ELECTRIC VEHICLE MARKET SEGMENTATION

Analysing the respective market in India using Segmentation analysis for

ELECTRIC VEHICLE

Submitted by

Archana S

Problem Statement

(EV Market) You are a team working under an Electric Vehicle Startup. The Startup is still deciding in which vehicle/customer space it will be develop its EVs. You have to analyse the Electric Vehicle market in India using Segmentation analysis and come up with a feasible strategy to enter the market, targeting the segments most likely to use Electric vehicles.

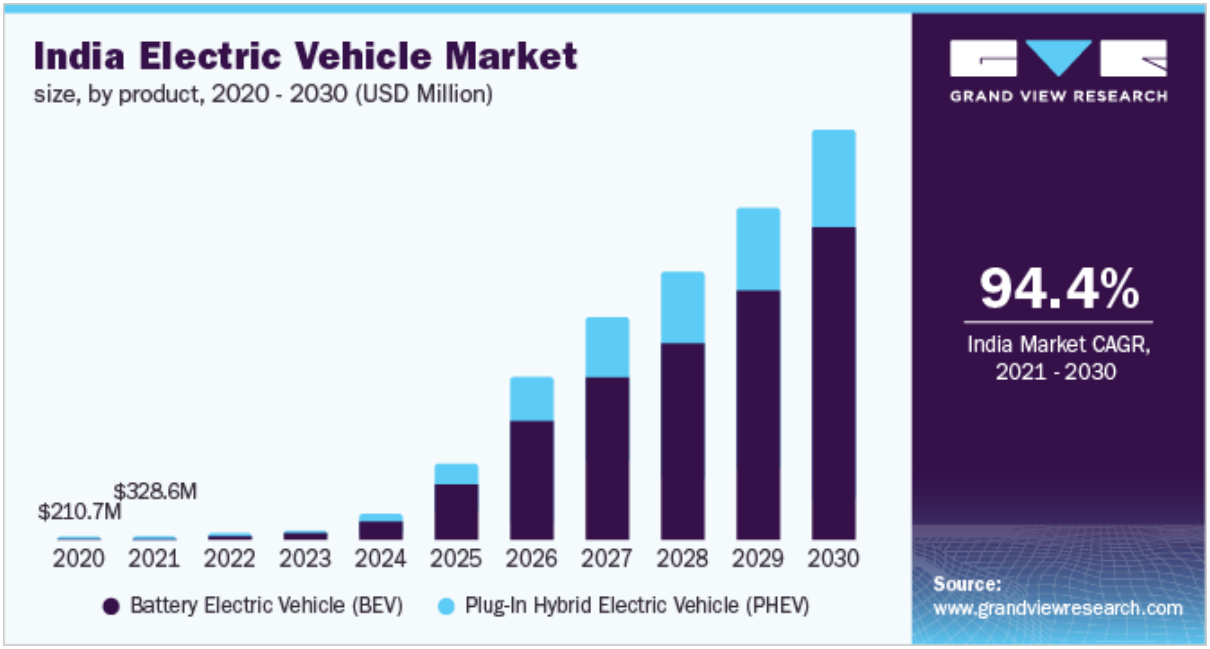
Over view

The India electric vehicle market size was valued at USD 220.1 million in 2020 and is expected to expand at a compound annual growth rate (CAGR) of 94.4% from 2021 to 2030. The attractive incentives being offered by the Indian government on the production and purchase of electric vehicles to encourage the adoption of electric vehicles are anticipated to drive the growth of the market over the forecast period. The outbreak of the COVID-19 pandemic triggered a significant decline in the overall sales of passenger and commercial vehicles in 2020. However, the sales of electric vehicles in India remained unaffected. The post-lockdown sale of pure and hybrid electric vehicles is a prominent driving factor for the electric vehicle market in India. The stringent Greenhouse gas (GHG) emission norms drafted by the government, such as the Bharat Stage (BS) VI emission standards introduced by India's Ministry of Road Transport and Highways (MoRTH), are also expected to play a decisive role in driving the growth of the market.

The increasing prices of conventional fuel are expected to accentuate the development of vehicle electrification. The stringent emission norms being drafted by the government and the growing environmental awareness among Indian consumers are also expected to fuel the demand for electric vehicles. Furthermore, Indian automakers, such as Tata Motors, and Mahindra and Mahindra Ltd., have embarked upon aggressive efforts to add electrified vehicles to their product portfolio, which is expected to encourage Indian consumers to opt for electric vehicles. All these factors bode well for the growth of the electric vehicle market in India over the forecast period.

The EV market in India comprised only two electric vehicle models in 2019. As a result, only 0.15% of the new passenger cars registered between April

2019 and March 2020 were BEVs. However, at the beginning of 2021, the India electric vehicle (EV) market consisted of around eight electric vehicle models, thereby offering more options for Indian consumers looking forward to buying electric vehicles. Moreover, the prices of electric vehicles are also expected to decline over the forecast period, thereby allowing EVs to provide a lower Total Cost of Ownership (TCO) as compared to conventional vehicles. This is expected to pave the way for the mass-market penetration of electric vehicles.



According to The Hindu News Report:

India's electric vehicle market grew 223% in 2022, adding around 48,000 EVs, according to market analyst firm Canalys.

Tata leads in EVs with 86% of the market share from just two models: the Nexon EV and Tigor EV.

Introduction

Electric vehicles (EVs) have gained significant traction in recent years as a cleaner and more efficient alternative to traditional gasoline-powered cars. With advancements in battery technology, a growing network of charging infrastructure, and increasing consumer demand, EVs have become a viable option for many drivers around the world. Changing the way we think about driving, these vehicles are powered by electricity stored in a battery, rather than gasoline, and use electric motors to turn the wheels.
India is the third largest automobile market globally in terms of sales, ahead of Germany and Japan. There is now a push for manufacturers and policymakers to collaborate to shift demand towards greener options. The automotive sector is a major contributor to India's economy, accounting for 7.1 percent of its GDP and providing significant employment. The Economic Survey 2023 predicts that India's domestic electric vehicle market will see a 49 percent compound annual growth rate (CAGR) between 2022 and 2030, with 10 million annual sales by 2030. Additionally, the electric vehicle industry is projected to create around 50 million direct and indirect jobs by 2030.

