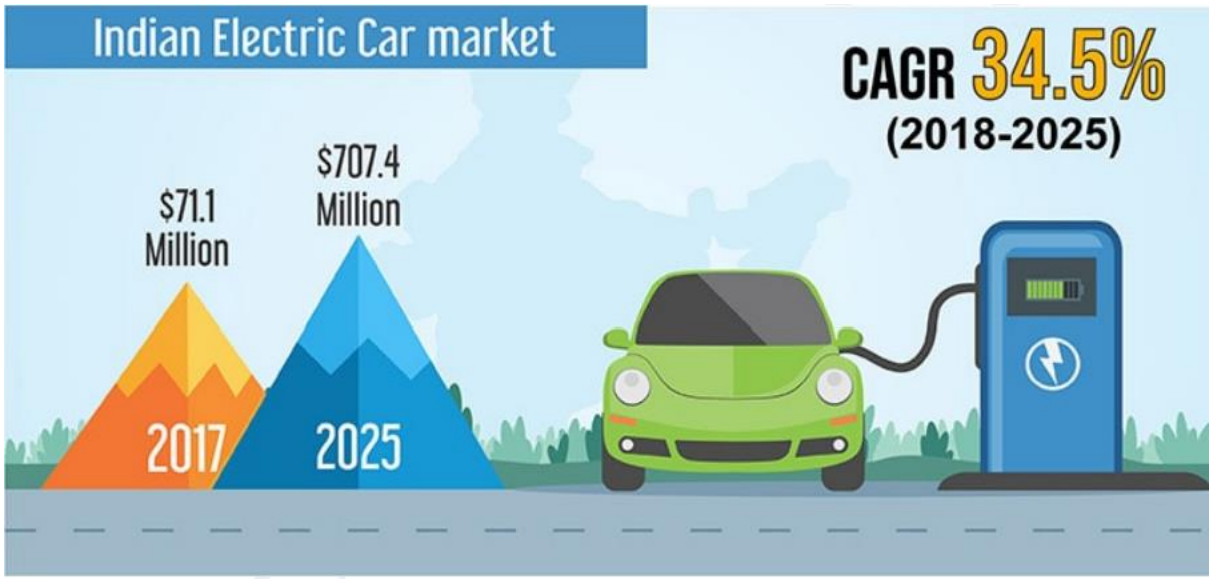
Electric Vehicle Market in India

Market Segmentation



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https://github.com/Vivek97990/EV-segmentation.git

Contents

Abstract

Market segmentation becomes a crucial tool for evolving transportation technology such as electric vehicles (EVs) in emerging markets to explore and implement for extensive adoption. EV adoption is expected to grow phenomenally in near future as low-emission and low-operating cost vehicles, and thus, it drives a considerable amount of forthcoming academic research curiosity. The main aim of this study is to explore and identify distinct sets of potential buyer segments for EVs based on psychographic, behavioural, and socio-economic characterization by employing an integrated research framework of 'perceived benefits-attitude-intention'. The study applied robust analytical procedures including cluster analysis, multiple discriminant analysis, and Chi-square test to operationalize and validate segments from the data collected from 563 respondents using a cross-sectional online survey. The findings posit that the three distinct sets of young consumer groups have been identified and labelled as 'Conservatives',Indifferents', and 'Enthusiasts' which are deemed to be buddying EV buyers The implications are recommended, which may offer some pertinent guidance for scholars and policymakers to encourage EVs adoption in the backdrop of emerging sustainable transport market.

In this report, we are going to analyse the data and solve the problem using Fermi Estimation by breaking down the problem.

Keywords: Electric vehicles, Market segmentation, Cluster analysis, Attitude towards electric vehicles, Subjective norms, Adoption intention, Sustainable transportation.

Data Collection:

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

We have collected EV sales data for 2-wheeler, 3-wheeler, and 4-wheeler buses, and all the other attributes. They were found from different sources whose respective links are provided below. EV Sales data is from January 2022-May 2022 we compute the whole year's data from 5 months of data by multiplying every section of sales by a constant to get the proper outcome.

https://evreporter.com/indias-region-wise-ev-market-jan-may-2022/

https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1778958

https://www.firstpost.com/tech/auto-tech/state-wise-ev-subsidies-in-india-a-handy-list-of-incentives-and-benefits-for-electric-vehicles-in-each-state-9952771.html

https://economictimes.indiatimes.com/wealth/fuelprices/fuel-diesel,citystate-uttarakhand.cms

https://www.currentresults.com/Weather/India/average-annual-temperatures.php

https://www.bikewale.com/electric-bike/#pageno=2&pagesize=30&fueltype=807

https://www.cardekho.com/electric-cars

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

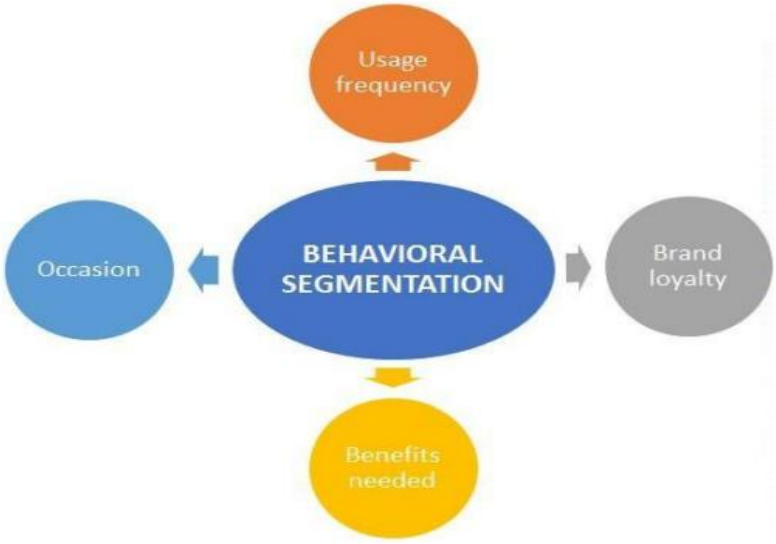
Market Segmentation

Target Market:

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

Behavioural Segmentation:

searches directly for similarities in behaviour or reported behaviour. Example: prior experience with the product, amount spent on the purchase, etc



Advantage:

Uses the very behaviour of interest is used as the basis of segment extraction.

Disadvantage:

Always readily available

Psychographic segmentation:

Grouped based on beliefs, interests, preferences, aspirations, or benefits sought when purchasing a product. Suitable for lifestyle segmentation. Involves many segmentation variables.

Advantage:

Generally, more reflective of the underlying reasons for differences in consumer behaviour.

Disadvantage:

Increased complexity of determining segment memberships for consumers.

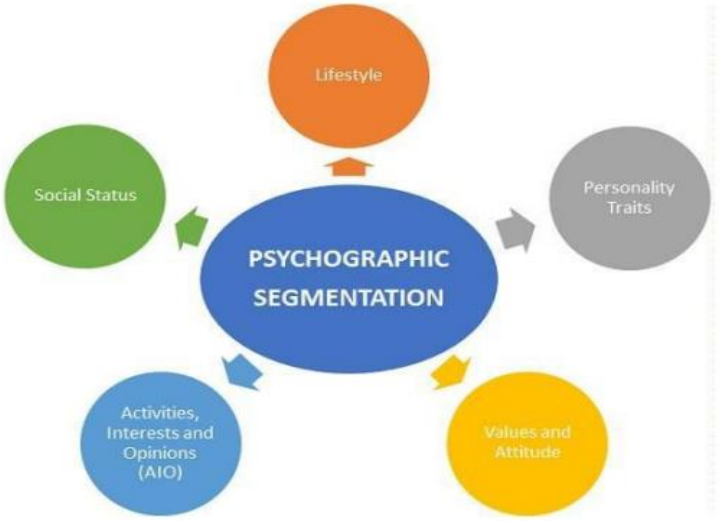


Figure 2: *Psychographic Segmentation*

Socio-Demographic Segmentation:

Includes age, gender, income, and education. Useful in industries

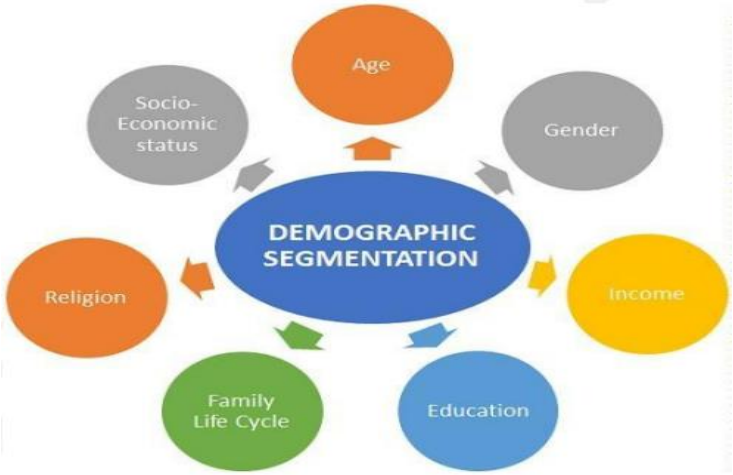


Figure 3: *Behavioral Segmentation*

Advantage:

Segment membership can easily be determined for every customer.

Disadvantage:

If this criterion is not the cause for customers product preferences, then it does not provide sufficient market insight for optimal segmentation decisions.

Segmenting for Electric Vehicle Market

The market segmentation approach aims at defining actionable, manageable, homogenous subgroups of individual customers to whom the marketers can target with a similar set of marketing strategies. In practice, there are two ways of segmenting the market-a-priori and post-hoc. An a-priori approach utilizes predefined characteristics such as age, gender, income, education, etc. to predefine the segments followed by profiling based on a host of measured variables (behavioural, psychographic, or benefit). In the post-hoc approach to segmentation on other hand, the segments are identified based on the relationship among the multiple measured variables. The commonality between both approaches lies in the fact that the measured variables determine the 'segmentation theme'. The present study utilizes an a-priori approach to segmentation so as to divide the potential EV customers into sub-groups.

It is argued that the blended approach of psychographic and socioeconomic attributes for market segmentation enables the formulation of sub-market strategies which in turn satisfy the specific tastes and preferences of the consumer groups. Straughan and Roberts presented a comparison between the usefulness of psychographic, demographic, and economic characteristics based on consumer evaluation of eco-friendly products.

