Electric Vehicle Market Segmentation

-Vanapalli Dimple Satya Deepak

Problem Statement:

Electric vehicles (EVs) are automobiles powered by electric motors rather than internal combustion engines (ICEs) that rely on fossil fuels. They utilize rechargeable batteries or other energy storage systems to store electricity and provide power to the electric motor, which propels the vehicle. EVs offer several advantages over traditional ICE vehicles, making them an increasingly popular choice among consumers and an important component of sustainable transportation solutions.

Electric vehicle market penetration is growing globally, but it still faces significant challenges, including high prices, limited driving range, lack of charging infrastructure, and consumer awareness.

1. High Prices: Electric vehicles (EVs) tend to be more expensive than conventional vehicles, and this is a significant barrier for many potential buyers. The high cost is mainly due to the battery pack, which can account for up to half of the vehicle's cost. EVs may be cheaper to operate in the long run, but the upfront cost is still a challenge for many consumers.

2. Limited Driving Range: The driving range of most EVs is still limited compared to conventional vehicles. This means that EVs may not be suitable for long-distance travel or for people who do not have access to charging infrastructure at home or work. Range anxiety is a significant barrier for many consumers.

3. Lack of Charging Infrastructure: A lack of charging infrastructure is a significant challenge for the EV market. Many people do not have access to charging stations at home or work, and public charging stations are often not available or located in inconvenient locations. This makes it difficult for people to rely on EVs for their daily transportation needs.

4. Consumer Awareness: Many consumers are not aware of the benefits of EVs and may have misconceptions about them. Some people may be hesitant to switch to EVs because they are not familiar with the technology, or they may have concerns about the availability of charging infrastructure or the driving range. Lack of consumer awareness is a significant barrier to the growth of the EV market.

Addressing these challenges will be critical to the continued growth and success of the EV market. The industry will need to continue to invest in battery technology, charging infrastructure, and consumer education to overcome these barriers and accelerate the adoption of EVs.

Electric Vehicle Startup is seeking to enter the Indian market and capture a significant share of the growing demand for electric vehicles. To ensure a successful market entry, we need to conduct a thorough segmentation analysis to identify the most viable customer segments for our EVs. By understanding the unique characteristics and preferences of these segments, we can tailor our marketing and product strategies to effectively target and meet the needs of these specific groups.

Segmentation Analysis:

Geographic Segmentation:

Regional preferences: Study the demand for electric vehicles across different states and cities in India.

Infrastructure availability: Assess the presence of charging infrastructure and availability of government incentives for EVs in different geographic areas.

Climate and terrain: Analyze the impact of climate conditions and topography on the suitability and adoption of EVs.

Demographic Segmentation:

Age and income: Determine the age groups and income levels that are more likely to adopt electric vehicles.

Occupation and lifestyle: Explore the preferences of working professionals, entrepreneurs, and individuals with environmentally conscious lifestyles.

Family size: Examine the requirements of families and their transportation needs.

Psychographic Segmentation:

Environmental consciousness: Evaluate the interest and willingness of individuals who prioritize sustainability and eco-friendly practices.

Technological inclination: Identify early adopters who embrace new technologies and are open to electric vehicles.

Social status and image: Study the impact of electric vehicles on social status and the desire of individuals to showcase their eco-consciousness.

Behavioural Segmentation:

Commuting patterns: Analyse the travel habits and patterns of individuals, including daily commute distances, frequency, and charging needs.

Purchase decision factors: Understand the key considerations influencing the purchase decision for electric vehicles, such as cost savings, environmental benefits, and performance.

Brand loyalty: Assess the willingness of customers to switch from conventional vehicles to EVs and the factors influencing their brand loyalty.

By conducting an in-depth analysis of these market segments, we can develop a comprehensive understanding of the Indian electric vehicle market and identify the segments that offer the highest potential for adoption and success. This knowledge will enable us to create a targeted and effective market entry strategy, ensuring that our EVs meet the specific requirements and preferences of the identified segments.