The Indian government has set a target to achieve 30 percent electrification of the country's vehicle fleet by 2030, and has introduced several incentives and policies to support the growth of the EV industry. The industry was given a major boost in the FY24 Union Budget for the production of electric vehicles, adoption of hydrogen fuel, and embracing changing technologies.

In the 2023-24 Union Budget, Finance Minister Nirmala Sitharaman announced a budget allocation of INR 35,000 crore for crucial capital investments aimed at achieving energy transition and net-zero targets by 2070. Furthermore, she stated that the government will support Battery Energy Storage Systems with a capacity of 4,000 MWH through viability gap funding. For electric vehicle manufacturers, the government has already launched initiatives such as the Faster Adoption of Manufacturing of Electric Vehicles Scheme – II (FAME – II) and the Production Linked Incentive Scheme (PLI). The Budget has allocated INR 51.72 billion (approximately $ 631 million) towards its FAME-II scheme to subsidize and promote the adoption of clean energy vehicles. This represents an 80 percent increase in budget allocation from previous years. The reduced custom duty on Lithium-iOn batteries used in electric vehicles and excise duty exemptions on natural gas and biogas could result in more foreign electric vehicles being imported to India.

The charging infrastructure is being expanded with investments from both government and private companies in setting up charging stations. The nation's first EV charging plaza was established by EESL in July 2020, and in just one year the number of charging stations has multiplied over five times. The increasing popularity of EVs in the national capital highlights the success of the Delhi EV Policy launched in 2020. In December 2022, EVs accounted for 16.8 percent of all vehicle sales in Delhi, marking a YoY growth of 86 percent.

India's electric vehicle market is poised for significant growth in the coming years. With supportive government policies, increasing consumer awareness, and advancements in technology, the country is well positioned to transition towards a more sustainable and eco-friendly mode of transportation. As the demand for EVs increases, it presents a tremendous opportunity for both local and international companies to invest in and contribute to the growth of India's EV ecosystem.

Data Sources

The data sources that were collected and used for the purpose of Electric Market segmentation and analysis are:

1. Electric Vehicle Dataset.csv : This dataset is the customer segmentation on the basics of various aspects like demographic, psychographic etc.
   Sources: http://www.kaggle.com
2. EV_India.csv : The dataset provides the statewise number of electric vehicles being used on the roads of India as on April 2022.
   Source: http://www.kaggle.com

3. Highway charging Stations.csv: This Dataset provides a view of different EV charging ports available in various highways and expressways across India.
   Source: http://www.kaggle.com

Customer Segmentation with Machine Learning

Customer segmentation enables a company to customize its relationships with the customers, as we do in our daily lives. When you perform customer segmentation, you find similar characteristics in each customer's behaviour and needs. Then, those are generalized into groups to satisfy demands with various strategies. Moreover, those strategies can be an input of the

- Targeted marketing activities to specific groups
- Launch of features aligning with the customer demand
- Development of the product roadmap

There are different products/solutions available in the market from packaged software to CRM products. Today, I will apply an unsupervised machine learning algorithm with Python.
I will apply K-Means clustering to the dataset with the following steps.

- Data Preparation
- Segmentation with K-means Clustering
- Hyperparameter Tuning
- Visualization and Interpretation of the Results

Data Preparation

Data Preprocessing:

Data preprocessing is an important step in the data mining process. It refers to the cleaning, transforming, and integrating of data in order to make it ready for analysis. The goal of data preprocessing is to improve the quality of the data and to make it more suitable for the specific data mining task.

Data preprocessing transforms the data into a format that is more easily and effectively processed in data mining, machine learning and other data science tasks. The techniques are generally used at the earliest stages of the machine learning and AI development pipeline to ensure accurate results.

There are several different tools and methods used for preprocessing data, including the following:

- sampling, which selects a representative subset from a large population of data;

- transformation, which manipulates raw data to produce a single input;
- denoising, which removes noise from data;
- imputation, which synthesizes statistically relevant data for missing values;
- normalization, which organizes data for more efficient access; and
- feature extraction, which pulls out a relevant feature subset that is significant in a particular context.

Electric Vehicle DataAnalysis

In [242]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import sklearn
from sklearn.preprocessing import LabelEncoder
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
```

In [108]:

```
df_Original = pd.read_csv(r"C:\Users\soora\Downloads\Electric Vehicle Dataset.csv")
pd.set_option('display.float_format', lambda x: '%.3f' % x)
df = df_Original.copy()
```

In [109]:

```
df.head()
```

Out[109]:

nnamed:	Age	City	Profession	Marital Status	Education	No. of Family members	Annual Income	Would you prefer replacing all your vehicles to Electronic vehicles?	If Yes/Maybe what type of EV would you prefer?	Do you think Electronic Vehicles are economical?	Which brand of vehicle do you currently own?	How much money could you spend on an Electronic vehicle?	Preference for wheels in EV	D Elect vel re fuel in I
0	30	Nabha	None	Single	Graduate	5	1193875.647	Maybe	SUV	Yes	Hyundai	<5 lakhs	2	I thi
1	27	Pune	None	Single	Graduate	4	1844540.398	Yes	SUV	Yes	Honda	<15 lakhs	4	Y <20
2	32	Kashipur	None	Single	Graduate	4	2948150.113	Yes	Hatchback	Yes	KIA	<15 lakhs	4	Y <20
3	55	Pune	Business	Single	Graduate	3	2832379.739	Maybe	Hatchback	No	Hyundai	<5 lakhs	4	Y <10
4	26	Satara	None	Single	Graduate	4	2638750.576	Yes	Sedan	Yes	McLaren	<15 lakhs	4	Y <20

In [110]:

```
df.tail()
```

Out[110]:

	Unnamed:	Age	City	Profession	Marital Status	Education	No. of Family members	Annual Income	Would you prefer replacing all your vehicles to Electronic vehicles?	If Yes/Maybe what type of EV would you prefer?	Do you think Electronic Vehicles are economical?	Which brand of vehicle do you currently own?	How much money could you spend on an Electronic vehicle?	Prefe for v
995	995	31	Pune	None	Married	Graduate	7	2110722.120	Yes	SUV	Yes	KIA	<25 lakhs	
996	996	29	Pune	None	Married	Post Graduate	4	1616287.706	No	SUV	Yes	KIA	<5 lakhs	
997	997	30	Mumbai	Business	Single	Graduate	4	2202829.029	Yes	SUV	Yes	Honda	<15 lakhs	
998	998	24	Ahmedabad	None	Married	Graduate	4	1764744.068	Yes	SUV	Yes	Maruti	<15 lakhs	
999	999	30	Pune	Business	Single	Graduate	4	2486664.468	No	Liftback	Yes	Maruti	<5 lakhs	

Data Processing

In [111]:

```
df.isnull().sum()
```

Out[111]:

```
Unnamed:                                                    0
Age                                                         0
City                                                        0
Profession                                                  0
Marital Status                                              0
Education                                                   0
No. of Family members                                       0
Annual Income                                               0
Would you prefer replacing all your vehicles to Electronic vehicles?    0
If Yes/Maybe what type of EV would you prefer?              0
Do you think Electronic Vehicles are economical?            0
Which brand of vehicle do you currently own?                0
How much money could you spend on an Electronic vehicle?    0
Preference for wheels in EV                                 0
Do you think Electronic vehicles will replace fuel cars in India?    0
dtype: int64
```

In [112]:

```
df.columns
```

Out[112]:

```
Index(['Unnamed: ', 'Age', 'City', 'Profession', 'Marital Status', 'Education',
       'No. of Family members', 'Annual Income',
       'Would you prefer replacing all your vehicles to Electronic vehicles?',
       'If Yes/Maybe what type of EV would you prefer?',
       'Do you think Electronic Vehicles are economical?',
       'Which brand of vehicle do you currently own?',
       'How much money could you spend on an Electronic vehicle?',
       'Preference for wheels in EV',
       'Do you think Electronic vehicles will replace fuel cars in India?'],
      dtype='object')
```

In [113]:

```
df.shape
```

Out[113]:

```
(1000, 15)
```

In [114]:

```
df.duplicated()
```

Out[114]:

```
0      False
1      False
2      False
3      False
4      False
       ...
995    False
996    False
997    False
998    False
999    False
Length: 1000, dtype: bool
```

In [115]:

```
df.corr()
```

Out[115]:

	Unnamed:	Age	No. of Family members	Annual Income	Preference for wheels in EV
Unnamed:	1.000	-0.004	0.009	-0.011	-0.023
Age	-0.004	1.000	0.024	-0.012	0.028
No. of Family members	0.009	0.024	1.000	0.028	-0.021
Annual Income	-0.011	-0.012	0.028	1.000	-0.023
Preference for wheels in EV	-0.023	0.028	-0.021	-0.023	1.000

In [116]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 15 columns):
 #   Column                                                      Non-Null Count  Dtype  
---  ------                                                      --------------  -----  
 0   Unnamed:                                                    1000 non-null   int64  
 1   Age                                                         1000 non-null   int64  
 2   City                                                        1000 non-null   object 
 3   Profession                                                  1000 non-null   object 
 4   Marital Status                                              1000 non-null   object 
 5   Education                                                   1000 non-null   object 
 6   No. of Family members                                       1000 non-null   int64  
 7   Annual Income                                               1000 non-null   float64
 8   Would you prefer replacing all your vehicles to Electronic vehicles?  1000 non-null   object 
 9   If Yes/Maybe what type of EV would you prefer?              1000 non-null   object 
 10  Do you think Electronic Vehicles are economical?            1000 non-null   object 
 11  Which brand of vehicle do you currently own?                1000 non-null   object 
 12  How much money could you spend on an Electronic vehicle?    1000 non-null   object 
 13  Preference for wheels in EV                                 1000 non-null   int64  
 14  Do you think Electronic vehicles will replace fuel cars in India?  1000 non-null   object 
dtypes: float64(1), int64(4), object(10)
memory usage: 117.3+ KB
```

In [117]:

```
df['Age'].unique()
```

Out[117]:

```
array([ 30,  27,  32,  55,  26,  28,  23,  25,  43,  59,  21,  29,  56,
        70,  50,  24,  61,  39,  31,  40,  18,  58,  22,  96,  64,  52,
        54,  42,  49,  57,  46,  36,  20,  19,  65,  17,  60,  44,  45,
        47,  82,  33,  37,  48,  69,  67,  86,  62,  66,  34,  63,  41,
        68,  16,  53,  15, 118,  38], dtype=int64)
```

In [118]:

```
df['City'].unique()
```

Out[118]:

```
array(['Nabha', 'Pune', 'Kashipur', 'Satara', 'Noida', 'Delhi', 'Mumbai',
       'pune', 'solapur', 'Haldwani', 'Nellore', 'Banglore', 'Faridabad',
       'Nagpur', 'Chandrapur', 'Chennai', 'Gurugram', 'Nashik',
       'Bengaluru', 'Hakdwani', 'Patiyala', 'pUNE', 'Ahmedabad', 'Karnal',
       'Rewari', 'New Delhi', 'Serampore', 'Jhansi', 'Jalandhar',
       'nashik'], dtype=object)
```

In [85]:

```
df["City"] = df["City"].replace({"Pune":"Pune", "pUNE": "Pune", "pune": "Pune", "Pune ": "Pune"})
df["City"] = df["City"].replace({"Mumbai ":"Mumbai", "Mumbai": "Mumbai"})
df["City"] = df["City"].replace({"Banglore ":"Bengaluru"})
df["City"] = df["City"].replace({"Delhi":"New Delhi", "Delhi ": "New Delhi", "New Delhi ": "New Delhi"})
df["City"] = df["City"].replace({"Hakdwani":"Haldwani", "Haldwani ": "Haldwani"})
df["City"] = df["City"].replace({"nashik":"Nashik"})
```