They pinpointed the perceived superiority of the psychographic characteristics over the socio-demographic and economic ones in explaining environmentally conscious consumer behaviour and thus, the study recommended the use of psychographic characteristics in profiling the consumer segments in the market for eco-friendly products. The present study adds perceived-benefit characteristics guided by blended psychographic and socio-economic aspects for segmenting the consumer market

Implementation Packages/Tools used:

1. Numpy: To calculate various calculations related to arrays.

2. Pandas: To read or load the datasets.

3.SKLearn: We have used LabelEncoder() to encode our values

Data-Preprocessing

Data Cleaning

The data collected is compact and is partly used for visualization purposes and partly for clustering. Python libraries such as NumPy, Pandas, Scikit-learn, and SciPy are used for the workflow, and the results obtained are ensured to be reproducible.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
sns.set()
from sklearn.cluster import KMeans
```

```
import warnings
warnings.filterwarnings('ignore')
```

```
df=pd.read_csv("Market segmentation newest.csv")
```

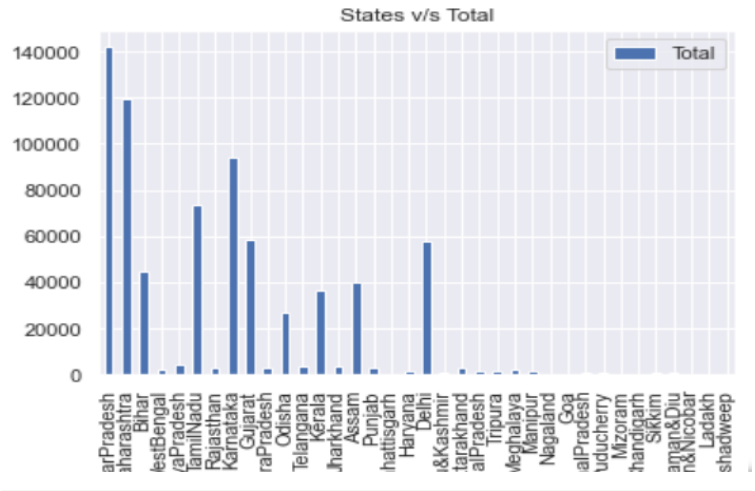
```
df.head()
```

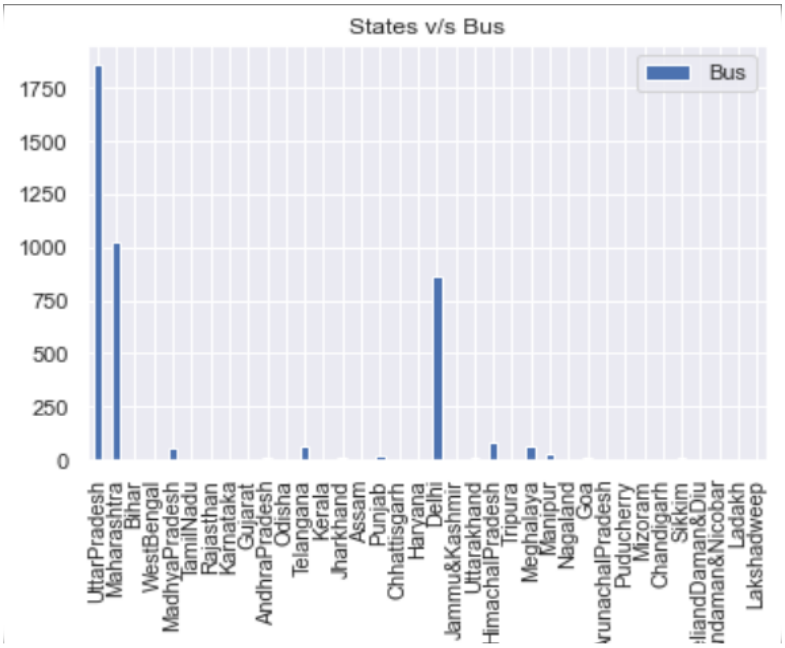
	States	2022estimates	2wheeler	3wheeler	4W	Bus	Total	EVSTATIONS	PCINCOME	TOTALEVVEHICLES	...	Avg.annualhightempcelsius	Avg.
0	UttarPradesh	233200000	27000	113400	0	1860	142260	207	65431	337180	...	33.0	
1	Maharashtra	125400000	105300	2700	10800	1022	119822	317	202130	116646	...	34.0	
2	Bihar	124900000	5400	39550	0	0	44950	37	46292	83335	...	31.0	
3	WestBengal	98600000	1958	0	0	0	1958	141	121463	48767	...	32.0	
4	MadhyaPradesh	85500000	2327	945	608	58	3938	235	98418	5100	...	32.0	

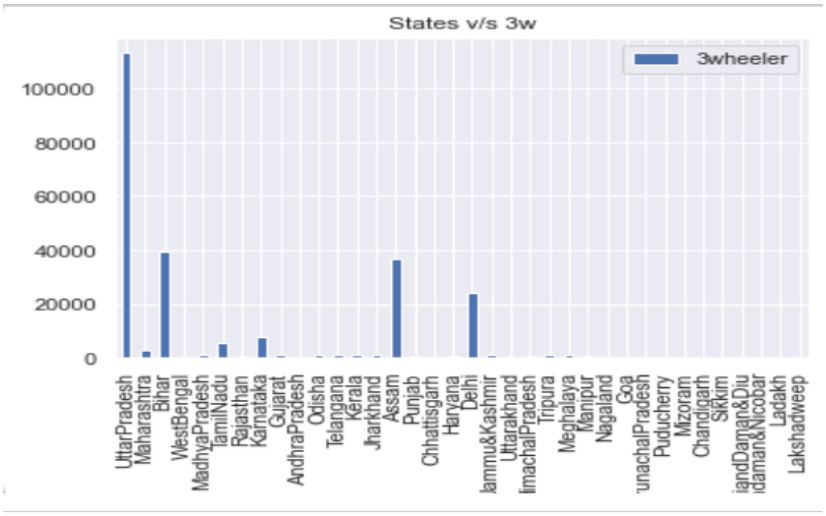
EDA

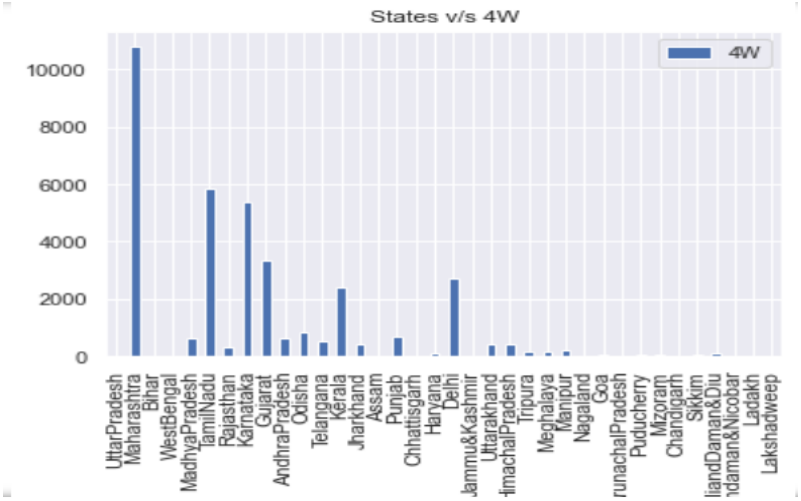
We start the Exploratory Data Analysis with some data Analysis drawn from the data without Principal Component Analysis and with some Principal Component Analysis in the dataset obtained from the combination of all the data we have. PCA is a statistical process that converts the observations of correlated features into a set of linearly uncorrelated features with the help of orthogonal transformation. These new transformed features are called the Principal Components. The process helps in reducing dimensions of the data to make the process of classification/regression or any form of machine learning, cost-effective.

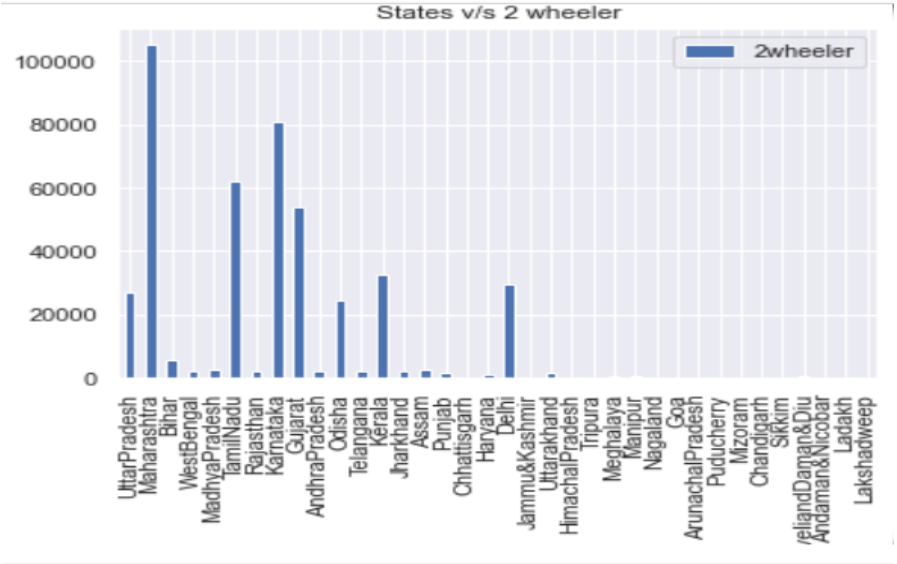
Comparison of cars in our

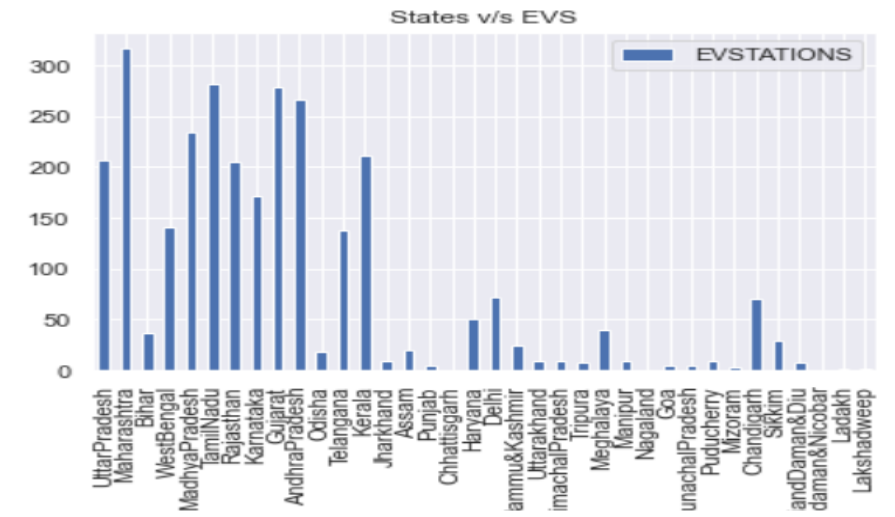



States v/s Bus
Bus
1750
1500
1250
1000
750
500
250
0
UttarPradesh
Maharashtra
Bihar
WestBengal
MadhyaPradesh
TamilNadu
Rajasthan
Karnataka
Gujarat
AndhraPradesh
Odisha
Telangana
Kerala
Jharkhand
Assam
Punjab
Chhattisgarh
Haryana
Delhi
Jammu&Kashmir
Uttarakhand
HimachalPradesh
Tripura
Meghalaya
Manipur
Nagaland
Goa
Puducherry
Mizoram
Chandigarh
Sikkim
Ladakh
Lakshadweep


States v/s 3w
3wheeler
100000
80000
60000
40000
20000
0
UttarPradesh
Maharashtra
Bihar
WestBengal
MadhyaPradesh
TamilNadu
Rajasthan
Karnataka
Gujarat
AndhraPradesh
Odisha
Telangana
Kerala
Jharkhand
Assam
Punjab
Chhattisgarh
Haryana
Delhi
Uttarakhand
Tripura
Meghalaya
Manipur
Nagaland
Puducherry
Mizoram
Chandigarh
Sikkim
Ladakh
Lakshadweep

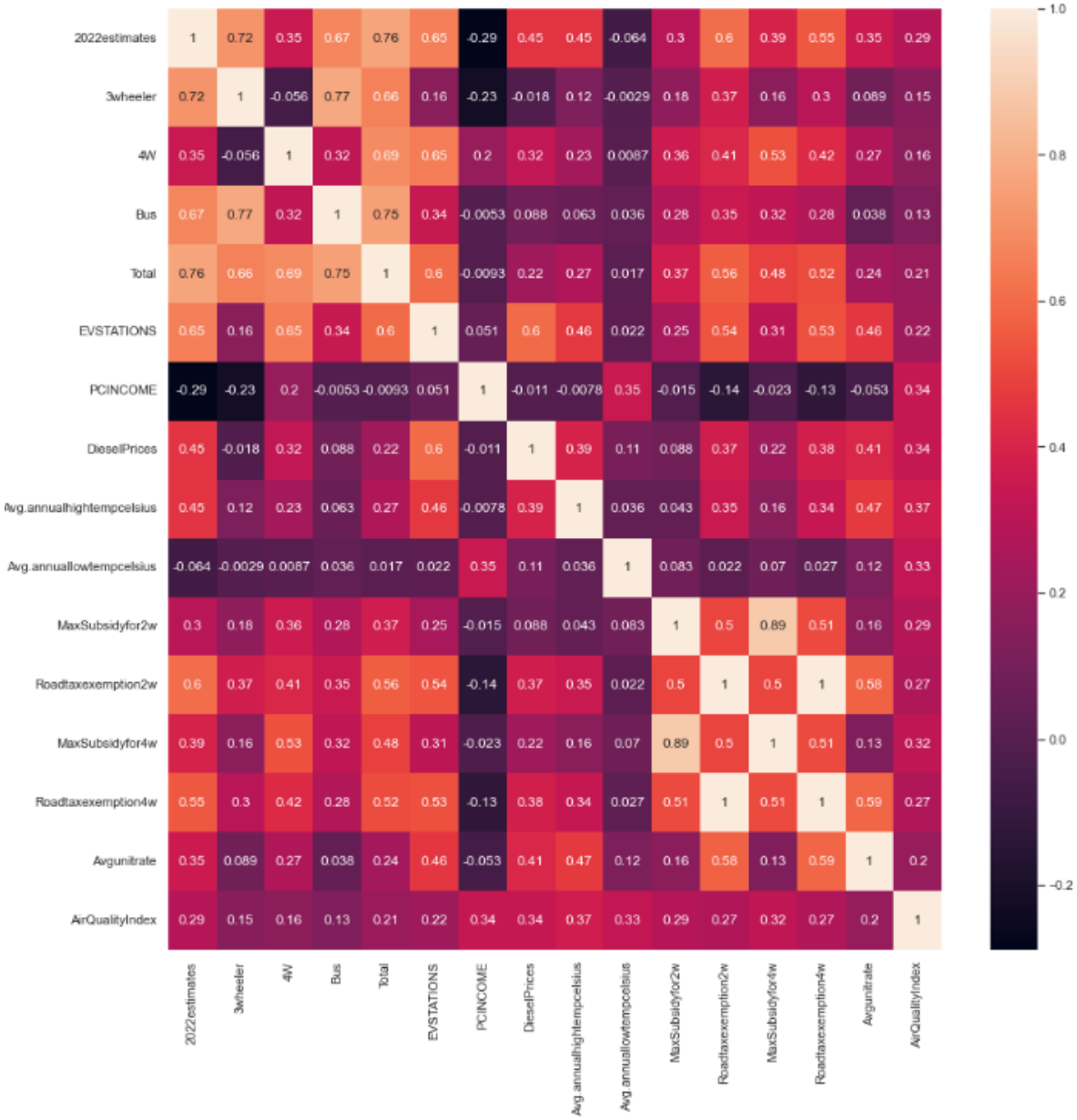

States v/s 4W
4W
10000
8000
6000
4000
2000
0
UttarPradesh
Maharashtra
Bihar
WestBengal
MadhyaPradesh
TamilNadu
Rajasthan
Karnataka
Gujarat
AndhraPradesh
Odisha
Telangana
Kerala
Jharkhand
Assam
Punjab
Chhattisgarh
Haryana
Delhi
Jammu&Kashmir
Uttarakhand
Tripura
Meghalaya
Manipur
Nagaland
Goa
Puducherry
Mizoram
Chandigarh
Sikkim
Ladakh
Lakshadweep





Correlation Matrix:

A correlation matrix is simply a table that displays the correlation. It is best used in variables that demonstrate a linear relationship between each other. Coefficients for different variables. The matrix depicts the correlation between all the possible pairs of values through the heatmap in the below figure. The relationship between two variables is usually considered strong when their correlation coefficient value is larger than 0.7.



Elbow Method:

The Elbow method is a popular method for determining the optimal number of clusters. The method is based on calculating the Within-Cluster-Sum of Squared Errors (WSS) for a different number of clusters (k) and selecting the k for which change in WSS first starts to diminish. The idea behind the elbow method is that the explained variation changes rapidly for a small number of clusters and then it slows down leading to an elbow formation in the curve. The elbow point is the number of clusters we can use for our clustering algorithm.