DataSources: (Dataset)

https://drive.google.com/drive/folders/1Yn_0KpPUvPjdNjJe8emy-QsKzqt7aexb

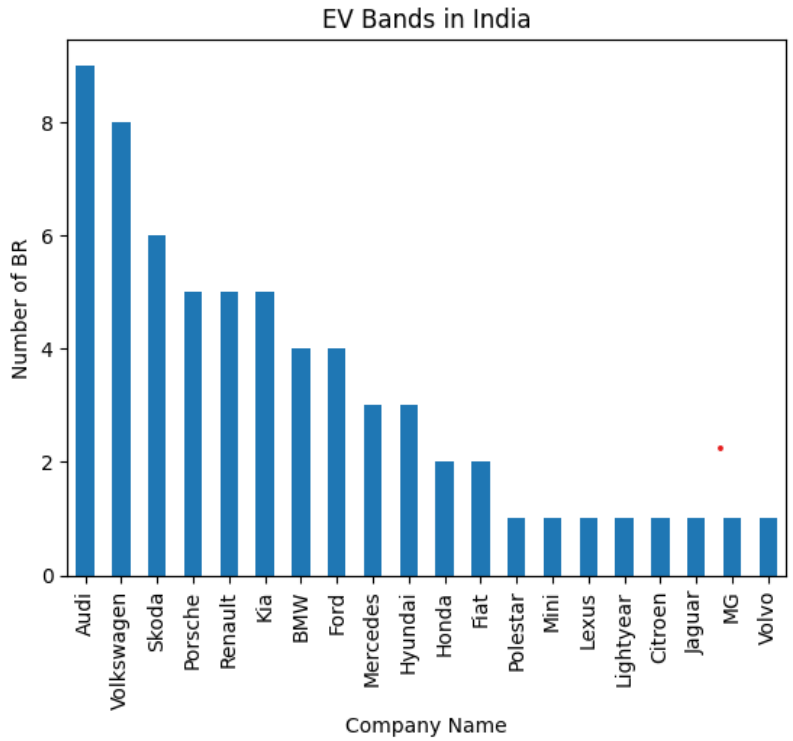
Data Preprocessing:

Dataset:

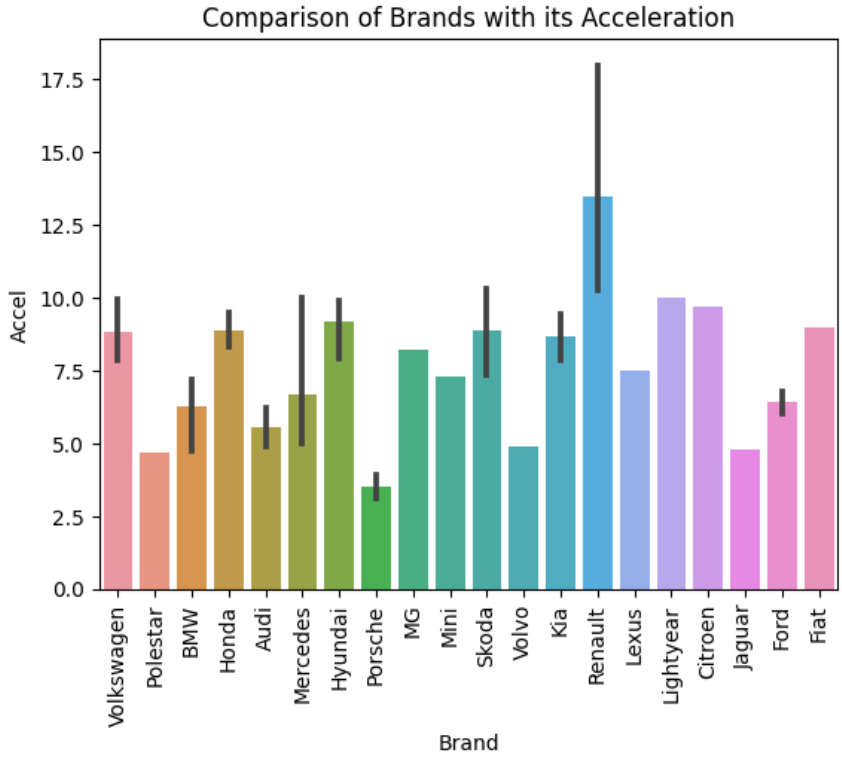
```
[5] df.head()
```

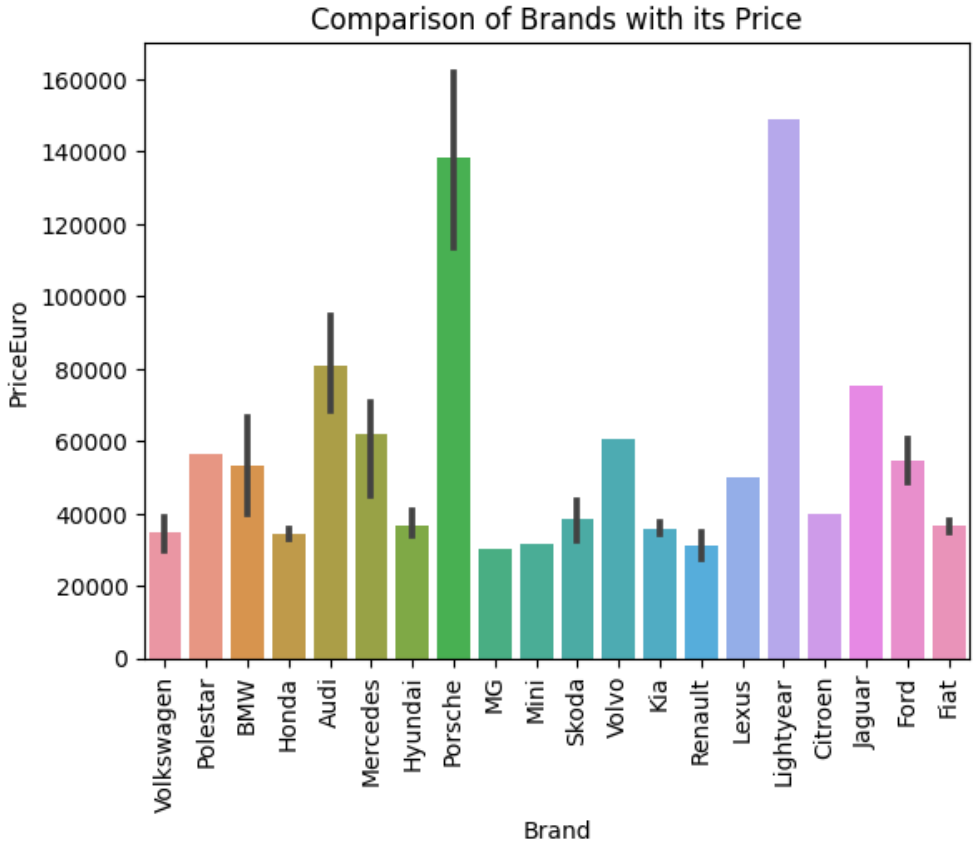
	Brand	Model	Accel	TopSpeed	Range	Efficiency	FastCharge	RapidCharge	PowerTrain	PlugType	BodyStyle	Segment	Seats	PriceEuro	CarName
0	Volkswagen	ID.3 Pure	10.0	160	270	167	250	Rapid charging possible	Rear Wheel Drive	Type 2 CCS	Hatchback	C	5	30000	Volkswagen-ID.3 Pure
1	Polestar	2	4.7	210	400	181	620	Rapid charging possible	All Wheel Drive	Type 2 CCS	Liftback	D	5	56440	Polestar-2
2	BMW	iX3	6.8	180	360	206	560	Rapid charging possible	Rear Wheel Drive	Type 2 CCS	SUV	D	5	68040	BMW-iX3
3	Honda	e	9.5	145	170	168	190	Rapid charging possible	Rear Wheel Drive	Type 2 CCS	Hatchback	B	4	32997	Honda-e
4	Volkswagen	e-Golf	9.6	150	190	168	220	Rapid charging possible	Front Wheel Drive	Type 2 CCS	Hatchback	C	5	31900	Volkswagen-e-Golf