In [86]:

```
df['No. of Family members'].unique()
```

Out[86]:

```
array([5, 4, 3, 2, 8, 6, 0, 1, 7], dtype=int64)
```

In [87]:

```
df['How much money could you spend on an Electronic vehicle?'].unique()
```

Out[87]:

```
array(['<5 lakhs', '<15 lakhs', '<25 lakhs', '700000', '>25 lakhs',
       '2000000', '1200000', '1500000'], dtype=object)
```

In [119]:

```
df.drop('Unnamed: ', axis=1, inplace = True)
```

In [124]:

```
df.describe()
```

Out[124]:

	Age	No. of Family members	Annual Income	Preference for wheels in EV
count	1000.000	1000.000	1000.000	1000.000
mean	31.800	4.118	2258341.824	3.349
std	11.295	1.470	999355.758	0.888
min	15.000	0.000	-376150.863	2.000
25%	26.000	4.000	1782115.520	2.000
50%	29.000	4.000	2329246.376	4.000
75%	31.000	5.000	2753169.612	4.000
max	118.000	8.000	12821282.030	4.000

There are 1000 rows and 15 columns. As there are no null values in this Dataset.

Profiling Describing Potential Segments

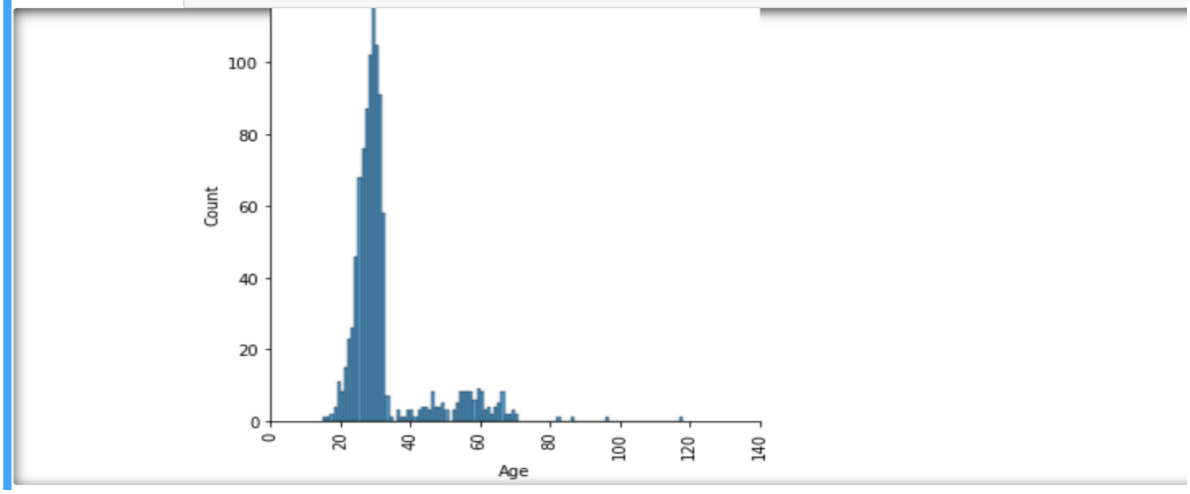
Age of Customer

As per the analysis done Electronic Vehicle dataset one characteristic of the potential segment would be age.

Data Visualization

In [268]:

```
for col in df.columns:
    ax= sns.displot(df[col])
    ax.set_xticklabels(rotation=90)
```

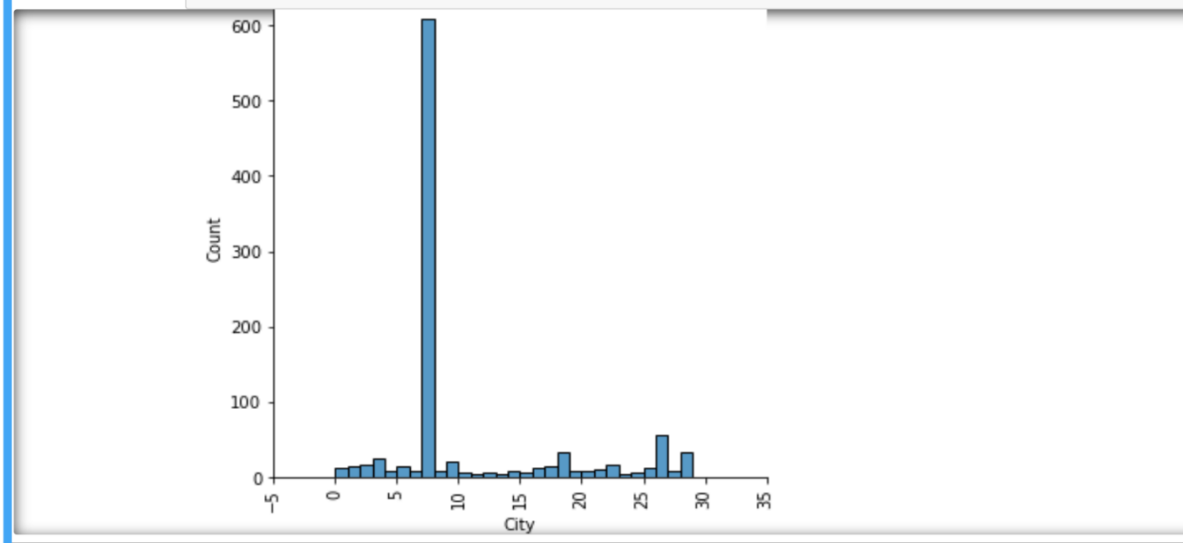


Location of the Customer

Location can play a vital role in companies' growth and build customer base.