The KElbow Visualizer function fits the KMeans model for a range of clusters values between 2 to 8. As shown in Figure, the elbow point is achieved which is highlighted by the function itself. The function also informs us about how much time was needed to plot models for various numbers of clusters through the green line.

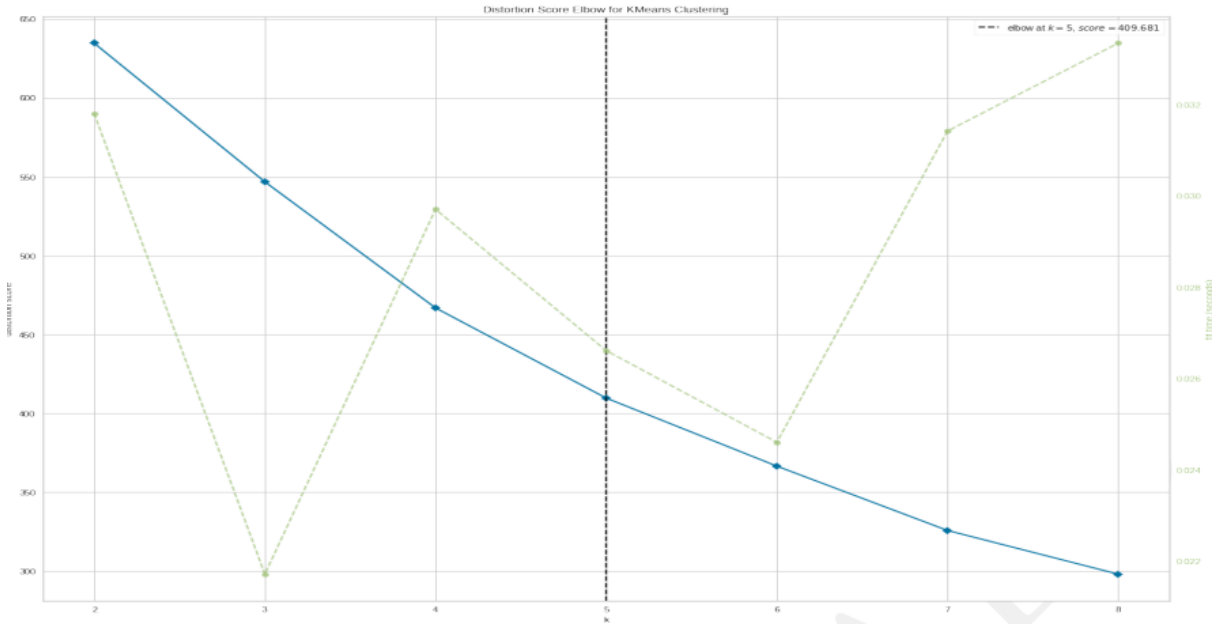


Figure 10: Evaluating the clusters using distortion

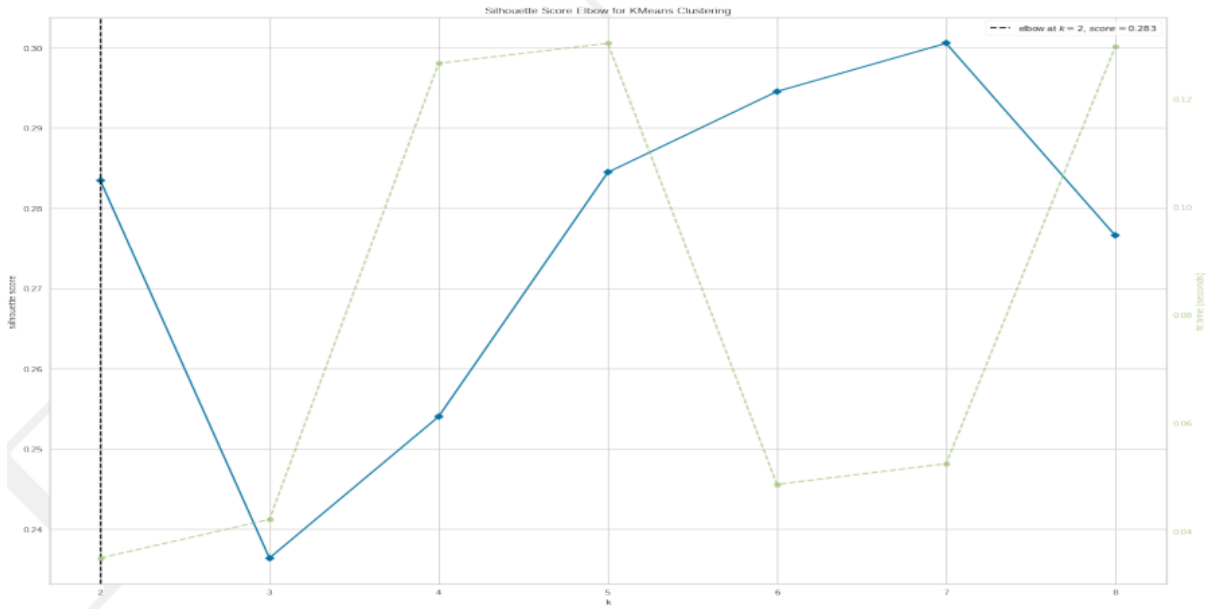


Figure 11: Evaluating the clusters using silhouette

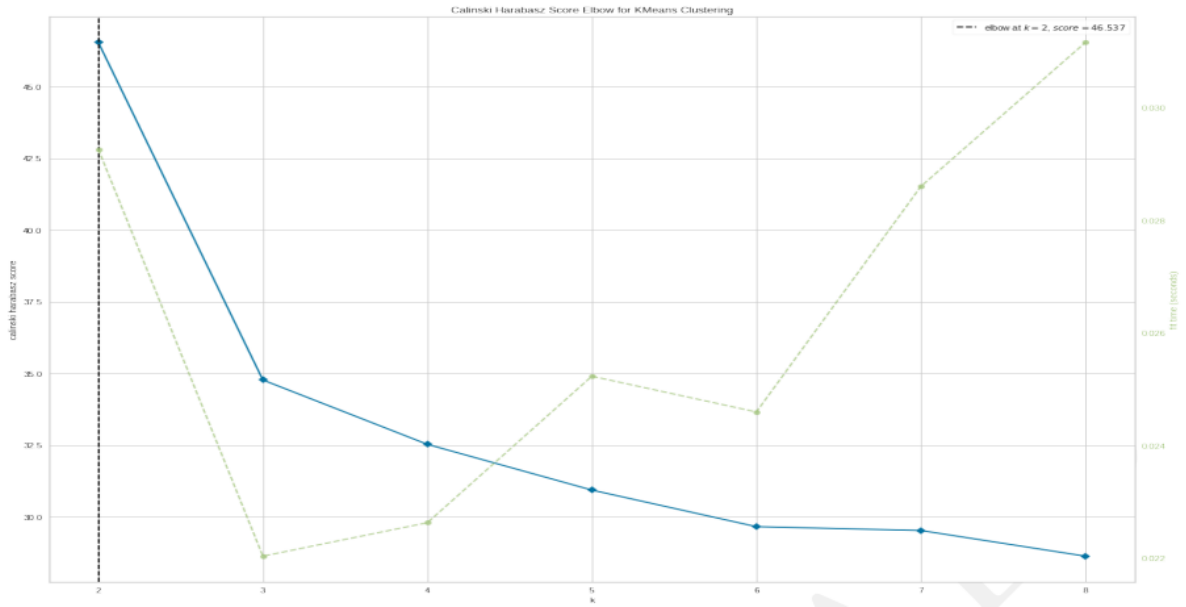


Figure 12: Evaluating the clusters using calinskiharabasaz

Analysis and Approaches used for Segmentation

Clustering

Clustering is one of the most common exploratory data analysis techniques used to get an intuition about the structure of the data. It can be defined as the task of identifying subgroups in the data such that data points in the same subgroup (cluster) are very similar while data points in different clusters are very different. In other words, we try to find homogeneous subgroups within the data such that data points in each cluster are as similar as possible according to a similarity measure such as euclidean-based distance or correlation-based distance.
The decision of which similarity measure to use is application-specific. Clustering analysis can be done on the basis of features where we try to find subgroups of samples based on features or on the basis of samples where we try to find subgroups of features based on samples.

K-Means Algorithm

K Means algorithm is an iterative algorithm that tries to partition the dataset into pre-defined distinct non-overlapping subgroups (clusters) where each data point belongs to **only one group**. It tries to make the intra-cluster data points as similar as possible while also keeping the clusters as different (far) as possible. It assigns data points to a cluster such that the sum of the squared distance between the data points and the cluster's centroid (arithmetic mean of all the data points that belong to that cluster) is at the minimum. The less variation we have within clusters, the more homogeneous (similar) the data points are within the same cluster.

The way k means algorithm works is as follows:

• Specify number of clusters K.

• Initialize centroids by first shuffling the dataset and then randomly selecting K data points for the centroids without replacement.

• Keep iterating until there is no change to the centroids. i.e. assignment of data points to clusters is not changing.

The approach k-means follows to solve the problem is expectation maximization The E-step is assigning the data points to the closest cluster. The M-step is computing the centroid of each cluster. Below is a breakdown of how we can solve it mathematically,

The objective function is:

$$J = \sum_{i=1}^{m} \sum_{k=1}^{K} w_{ik} ||x^i - \mu_k|| \quad (1)$$

And M-step is :

$$\frac{\partial J}{\partial \mu_k} \equiv 2 \sum_{i=1}^{m} w_{ik}(x^i - \mu_k) = 0$$

$$\Rightarrow \mu_k = \frac{\sum_{i=1}^{m} w_{ik} x^i}{\sum_{i=1}^{m} w_{ik}}$$

Applications

K means algorithm is very popular and used in a variety of applications such as market segmentation, document clustering, image segmentation and image compression, etc. The goal usually when we undergo a cluster analysis is either:

1. Get a meaningful intuition of the structure of the data we're dealing with.
2. Cluster-then-predict where different models will be built for different subgroups if we believe there is a wide variation in the behaviors of different subgroups.

The **k-means clustering algorithm** performs the following tasks:

- Specify number of clusters K
- Initialize centroids by first shuffling the dataset and then randomly selecting K data points for the centroids without replacement.
- Compute the sum of the squared distance between data points and all centroids
- Assign each data point to the closest cluster (centroid).
- Compute the centroids for the clusters by taking the average of the all data points that belong to each cluster.
- Keep iterating until there is no change to the centroids. i.e assignment of data points to clusters isn't changing.

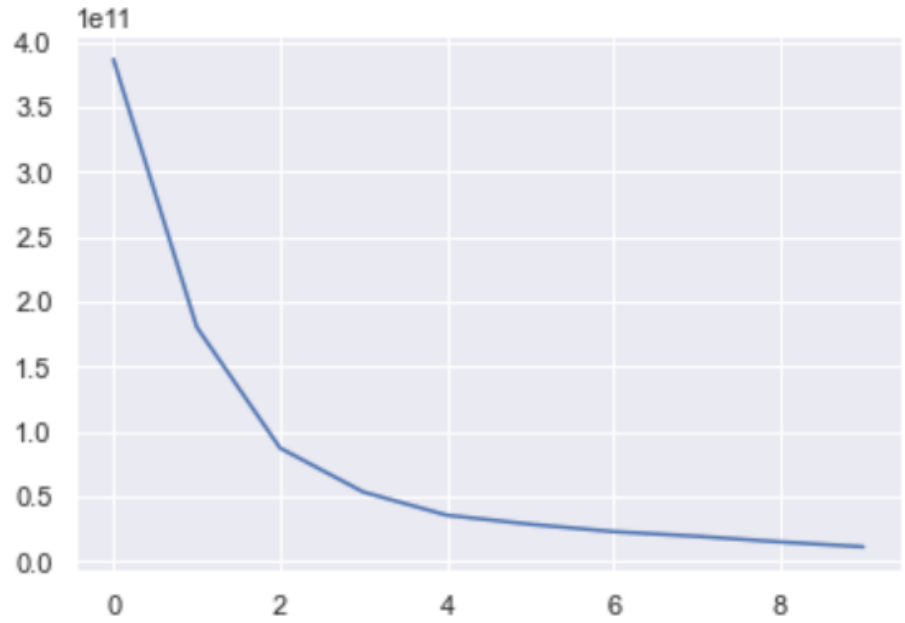
According to the Elbow method, here we take K=2 clusters to train KMeans model. The derived clusters are shown in the following figure

- Initially we are applying KMeans for 3-Wheeler,4 Wheeler and Bus.

