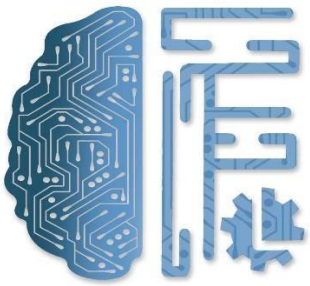

FeyNN LABS

Machine Learning Internship

A Market Segmentation Case Study Report

On Electric Vehicle Market Segmentation

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Abstract

This report will analyze the electric vehicle market through historical data on the registration of EVs in an effort to understand the present scenario of the market and predict future trends. The foremost objective of this research is to delve into the growth trends of electric vehicles in the market, discern what factors are driving these trends, and predict what to expect from the market in the future. Specifically, the study analyses past increases in registrations of EVs, based on the sources varying between different regions, brands, and models.

Analyzing these patterns can lead to predicting future EV registrations and hence analyzing the expansion potential of the EV market. In addition, the report analyzes the most important factors that influence consumer decisions, including vehicle pricing, brand preferences, electric range, and model availability. The study presents insights into the trends and behaviors of consumers in the EV market through visualizations and statistical methods, including bar plots, histograms, and distribution graphs.

This study, therefore, aims to provide a thorough understanding of the electric vehicle market and its current dynamics for future growth opportunities. In this report we are going to analyse the data and solve the problem using Fermi Estimation by breaking down the problem.

Data Collection :

The data has been collected manually, and the sources used for this process are listed below :

https://en.wikipedia.org/wiki/Technology_adoption_life_cycle

https://www.kaggle.com/datasets

https://www.techtarget.com/searchcio/definition/technology-adoption-lifecycle

Market Segmentation

Target Market:

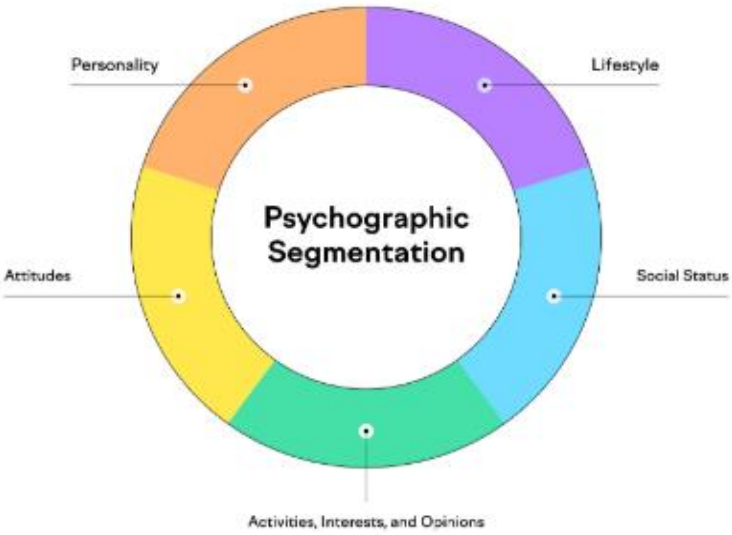
The target market of Electric Vehicle Market Segmentation can be categorized into Geographic, Socio-Demographic, Behavioural, and Psychographic Segmentation.

Behavioural Segmentation :

This focuses on how people use EVs, their buying habits, and brand preferences. For instance, some may choose EVs for daily commuting, while others may prefer them for long-distance travel.

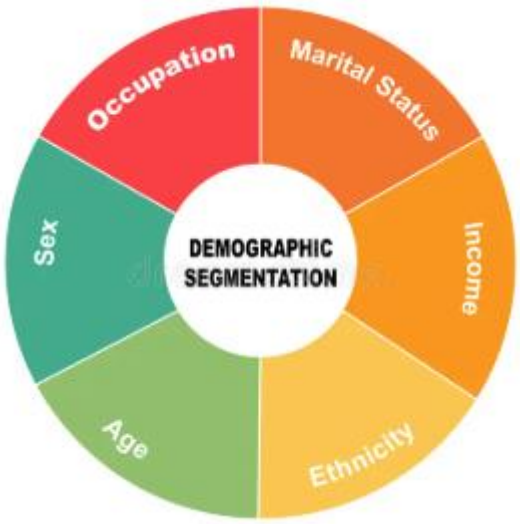
Psychographic Segmentation :

This examines lifestyle, values, and attitudes. People who care about sustainability, technology, and innovation are more likely to adopt EVs. Suitable for lifestyle segmentation. Involves many segmentation variables.



Socio-Demographic Segmentation :

This considers factors like age, income, education, and occupation. Younger, high-income individuals or environmentally conscious professionals may be more likely to buy EVs.



Technology Adoption Lifecycle & EV Market Segmentation

The Technology Adoption Lifecycle of new technologies, including Electric Vehicles (EVs), describes which groups of consumers adopt them over time. This model helps businesses understand their customers and tailor their strategies for marketing, pricing, and infrastructure development.