Data Visualization

```
In [268]: for col in df.columns:
              ax= sns.displot(df[col])
              ax.set_xticklabels(rotation=90)
```

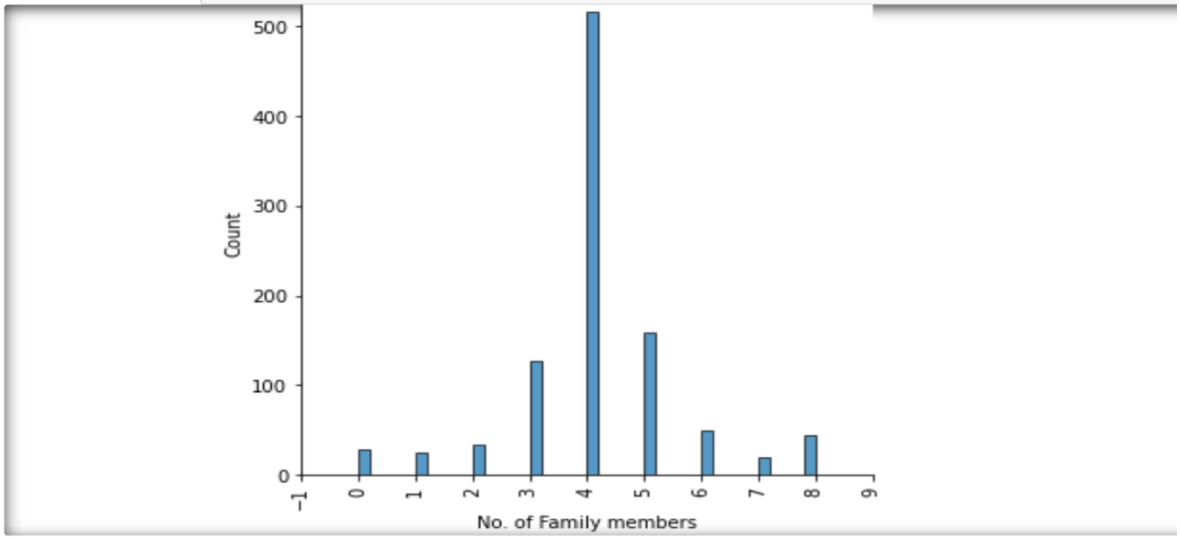


Family Size of Customer

As per the analysis, the visualization of customer family Data.

Data Visualization

```
In [268]: for col in df.columns:
              ax= sns.displot(df[col])
              ax.set_xticklabels(rotation=90)
```

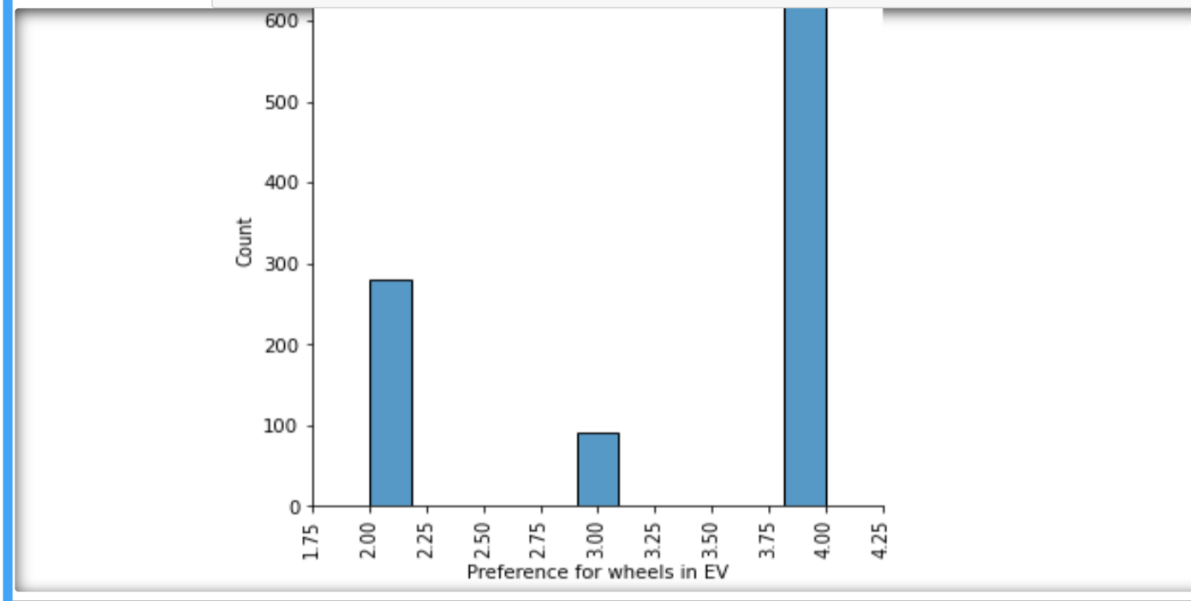


Vehicle Wheel Type

Regarding the number of wheels on a vehicle, wheel type also creates a verity of market segments that serve various customers bases. Making a potential market segment using this information may be beneficial.

Data Visualization

```
In [268]: for col in df.columns:
              ax= sns.displot(df[col])
              ax.set_xticklabels(rotation=90)
```

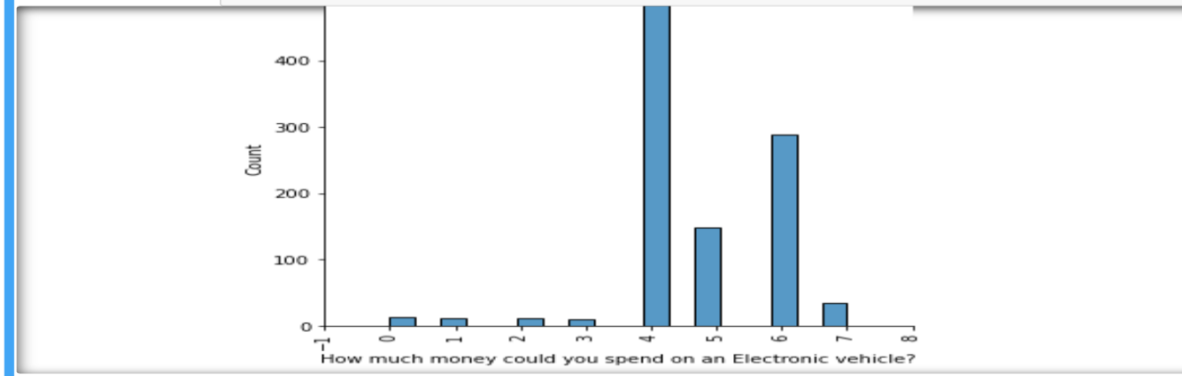


Price of EV

Many market segments could be created based on the EV selling price and this gives us the chance to tailor the product to the needs and wants of affluent customers.