```
wcss = []
for i in range(1,11):
    kmeans_pca = KMeans(n_clusters = i, init = 'k-means++', random_state = 42)
    kmeans_pca.fit(df4)
    wcss.append(kmeans_pca.inertia_)
```

```
plt.plot(wcss)
```

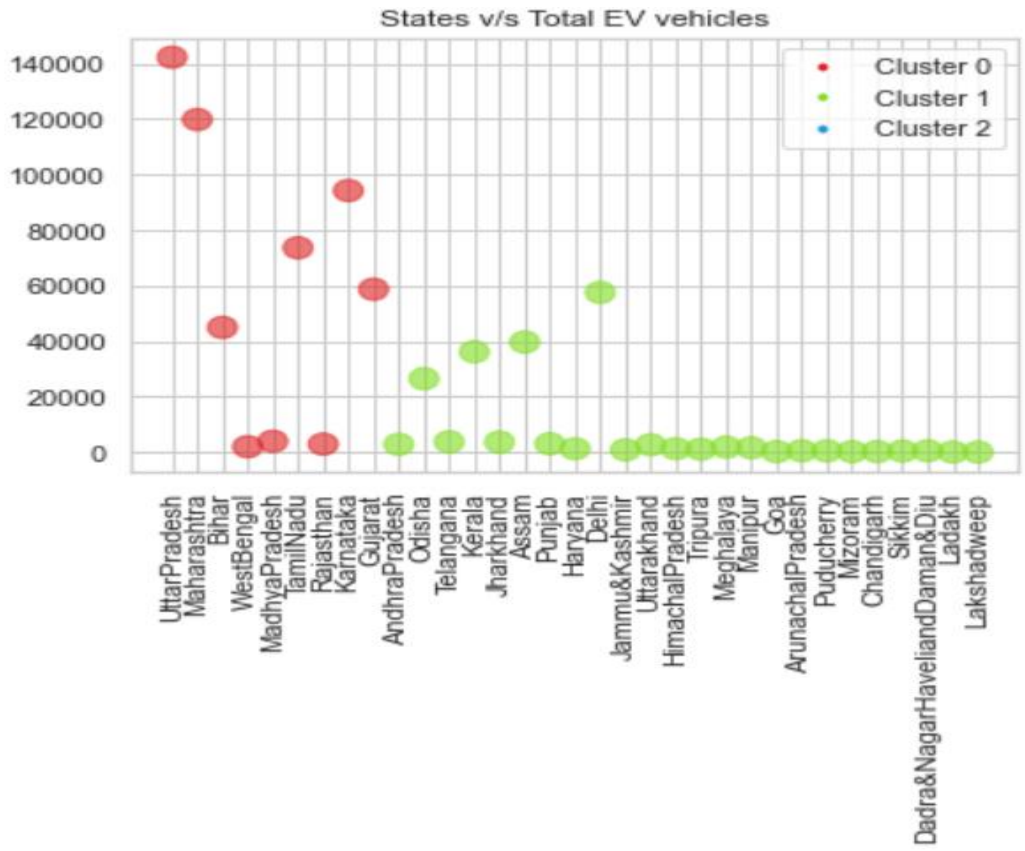
```
[<matplotlib.lines.Line2D at 0x241c155f160>]
```



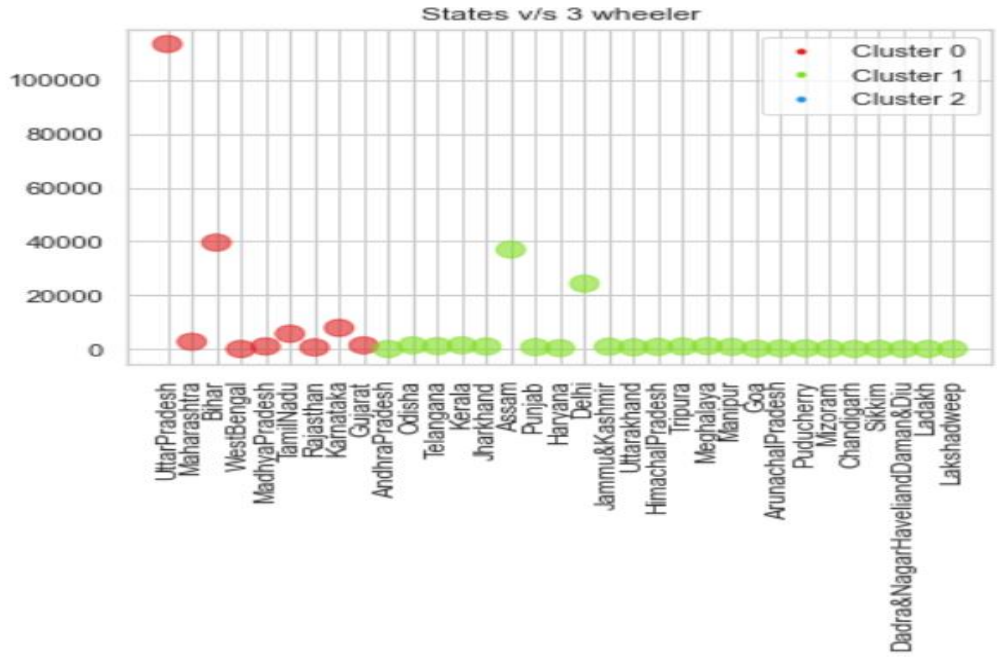
```
kmeans = KMeans(n_clusters=2)
kmeans.fit(df4)
```