1. **Innovators (2.5%)** :
   The first to purchase an EV, these are technology enthusiasts and risk-takers who pay a premium price; charge infrastructures are scarce. They are mostly wealthy individuals who can afford premium electric vehicles (e.g., Tesla, BMW i-Series).

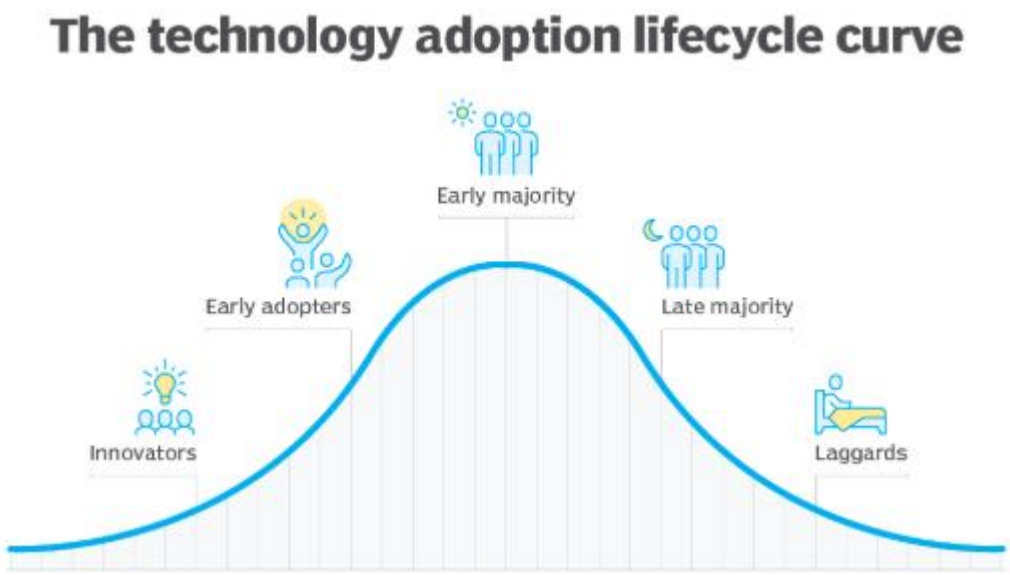
2. **Early Adopters (13.5%) :**
   This segment will fill the gap between the niches and the mainstream market. Key customers in this category include;
   Higher educated, environment-conscious consumer.
   Influencer or industry players whose job is to drive the use of EVs.
   More likely to adopt EVs if government incentives and charging stations are available.

3. **Early Majority (34%) :**
   These are practical consumers who wait until the technology is proven. They look for:
   Lower costs and higher availability of charging stations.
   Positive user reviews and real-world performance data.
   Government policies supporting EV adoption (e.g., FAME II subsidies in India).

4. **Late Majority (34%) :**
   These consumers embrace EVs only when they become a norm and the prices fall substantially. They wait for charging infrastructure to become well-established and resale value to be good. Like Entry-level EV buyers, such as Tata Tiago EV or Mahindra XUV400.

5. **Laggards (16%) :**
   The last group to adopt EVs, often resisting until there are no alternatives.

They Prefer traditional ICE (Internal Combustion Engine) vehicles. Require mandatory regulations (e.g., banning petrol/diesel cars) to switch. Example: Consumers in rural areas with limited EV infrastructure.