Data Visualization

```
In [268]: for col in df.columns:
              ax= sns.displot(df[col])
              ax.set_xticklabels(rotation=90)
```



Segmentation with K-means Clustering

We are going to use K-means algorithm from scikit-learn. Let's first understand how the algorithm will form customer groups:

Initialize k=n centroids=number-of-clusters randomly or smartly

Assign each data point to the closest centroid based on Euclidian distance, thus forming the groups

Move centres to the average of all points in the cluster

While running the steps through, the algorithm checks the sum of squared distances between clustered-point and centre for each cluster. Mathematically speaking, it tries to minimize — optimize the within-cluster sum-of-squared-distances or inertia of each cluster.

$$\sum_{i=0}^{n} \min_{\mu_j \in C} (||x_i - \mu_j||^2)$$

Mathematical expression of within-cluster sum-of-squared-distances or inertia where X is the points in the cluster and μ is the current centroid

When inertia value does not minimize further, algorithm converges. Thus, iteration stops.

```
from sklearn.cluster import Kmeans
kmeans_model = KMeans(init='k-means++', max_iter=500, random_state=42)
```

`init` parameter with the `k-means++` allows the algorithm to place initial centers smartly, rather than random.

`max_iter` is the maximum number of iterations of the algorithm in a single run, default value is 300.

`random_state` guarantees the reproducibility of the model results.

This algorithm is easy to understand, fits well to large datasets in terms of computing times and guarantees convergence. However, when centroids are initialized randomly, algorithm may not assign the points to the groups in the most optimal way.

One important consideration is the selection of *k*. In other words, how many groups should be formed? For example, K-means applied above uses *k=8* as a default value.

Hyperparameter Tuning

While selecting *k,* we are going to decide against the optimization criteria of the K-means, inertia, using elbow method. We are going to build different K-means models with *k* values 1 to 15, and save the corresponding inertia values.

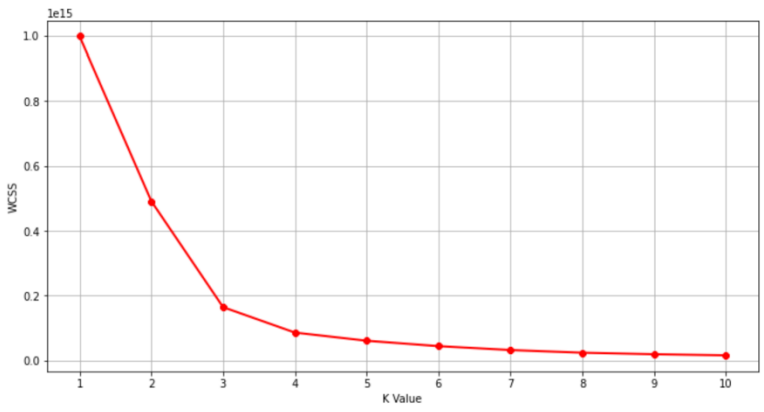
With the elbow method, we are going to select the k value where the decrease in the inertia stabilizes.

When k=1 inertia is at the highest, meaning data is not grouped yet. Inertia decreases steeply until k=2. Between k=2 and 4, the curve continues to decrease fast.

At k=4, the descent stabilizes and continues linearly afterwards, forming an elbow at k=4. This points out the optimal number of customer group is *4*.

K MEANS MODEL

In [142]:
```
from sklearn.cluster import KMeans
wcss = []
for k in range(1,11):
    kmeans = KMeans(n_clusters=k, init="k-means++",random_state=28)
    kmeans.fit(X)
    wcss.append(kmeans.inertia_)
plt.figure(figsize=(12,6))
plt.grid()
plt.plot(range(1,11),wcss, linewidth=2, color="red", marker ="8")
plt.xlabel("K Value")
plt.xticks(np.arange(1,11,1))
plt.ylabel("WCSS")
plt.show()
```

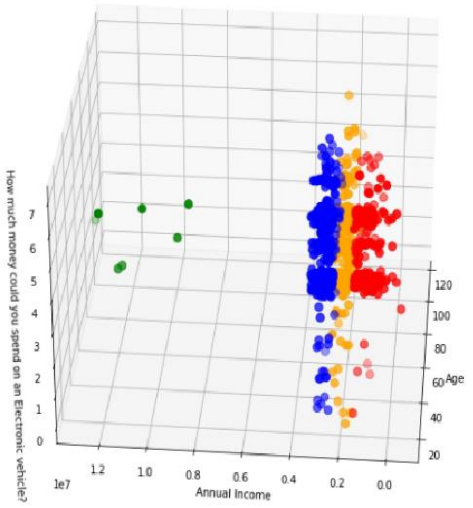


Visualization and Interpretation of the Results

Let's plug in the *k=4* to K-means and visualize how customer groups are created:

In [143]:

```
km = KMeans(n_clusters=4, random_state=28)
clusters = km.fit_predict(df)
df["Cluster"] = clusters

df_Original["Cluster"] = clusters

from mpl_toolkits.mplot3d import Axes3D
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd

fig = plt.figure(figsize=(20,10))
ax = fig.add_subplot(111, projection='3d')
ax.scatter(df.Age[df.Cluster == 0], df["Annual Income"][df.Cluster == 0], df["How much money could you spend on an Electronic vehicle?"][
ax.scatter(df.Age[df.Cluster == 1], df["Annual Income"][df.Cluster == 1], df["How much money could you spend on an Electronic vehicle?"][
ax.scatter(df.Age[df.Cluster == 2], df["Annual Income"][df.Cluster == 2], df["How much money could you spend on an Electronic vehicle?"][
ax.scatter(df.Age[df.Cluster == 3], df["Annual Income"][df.Cluster == 3], df["How much money could you spend on an Electronic vehicle?"][

ax.view_init(30, 185)
plt.xlabel("Age")
plt.ylabel("Annual Income")
ax.set_zlabel('How much money could you spend on an Electronic vehicle?')
plt.show()
```



Target Market

A target market is a group of people that have been identified as the most likely potential customers for a product because of their shared characteristics such as age, income, and lifestyle.