```
KMeans(n_clusters=2)
```

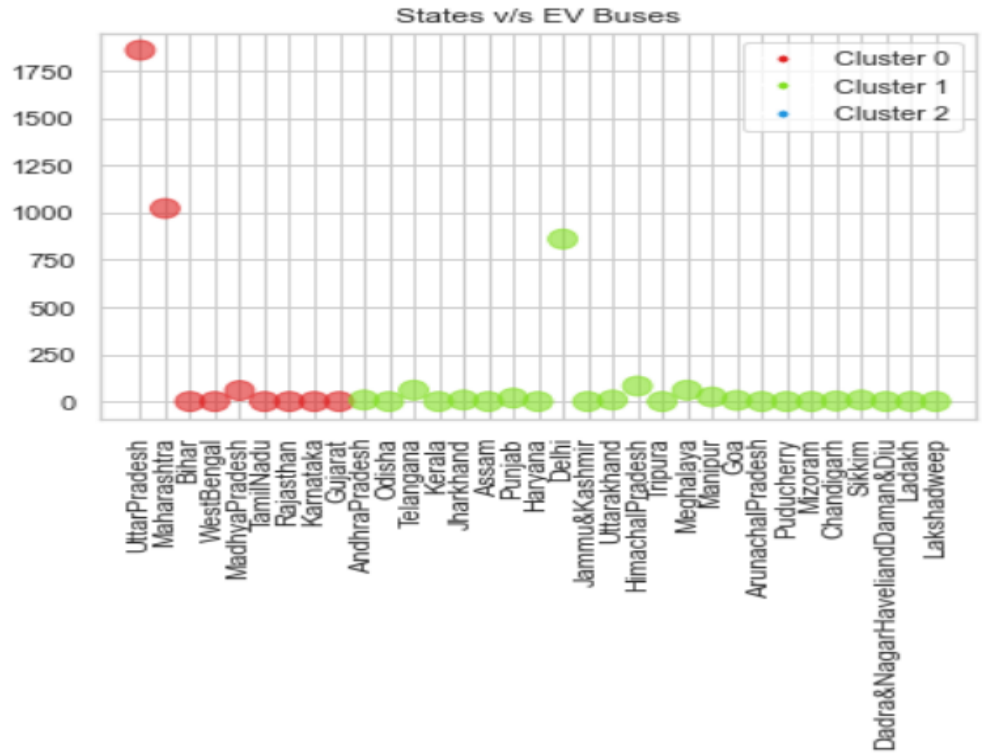
```
from matplotlib.lines import Line2D
legend_elements = [Line2D([0], [0], marker='o', color='w', label='Cluster {}'.format(i),
                markerfacecolor=mcolor, markersize=5) for i, mcolor in enumerate(colors)]
plt.legend(handles=legend_elements, loc='upper right')

plt.scatter(df2.States, df2.Total, c=df2.c, alpha = 0.6, s=120)
plt.title("States v/s Total EV vehicles")
plt.xticks(rotation = 90)
plt.show()
```



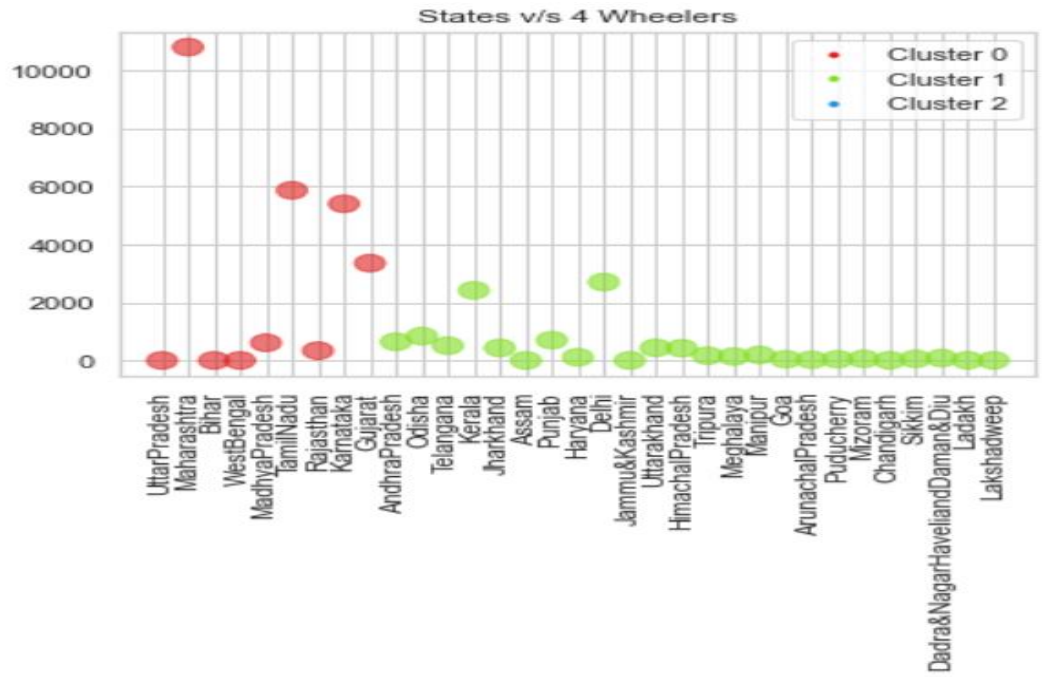
From the above scatter graph, we can inference that Top 3 states for EV vehicles are UP, Maharashtra & Karnataka.



From above scatter graph we can inference that top 3 states for 3 wheelers are UP, Bihar and Assam.

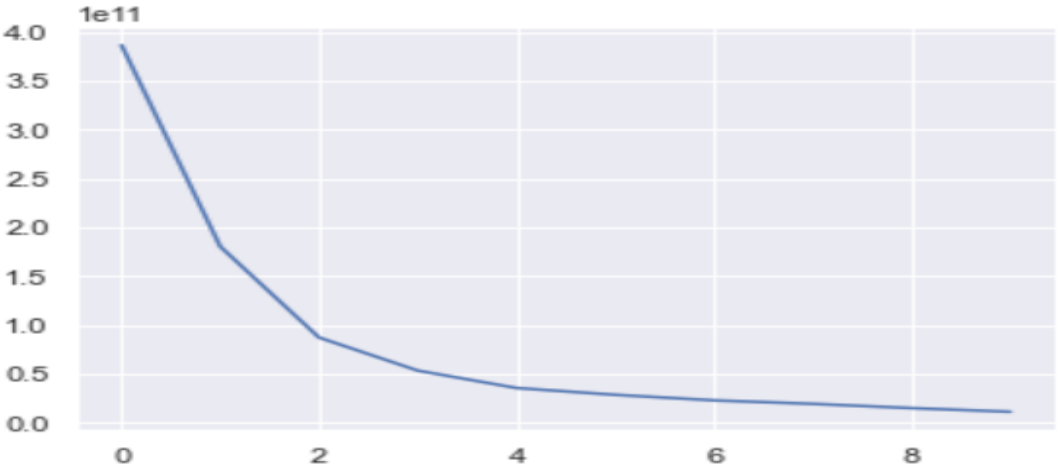


From the above scatter plot, we can inference that Top 3 states for EV Bus vehicles are UP, Maharashtra and Delhi.



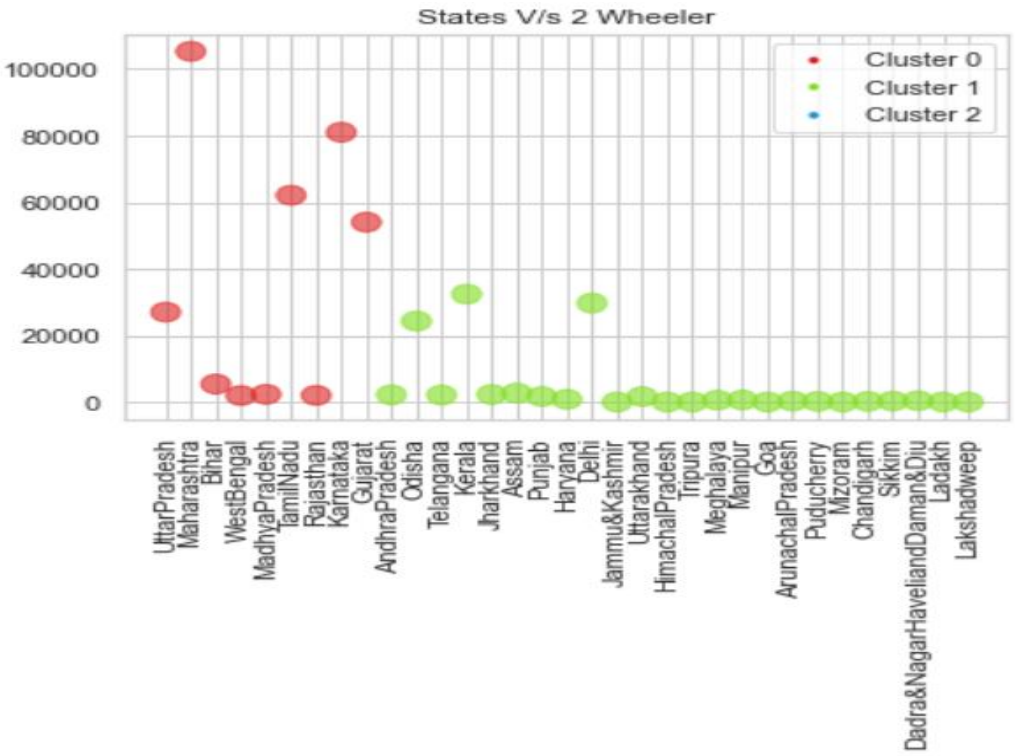
From the above scatter plot, we can inference that Top 3 states for EV Bus vehicles are Maharashtra, Tamil Nadu and Karnataka.

- Now we will again go with K-Means clustering but for 2-wheeler. After applying Elbow method, we found that 2 clusters will be formed.




```
kmeans = KMeans(n_clusters=2)
kmeans.fit(df4)
```

```
KMeans(n_clusters=2)
```



From above plot for 2-wheeler, we have found that top 3 states are Maharashtra, Karnataka and Tamil Nadu.

From the above plots we got top performer states according to the sale of EV vehicles but without considering the population of states we cannot conclude the top states for EV vehicle sales hence we will consider the population of states and do visualization according to it.

VISUALIZATION

In this part we try to analyse the population of two-wheeler, three wheeler, four wheeler, bus and total electric vehicles population percentage with respect to the actual vehicle population to the estimates of 2022 for each state in India.

In [93]:
```
df4['TwoWP'] = (df4['TwoW'] /
                df2['2022estimates'] * 100)
```

In [84]:
```
df2['P3'] = (df2['ThreeW'] /
                df2['2022estimates'] * 100)
```

In [86]:
```
df2['P4'] = (df2['FourW'] /
                df2['2022estimates'] * 100)
```

In [87]:
```
df2['BusP'] = (df2['Bus'] /
                df2['2022estimates'] * 100)
```

```
In [89]: df2['TotalP'] = (df2['Total'] /
                          df2['2022estimates'] * 100)
```

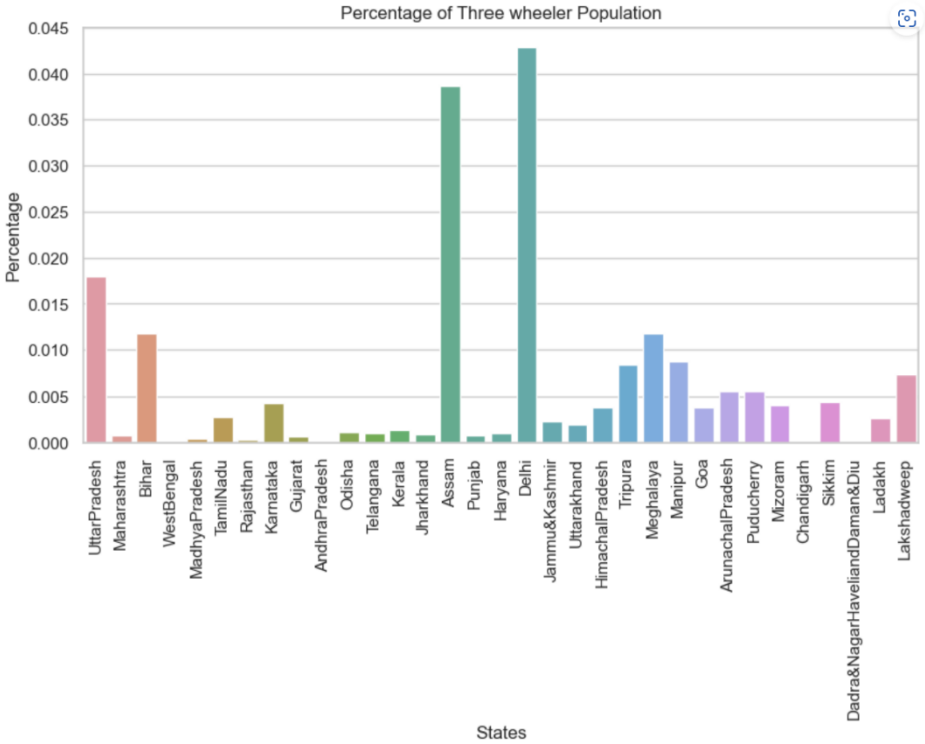
Here we are also finding the electric vehicle charging stations population percentage with respect to the total number of vehicles in that particular state in India.