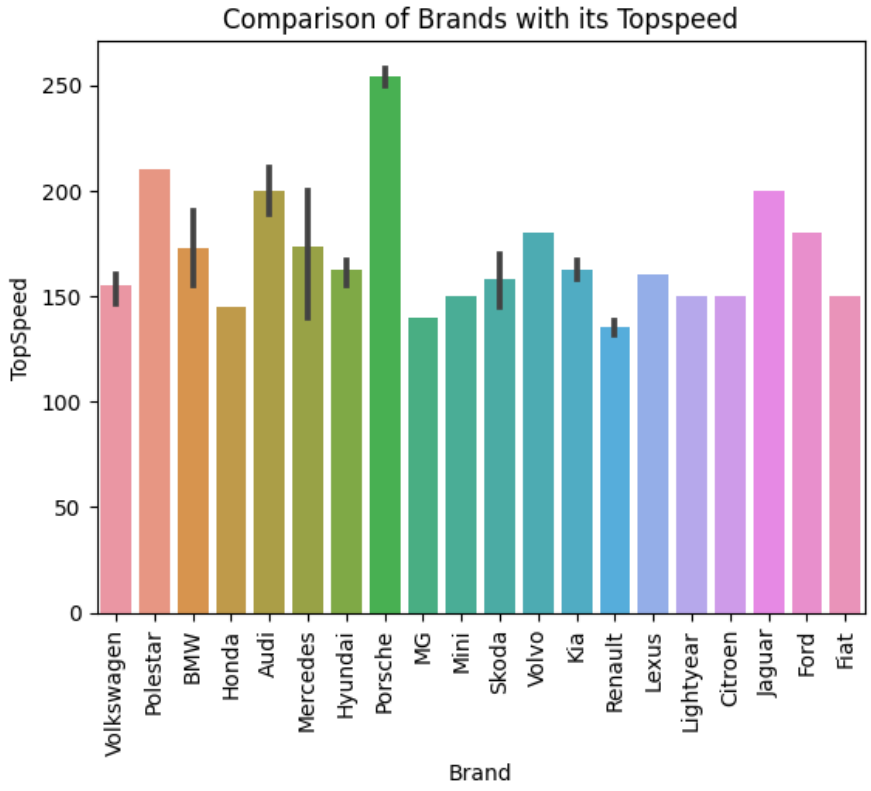
EV Brands In India:

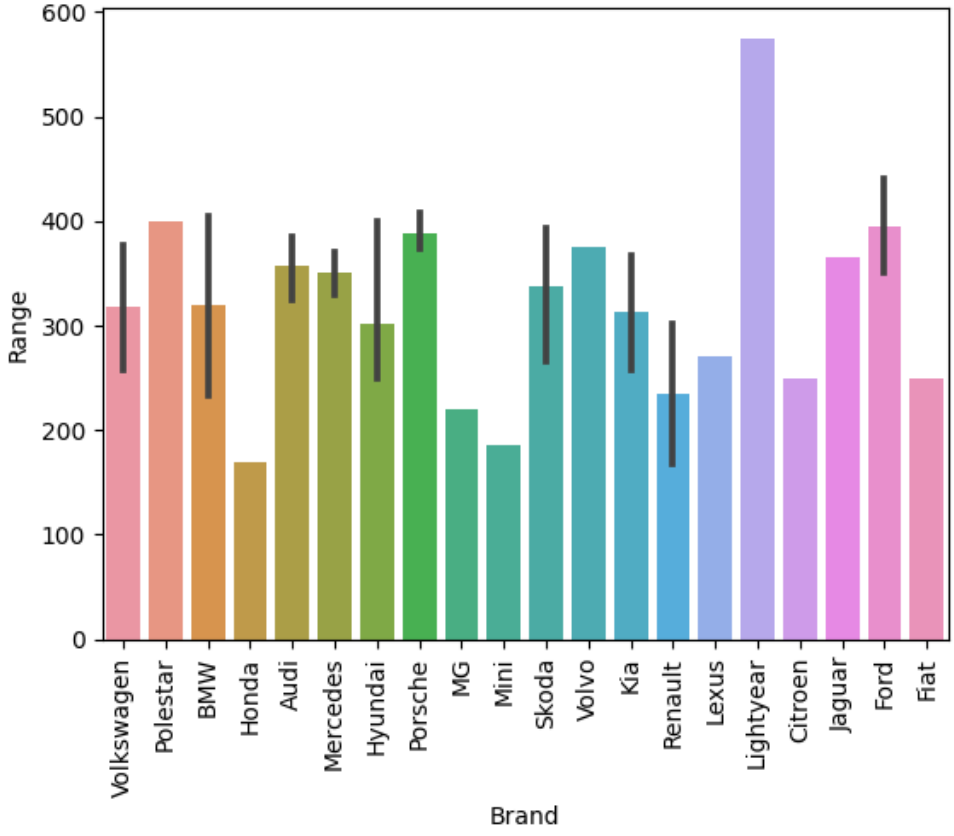


Comparision Of EV Brands:






Comparison of Brands with its Topspeed
TopSpeed
0
50
100
150
200
250
Volkswagen
Polestar
BMW
Honda
Audi
Mercedes
Hyundai
Porsche
MG
Mini
Skoda
Volvo
Kia
Renault
Lexus
Lightyear
Citroen
Jaguar
Ford
Fiat
Brand


Range
0
100
200
300
400
500
600
Volkswagen
Polestar
BMW
Honda
Audi
Mercedes
Hyundai
Porsche
MG
Mini
Skoda
Volvo
Kia
Renault
Lexus
Lightyear
Citroen
Jaguar
Ford
Fiat
Brand

K-Means Clustering:

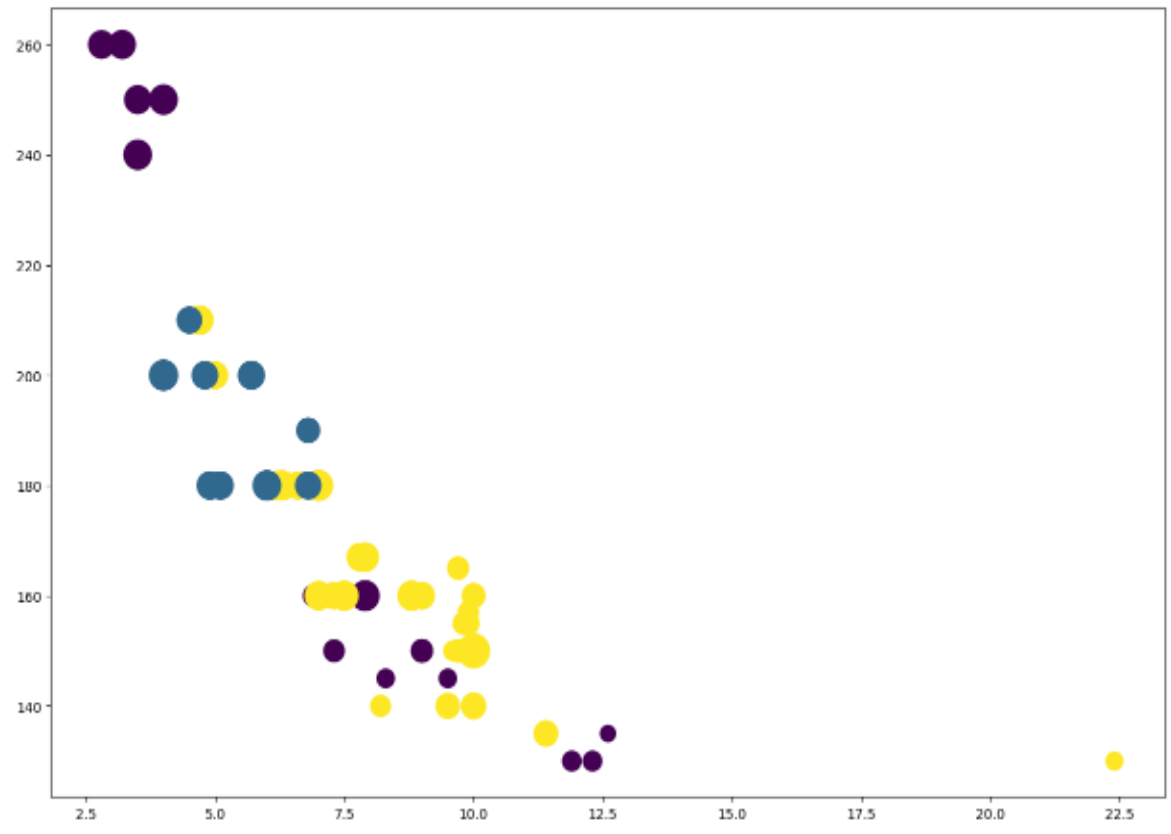
Cluster 1 – Violet

Cluster 2 - Blue

Cluster 3 - Yellow

```
df1 = df[df.Cluster == 0]
df2 = df[df.Cluster == 1]
df3 = df[df.Cluster == 2]
fig = plt.figure(figsize =(15, 10))
plt.scatter(df1.Accel, df1.TopSpeed, df1.Range, df1.Seats)
plt.scatter(df2.Accel, df2.TopSpeed, df2.Range, df2.Seats)
plt.scatter(df3.Accel, df3.TopSpeed, df3.Range, df3.Seats)
```

```
<matplotlib.collections.PathCollection at 0x7a3b821f94b0>
```



Github Link: https://github.com/VANAPALLI-DIMPLE-SATYA-DEEPAK/EV-Market-Segmentation

Summary:

There are many EV manufacturing companies in the country like Hero Electric, Tata Motors, Ather Energy, Ashok Leyland, Hyundai Kona Electric, etc. Tesla has also arrived, the demand will get higher & higher since it is automotive so the investments and policies and all that would be bigger but it will take some time to perfectly settle in India.

The following are the key insights of the project:

- The electric vehicle industry has not done that much good due to the devastating hit of the Covid outbreak but it will take a huge jump in upcoming years
- The use of EVs will be game-changing in terms of environment, air, noise pollution-free, postelectric, and much more.
- The company should plan to establish local operations in India either by partnering with a local company or by setting up its own manufacturing/ development unit, potentially combined with imports of specific components
- The company would expect to further grow in India, underpinned by a growing commercial fleet market for two-wheelers and three-wheelers especially for last km delivery/urban freight services. The company must see opportunities across the supply chain in the battery, EV component and charging infrastructure segments including the machinery and equipment needed for establishing manufacturing plants, training and provision of skilled workforce etc.
- The company should start their business from Metro Cities in India and then after considerable business expand to other cities of the same state of the Metro Cities. This will help the company to expand easily as they will be having a prior knowledge of business from Metro Cities and Network of Supply chain will be easy for the company as the time goes in business.

CONCLUSION:

Electric Vehicles Are The Future