Identifying the target market is a key part of the decision-making process when a company designs, packages, and advertises its product.

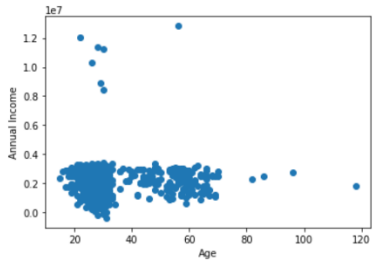
The 4 Target Markets are:

Marketing professionals divide consumers into four major segments:

Demographic: These are the main characteristics that define your target market. Everyone can be identified as belonging to a specific age group, income level, gender, occupation, and education level.

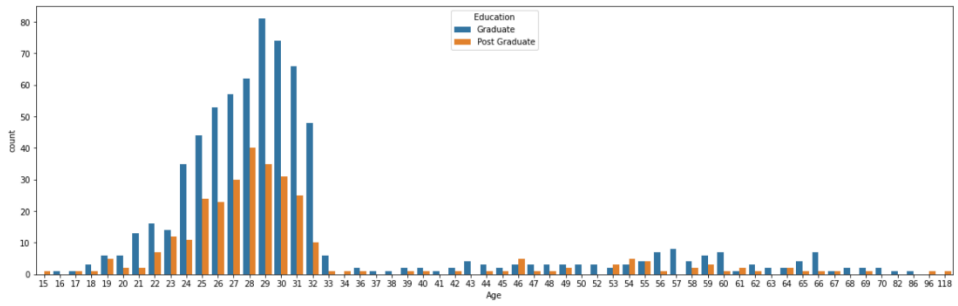
```
In [125]: plt.xlabel('Age')
          plt.ylabel('Annual Income')
          plt.scatter(df['Age'],df['Annual Income'])
```

```
Out[125]: <matplotlib.collections.PathCollection at 0x23f240774f0>
```



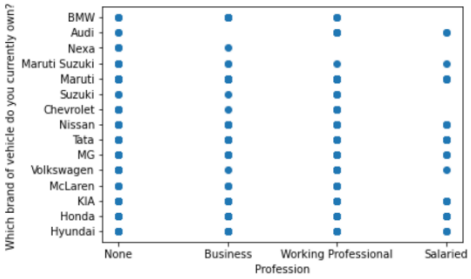

```
In [126]: plt.figure(figsize=(20,6))
          sns.countplot(x="Age", data=df, hue="Education")
```

```
Out[126]: <AxesSubplot:xlabel='Age', ylabel='count'>
```



In [127]:
```
plt.xlabel('Profession')
plt.ylabel('Which brand of vehicle do you currently own? ')
plt.scatter(df['Profession'],df['Which brand of vehicle do you currently own?'])
```

Out[127]:
```
<matplotlib.collections.PathCollection at 0x23f269c0fd0>
```



education Analysis of EV customers

In [159]:
```
[Cluster_0['Education'].value_counts().head(),
 Cluster_1['Education'].value_counts().head(),
 Cluster_2['Education'].value_counts().head(),
 Cluster_3['Education'].value_counts().head()]
```

Out[159]:
```
[Graduate         298
 Post Graduate    132
 Name: Education, dtype: int64,
 Graduate         130
 Post Graduate     65
 Name: Education, dtype: int64,
 Graduate         5
 Post Graduate    2
 Name: Education, dtype: int64,
 Graduate         260
 Post Graduate    108
 Name: Education, dtype: int64]
```

In [160]:
```
e=Cluster_3[Cluster_3['Education']=='Graduate']
e['Would you prefer replacing all your vehicles to Electronic vehicles?'].value_counts()
```

Out[160]:
```
Yes      176
Maybe     50
No        34
Name: Would you prefer replacing all your vehicles to Electronic vehicles?, dtype: int64
```

In [161]:
```
vehicles to Electronic vehicles?']



ing all your vehicles to Electronic vehicles?', 'Cluster'])
Electronic vehicles?']=='Yes').sum() + (i['Would you prefer replacing all your vehicles to Electronic vehicles?']=='Maybe').sum()
```

Out[161]:
```
864
```

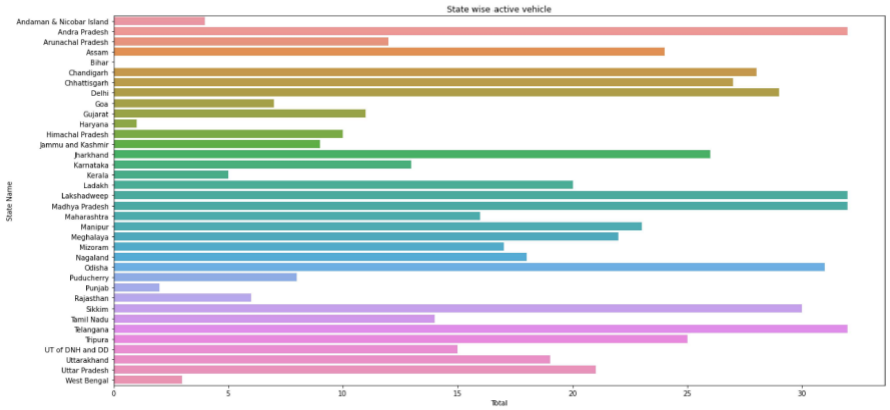
864 customers out of 1000 are intersted in EV.