```
In [91]: df2['EVSTATIONSP'] = (df2['EVSTATIONS'] /
                               df2['Total'] * 100)
```

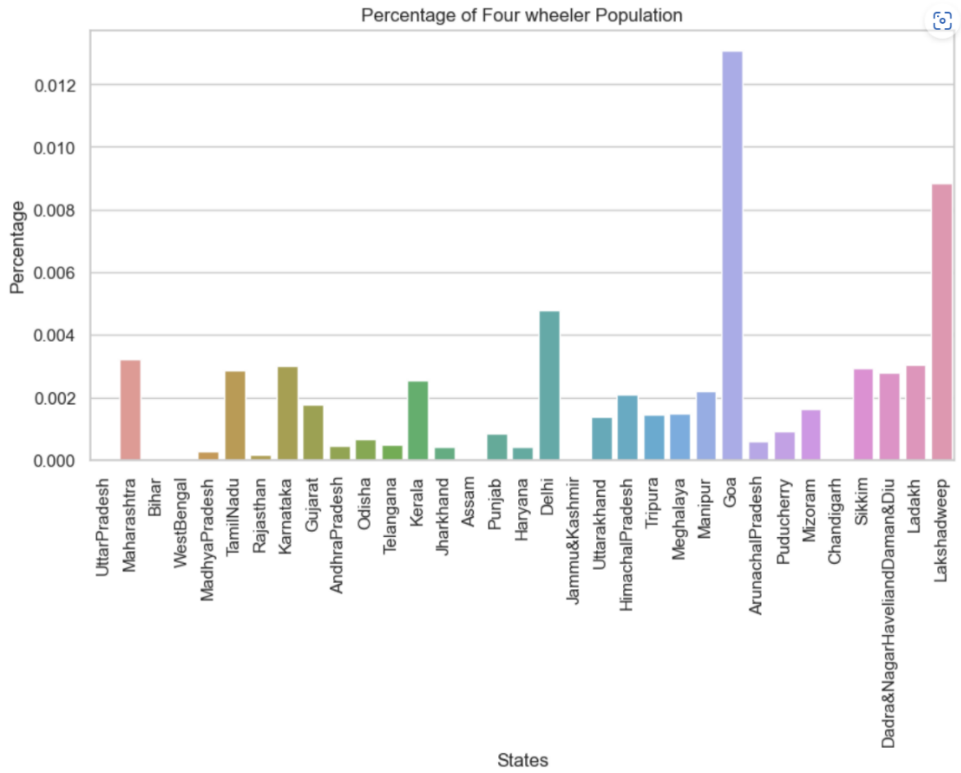
We stored the population percentage data of each vehicle type in a new separate column in the dataset to visualize them later.

BARPLOT:

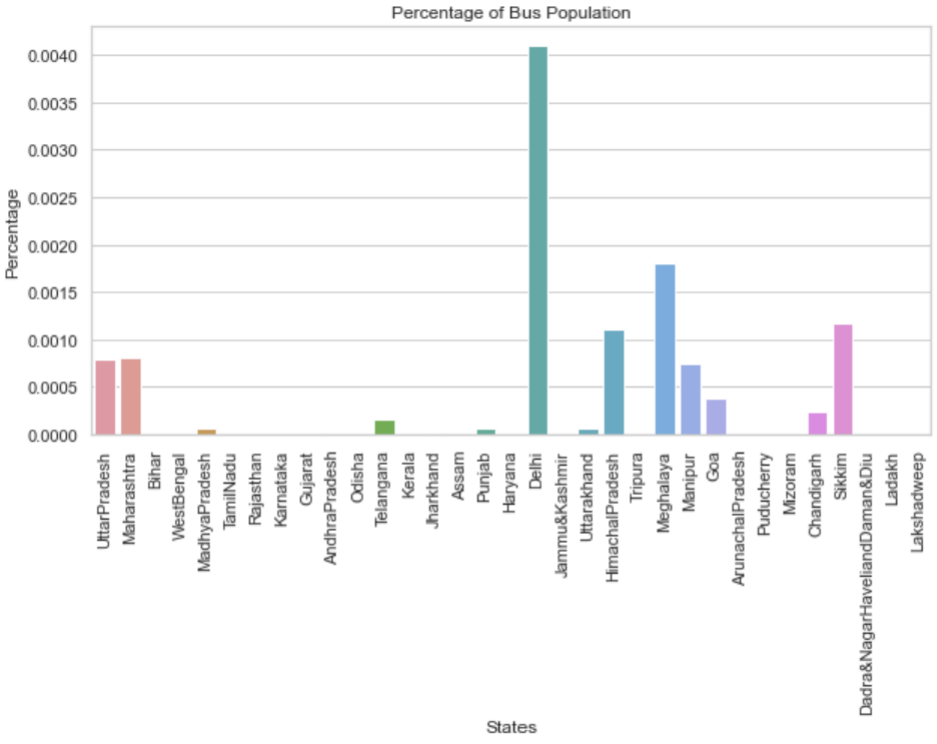
A bar plot or bar chart is a graph that represents the category of data with rectangular bars with lengths and heights that is proportional to the values which they represent. The bar plots can be plotted horizontally or vertically. A bar chart describes the comparisons between the discrete categories. One of the axes of the plot represents the specific categories being compared, while the other axis represents the measured values corresponding to those categories.



The above bar plot depicts the Three-wheeler population percentages with respect to each city. As we can see the percentage of usage of three-wheeler is high in cities like Delhi, Assam, and Uttar Pradesh. The percentage is medium in Bihar, Meghalaya, and Manipur and low in cities like West Bengal, Chandigarh, Andhra Pradesh etc.

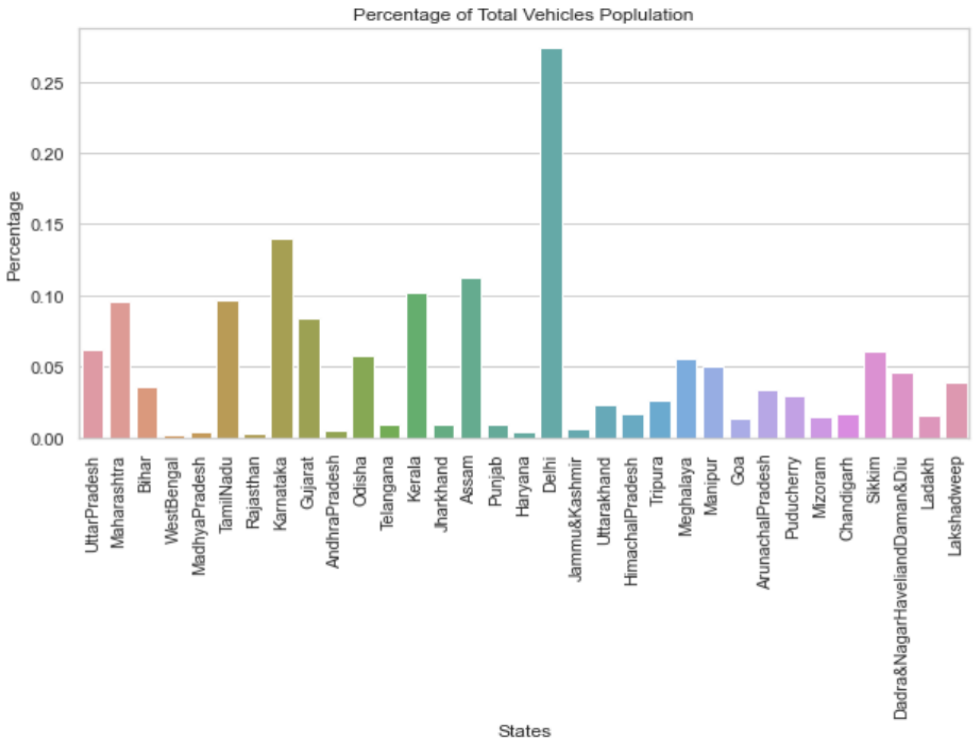


The above bar plot depicts the Four-wheeler population percentages with respect to each city. As we can see the percentage of usage of four-wheeler is high in cities like Delhi, Goa, and Lakshadweep. The percentage is medium in Maharashtra, Karnataka and low in cities like West Bengal, Chandigarh, Bihar etc.

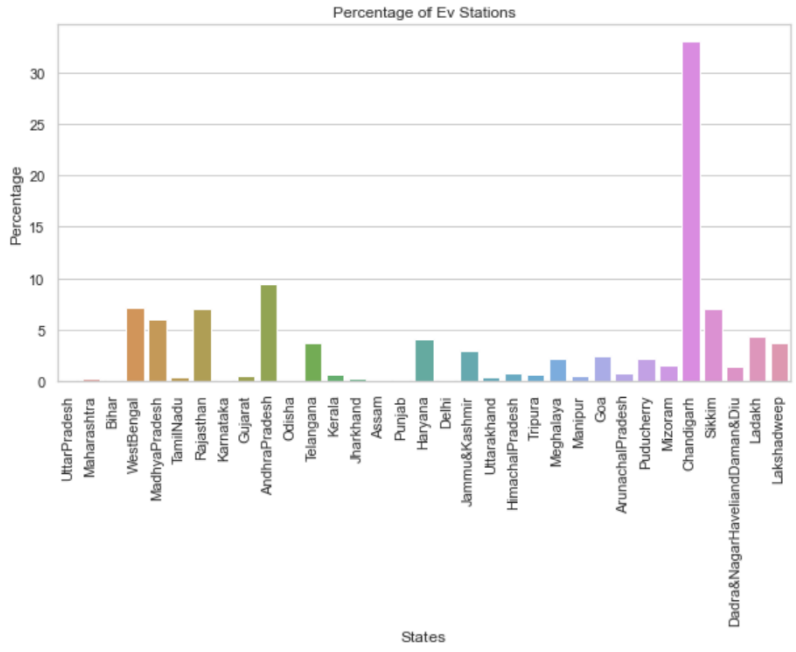


The above bar plot depicts the Bus population percentages with respect to each city. As we can see the percentage of usage of Bus is high in cities like Delhi, Meghalaya, and Sikkim. The

percentage is medium in Uttar Pradesh and Maharashtra and low in cities like West Bengal, Bihar, Tamil Nadu etc.

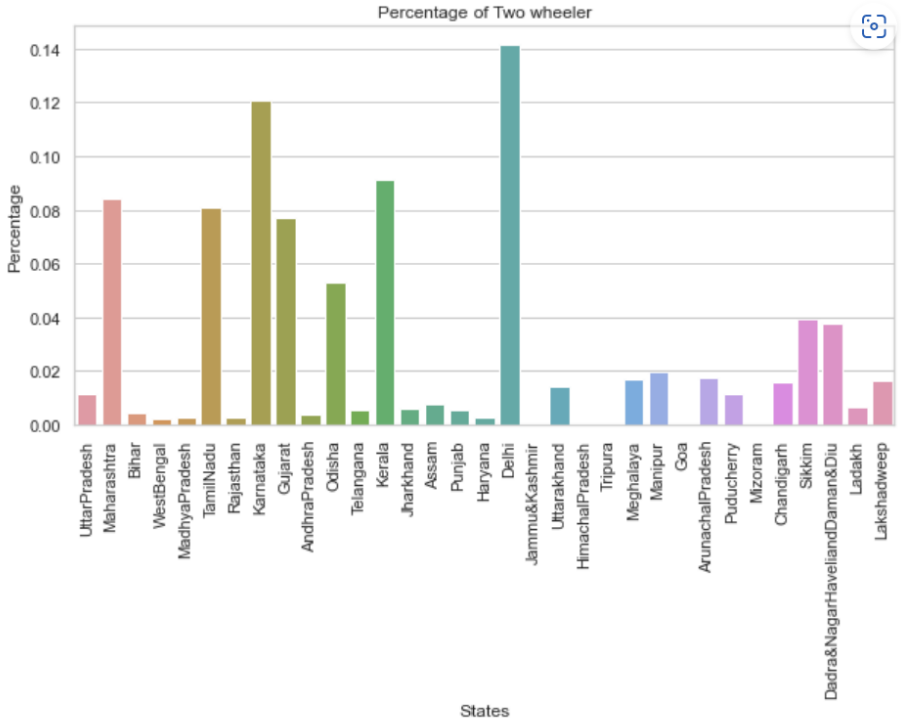


The above bar plot depicts the Total electric vehicle population percentages with respect to each city. As we can see the percentage of usage of electric vehicle is high in cities like Delhi, Assam, and Karnataka. The percentage is medium in Kerala and Maharashtra and low in cities like West Bengal, Rajasthan, and Haryana.

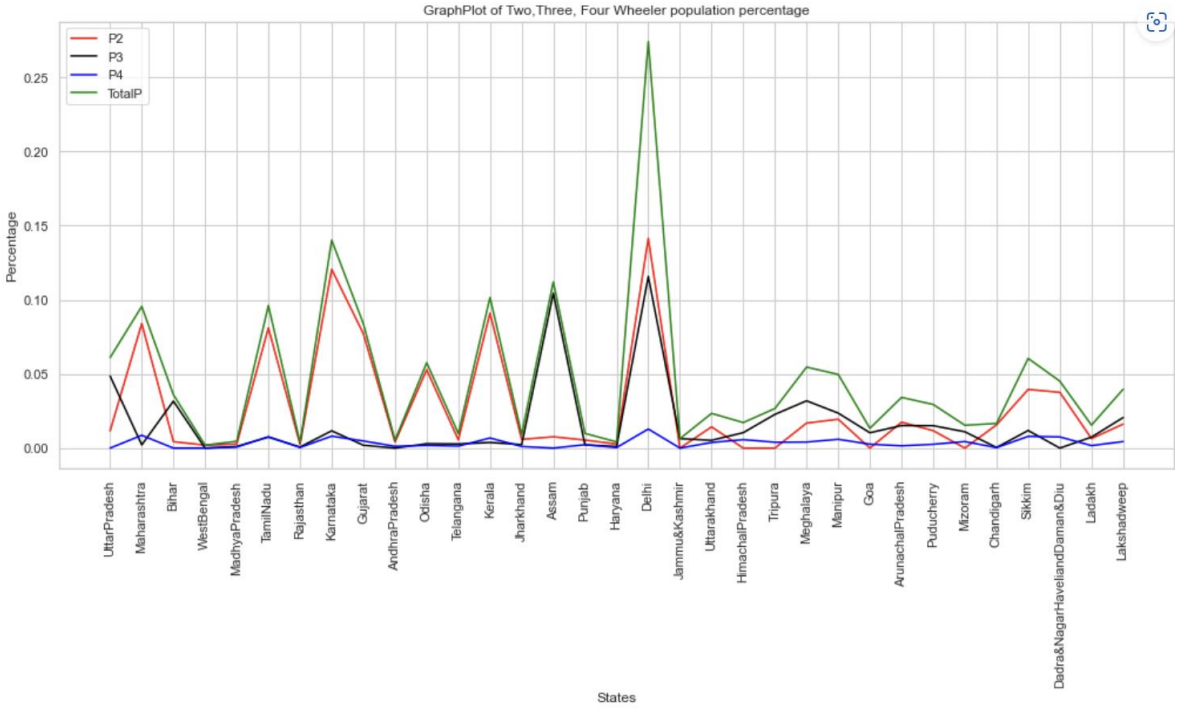


The above bar plot depicts the Ev stations population percentages with respect to each city. As we can see the percentage of usage of Ev stations is high in cities like Delhi, Assam, and Uttar

Pradesh. The percentage is medium in Bihar, Meghalaya, and Manipur and low in cities like West Bengal, Chandigarh, Andhra Pradesh etc.



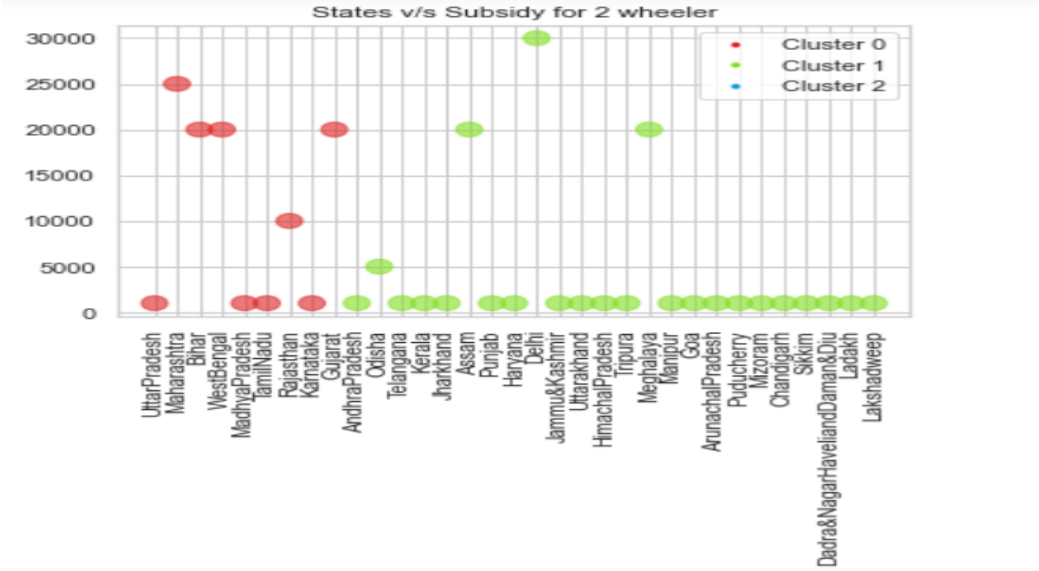