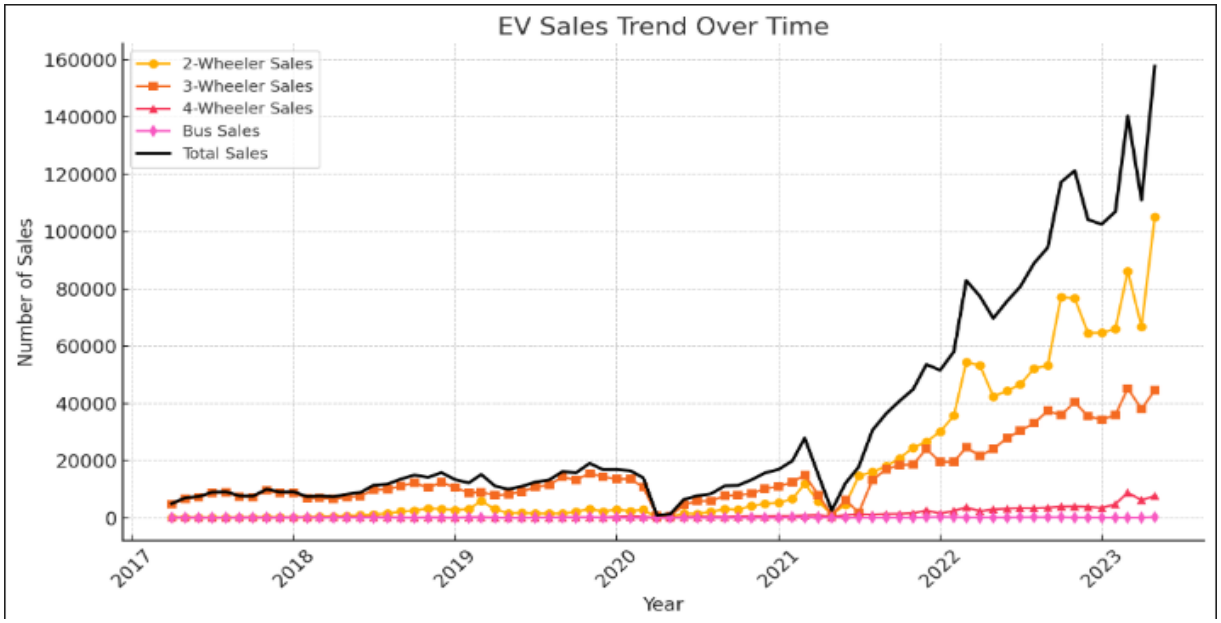


The first two groups are known as the early market segment, while the other three are the mainstream market. All five groups can be visualized using a technology adoption curve where one side of the curve shows where the lifecycle begins -- with innovators -- and the other side shows where it ends -- with laggards.

Distribution of EV Sales in India

The distribution of electric vehicle (EV) sales in India has shown rapid growth, driven by government incentives, rising fuel costs, and increasing consumer awareness. The adoption rate varies across different vehicle categories, geographic locations, and consumer segments.

For this analysis, I explored an electric vehicle (EV) sales dataset obtained from Kaggle, covering the calendar years 2017 to 2021. This dataset provides a chronological sequence of EV sales across different vehicle categories in India, allowing for an in-depth exploration of sales trends, distribution patterns, and market dynamics.



Conclusion :

- The 2-wheeler (2 W) segment appears to have a wider distribution of sales, indicating high variability in monthly sales. This suggests rapid adoption and fluctuations in demand.
- The 3-wheeler (3 W) and 4-wheeler (4 W) segments show more consistent sales trends, with fewer extreme variations.
- Buses (BUS) have the lowest sales numbers and a smaller spread, indicating limited adoption compared to other categories.

Market Segmentation Using Fermi Estimation for EV Market in India

Fermi estimation is a technique used to approximate complex problems by breaking them into smaller, more manageable calculations using logical assumptions.

Using the available dataset (2017–2023), we can estimate the potential market size for different EV segments in India based on historical sales trends, population data, and adoption rates.

1. Total Population of India (2023):

- India has 1.4 billion people.

2. Percentage of Population Using Vehicles:

- **2-Wheelers (2W)**: 40% of people use 2-wheelers.
- **3-Wheelers (3W)**: Around 5% of the population uses 3-wheelers (mainly auto-rickshaws).
- **4-Wheelers (4W)**: About 10% of people use 4-wheelers (cars).

For 2-Wheelers (2W):

1. **Number of 2W Users**:
   40% × 1.4 billion = 560 million 2W users.
2. **Urban 2W Users**:
   35% of people live in urban areas. So, the number of urban 2W users is:
   35% × 560M = 196 million urban 2W users.
3. **Electric 2W Adoption Rate**:
   - **Current adoption rate**: 5% of urban 2W users are electric. So, the current number of electric 2W users: 5% × 196M = 9.8 million electric 2W users.
   - **2030 adoption rate**: Expected to grow to 15%. So, the potential number of electric 2W users in 2030: 15% × 196M = 29.4 million electric 2W users.

For 3-Wheelers (3W):

1. **Number of 3W Users**:
   5% × 1.4 billion = 70 million 3W users (mainly auto-rickshaws).

2. **Urban 3W Users**:
   35% of 3W users are in urban areas:
   35% × 70M = 24.5 million urban 3W users.

3. **Electric 3W Adoption Rate**:

   - **Current adoption rate**: 10% of urban 3W users are electric. So, the current number of electric 3W users: 10% × 24.5M = 2.45 million electric 3W users.

   - **2030 adoption rate**: Expected to grow to 30%. So, the potential number of electric 3W users in 2030: 30% × 24.5M = 7.35 million electric 3W users.

For 4-Wheelers (4W):

1. **Number of 4W Users**:
   10% × 1.4 billion = 140 million 4W users (cars).

2. **Urban 4W Users**:
   35% of 4W users are in urban areas:
   35% × 140M = 49 million urban 4W users.

3. **Electric 4W Adoption Rate**:

   - **Current adoption rate**: 2% of urban 4W users are electric. So, the current number of electric 4W users: 2% × 49M = 0.98 million electric 4W users.

   - **2030 adoption rate**: Expected to grow to 10%. So, the potential number of electric 4W users in 2030: 10% × 49M = 4.9 million electric 4W users.

Conclusion :

2W and 3W markets will likely dominate in the short-term, as they are more affordable and offer higher savings on fuel.