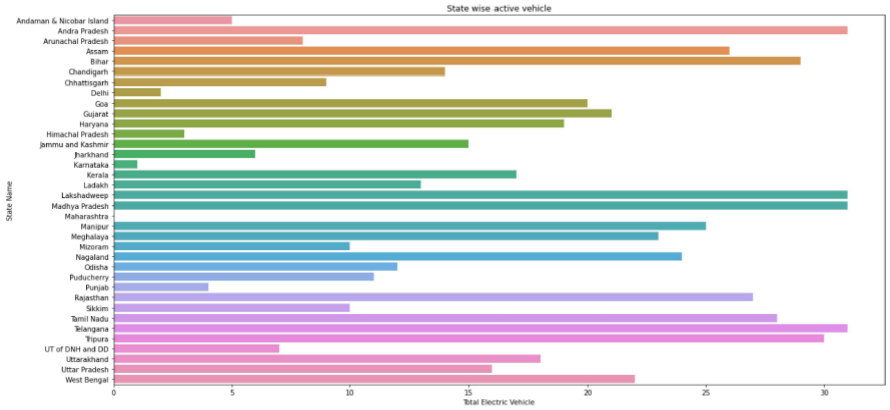
Graduates are more interested in replacing vehicles to EV

Geographic: This segment is increasingly relevant in the era of globalization. Regional preferences need to be taken into account.

In [254]:

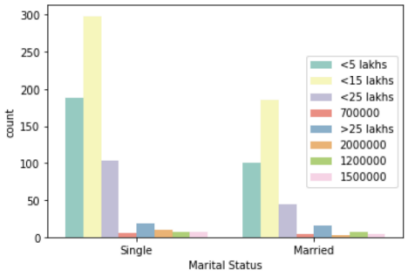
```
plt.rcParams['figure.figsize'] = (20, 10)
f = sns.barplot(y=Active_EVs['State Name'], x=Active_EV['Total'])
plt.title('State wise active vehicle')
plt.show()


plt.rcParams['figure.figsize'] = (20, 10)
f = sns.barplot(y=Active_EV['State Name'], x=Active_EV['Total Electric Vehicle'])
plt.title('State wise active vehicle')
plt.show()
```





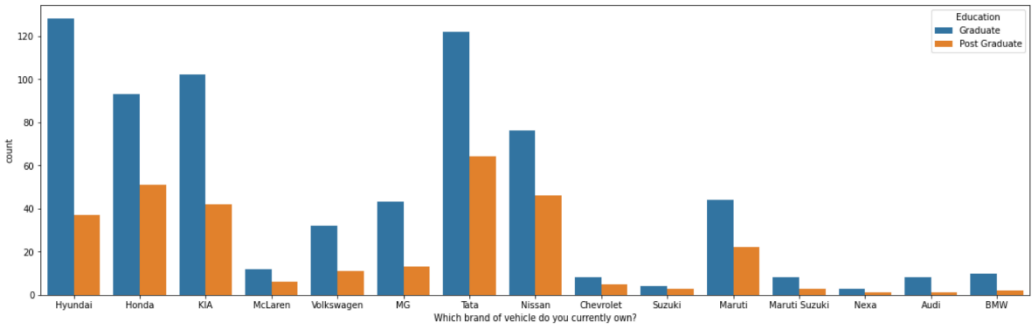
Psychographic: This segment goes beyond the basics of demographics to consider lifestyle, attitudes, interests, and values.

In [123]:
```
sns.countplot(x ='Marital Status', hue = 'How much money could you spend on an Electronic vehicle?',  data = df, palette = 'Set3'
plt.legend(loc='center right')
plt.show()
```



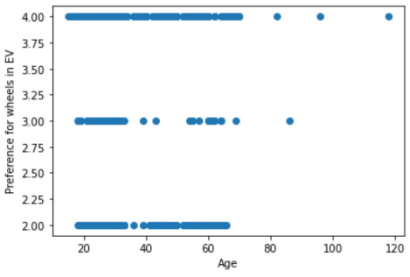
In [128]:
```
plt.figure(figsize=(20,6))
sns.countplot(x="Which brand of vehicle do you currently own?", data=df, hue="Education")
```

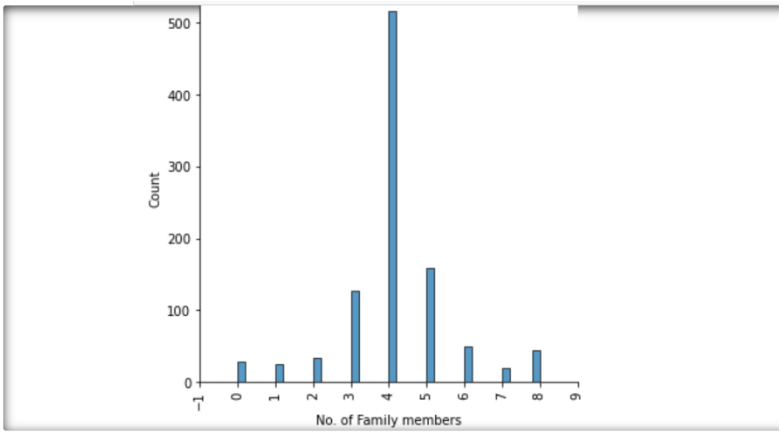
Out[128]:
```
<AxesSubplot:xlabel='Which brand of vehicle do you currently own?', ylabel='count'>
```



In [129]:
```
plt.xlabel('Age')
plt.ylabel('Preference for wheels in EV')
plt.scatter(df['Age'],df['Preference for wheels in EV'])
```

Out[129]:
```
<matplotlib.collections.PathCollection at 0x23f26ad4430>
```





Behavioral: This is the one segment that relies on research into the decisions of a company's current customers. New products may be introduced based on research into the proven appeal of past products.

Charging and range remain the top priority for consumers entering the electric vehicle market. Whilst having their differences, the two go hand-in hand as consumers worry about how to charge, and how often they can charge their vehicle.

Referance

http://www.kaggle.com/

http://www.google.co.in

http://en.wikipedia.org/wiki

https://www.investopedia.com/