The above bar plot depicts the Two-wheeler population percentages with respect to each city. As we can see the percentage of usage of two-wheeler is high in cities like Delhi, Karnataka and Kerala. The percentage is medium in Gujarat, Tamil Nādu and Maharashtra and low in cities like West Bengal, Tripura etc.



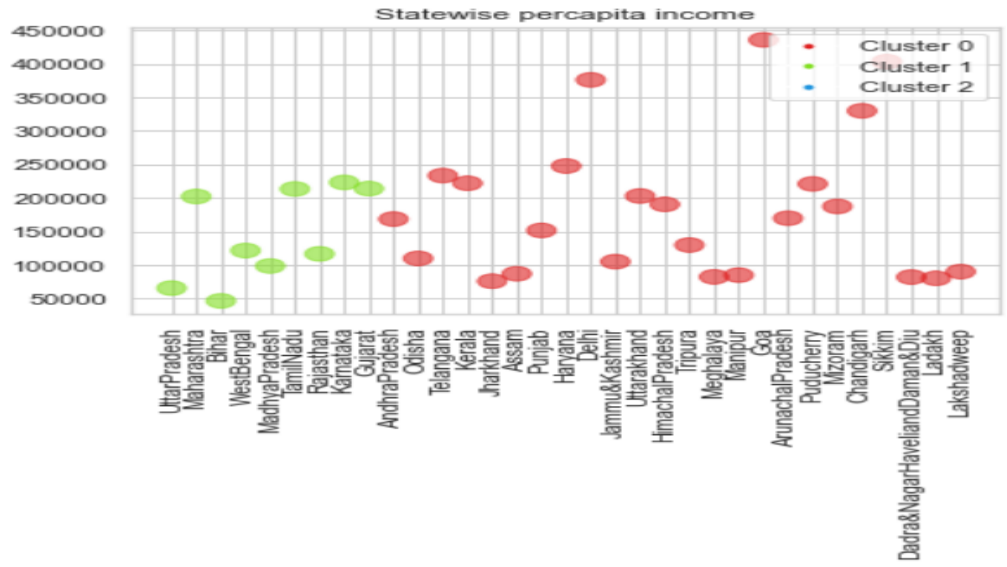
The above Multi line graph depicts the Two-wheeler(P2), Three-wheeler(P3), Four-wheeler(P4) population percentages with respect to state.

Profiling and describing the Segments: -

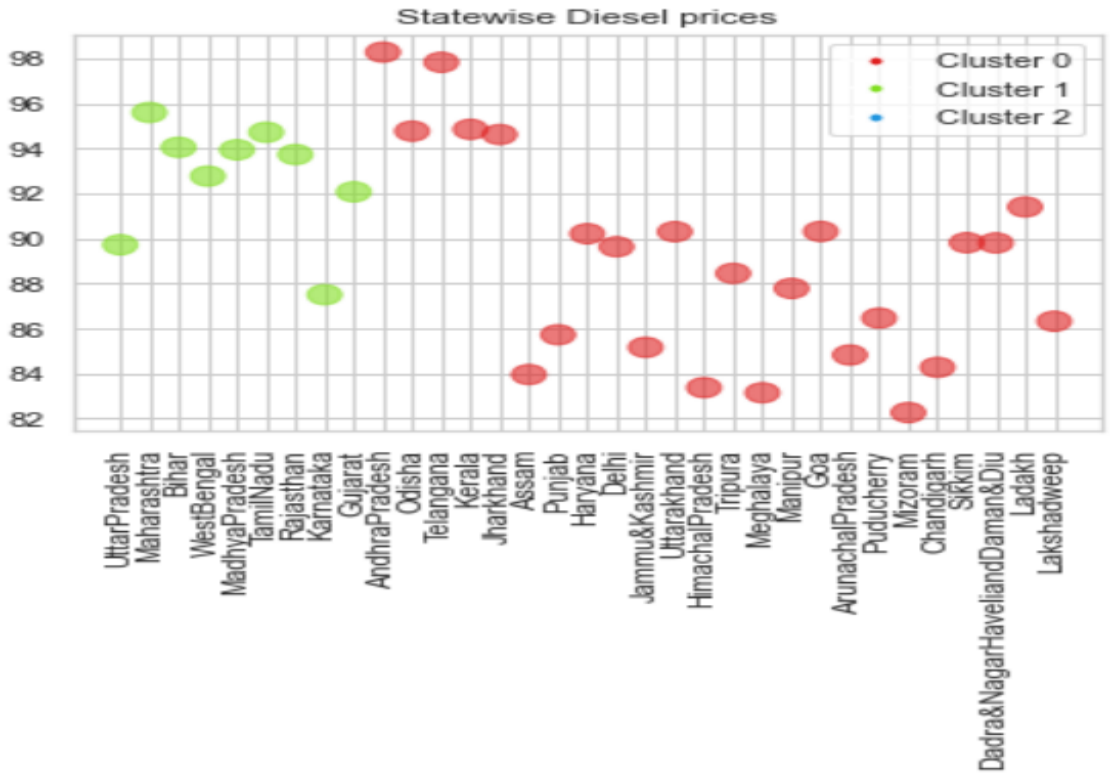
Sorting our model according to Maximum subsidy given by states for 2-wheeler, Air Quality Index, Per capita income state wise and Diesel prices state wise below are the scatter plots describing them.



From the above scatter plot we can inference that top 2 states for subsidy provider on 2 wheelers are Delhi and Maharashtra.



From above plot we can inference that top 3 per capita income states are Goa, Sikkim & Delhi.



From the above plot we can inference that top 2 states for high diesel prices are Andhra Pradesh and Telangana.

Target Segments:-

So from the analysis we can see that the optimum targeted segments should be belong to the following categories:

Demographic: Per capita income comes in Demographic segment as more per capita income of state more can be the sell of EV vehicle.

Psychographic: Diesel prices, EV stations,Subsidy for 2-wheeler comes in this segment.

- Diesel Prices: - More the diesel and petrol prices in the states more migration towards other alternatives.
- Subsidy: - More subsidy provided by the states on EV vehicle more will be the sell. We can choose the states where good subsidies are provided on EV vehicle.
- EV Stations: - Before buying anything buyer always looks for its service station or filling stations. Wherever EV stations are high in number can choose those states.

Conclusion: - It depends on a Startup in which segment it wants to operate whether its 2-wheeler or 4-wheeler or 3-wheeler or in big transportation (Trucks, Bus etc.) vehicle.

For 2-wheeler we can conclude from the EDA-2 that Delhi and Karnataka are the best performing states in terms of sell.

For 3-wheeler we can conclude from the EDA-2 that Delhi and Assam are the best-performing states in terms of sell.

For 4-wheeler we can conclude from the EDA-2 that Delhi and Maharashtra are the best performing states in terms of sell.

For Bigger transportation (Bus) we can conclude from the EDA-2 that Delhi and Meghalaya are the best performing states in terms of sell.

Target Price Range

About Data:

This dataset consists of five columns: Bikes, Bikes_price, Cars, Cars_model, Cars_price. It contains the data about bikes and their respective prices. Similarly, cars, their respective models, and prices. Particularly, the data is about 36 bikes and 24 cars.

EDA for Bikes:

Importing Libraries

