marketing mix influence each other. They make up the business plan for a company and handle it right, and can give it great success. The marketing mix needs a lot of understanding, market research and consultation with several people, from users to trade to manufacturing and several others

LEARNINGS:

- The penetration of EV in India has Increased Significantly in the last five years as they are more efficient. In addition, growing fuel prices are further helping to boost substantial growth in the product adoption, mainly due to their extended range and efficiency.
- From this analysis we create different types of segments to affect consumers' purchasing decisions.
- Demographic segmentation focuses on education level, family size, occupation, income, etc. since it is based on knowing how customers use your products and services and how much they are willing to pay for them. That depends on consumers' education, Financial status and purpose of buying EV's. If a customer's purpose is to buy an EV for transporting goods in different cities or states, that customer will focus on the boot space and maximum range of a vehicle.
- On a psychological segment some customers may go for a product which gives them satisfaction and others may go with a product which is cheaper in cost and their other factors are average.

github link:

<https://github.com/havilahp/Electric-vehicle-market-segmentation-analysis>