```
1 import numpy as np
2 import pandas as pd
3 import matplotlib.pyplot as plt
4 import seaborn as sns
5 import warnings
6 warnings.filterwarnings("ignore")
```

Reading the data

```
1 df = pd.read_csv("vehicles.csv")
```

```
1 df.head()
```

	Bikes	Bikes_price	Cars	Cars_model	Cars_price
0	Okaya Faast	109000	Pravaig	DEFY	3950000.0
1	Hero Electric Atria	77767	Tata	Tigor EV	1375000.0
2	Okinawa Ridge Plus	66954	PMV	EaS E	479000.0
3	BGauss D15	99999	BYD	Atto 3	3399000.0
4	PURE EV ETrance Neo	84855	Mercedes-Benz	EQS	24500000.0

Splitting the data into two parts:

df1: Data about bikes and their respective prices.

df2: Data about cars and their respective models and prices.

```
df1=df[['Bikes','Bikes_price']]
df1.head()
```

	Bikes	Bikes_price
0	Okaya Faast	109000
1	Hero Electric Atria	77767
2	Okinawa Ridge Plus	66954
3	BGauss D15	99999
4	PURE EV ETrance Neo	84855

```
df1.isna().sum()
```

```
Bikes          0
Bikes_price    0
dtype: int64
```

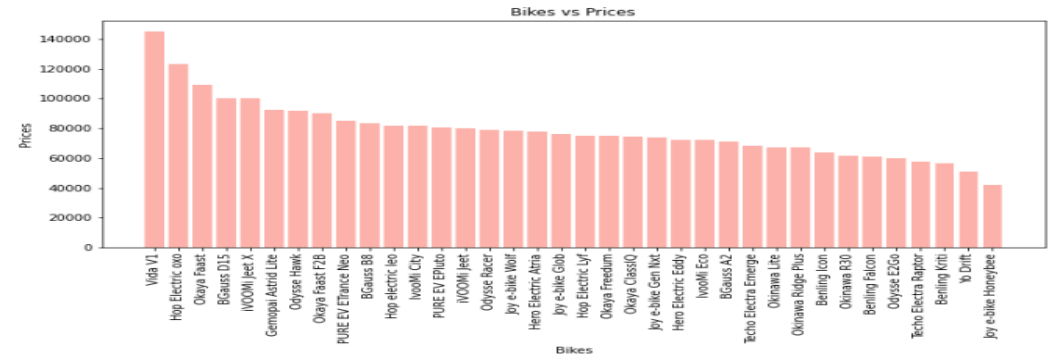
Here none of the column is null so we can move further.

```
df1.describe().T
```

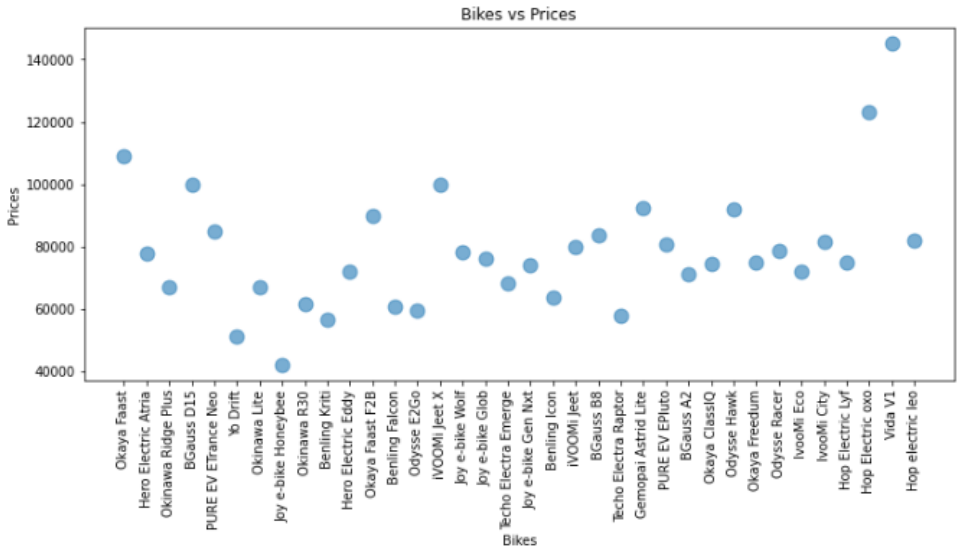
	count	mean	std	min	25%	50%	75%	max
Bikes_price	36.0	78454.5	19700.415261	42200.0	67011.75	75519.5	83886.0	145000.0

- The average price of the bikes is Rs. 78,454.5
- The minimum price of the bikes is Rs. 42,200
- The maximum price of the bikes is Rs. 1,45,000

```
plt_1 = plt.figure(figsize=(12,5))
plt.bar(df1_sorted_desc.Bikes, df1_sorted_desc.Bikes_price,alpha = 0.6,color='salmon')
plt.xticks(rotation = 90)
plt.xlabel('Bikes')
plt.ylabel('Prices')
plt.title('Bikes vs Prices')
plt.show()
```



```
plt_1 = plt.figure(figsize=(12,5))
plt.scatter(df1.Bikes, df1.Bikes_price,alpha = 0.6, s=120)
plt.xticks(rotation = 90)
plt.xlabel('Bikes')
plt.ylabel('Prices')
plt.title('Bikes vs Prices')
plt.show()
```



EDA for Cars:

```
df2=df[['Cars','Cars_model','Cars_price']]
```

	Cars	Cars_model	Cars_price
0	Pravaig	DEFY	3950000.0
1	Tata	Tigor EV	1375000.0
2	PMV	EaS E	479000.0
3	BYD	Atto 3	3399000.0
4	Mercedes-Benz	EQS	24500000.0

```
df2.isna().sum()
```

```
Cars          12
Cars_model    12
Cars_price    12
dtype: int64
```

Here we get 12 null values in each column, we have to remove or adjust them to move further

```
df2=df2.dropna()
df2.isna().sum()
```

```
Cars          0
Cars_model    0
Cars_price    0
dtype: int64
```

Now, none of the column is null so we can move further.

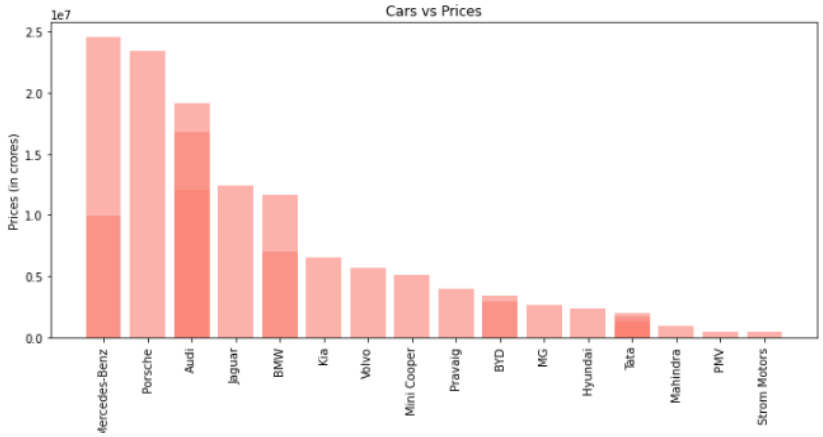
```
df2.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Cars_price	24.0	7.396458e+06	7.291047e+06	450000.0	1940500.0	4520000.0	11700000.0	24500000.0

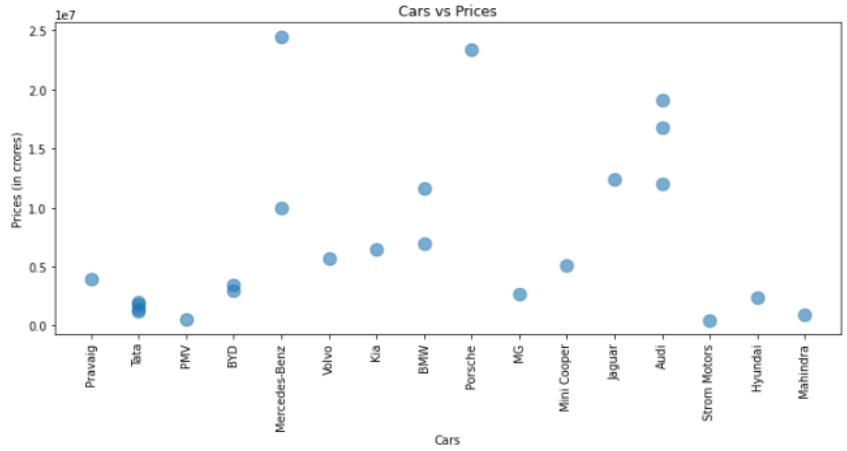
- The average price of the cars is Rs. 73,96,458.333
- The minimum price of the cars is Rs. 4,50,000
- The maximum price of the cars is Rs. 2,45,00,000

- Here, for premium customers we can set the price of 1 crore or above 1 crore.
- For other class of customers the price range can be in the range of 15 lakhs to 60 lakhs.

```
plt_2 = plt.figure(figsize=(12,5))
plt.bar(df2_sorted_desc.Cars, df2_sorted_desc.Cars_price,alpha = 0.6, color='salmon')
plt.xticks(rotation = 90)
plt.xlabel('Cars')
plt.ylabel('Prices (in crores)')
plt.title('Cars vs Prices')
plt.show()
```




```
plt_2 = plt.figure(figsize=(12,5))
plt.scatter(df2.Cars, df2.Cars_price,alpha = 0.6, s=120)
plt.xticks(rotation = 90)
plt.xlabel('Cars')
plt.ylabel('Prices (in crores)')
plt.title('Cars vs Prices')
plt.show()
```



Target Segments:

So, from the analysis we can see that the optimum targeted segment should be belonging to the following categories:

Psychographic:

• **Price:** From the above analysis, the price range of cars is between ₹16,00,000 to ₹1,80,00,000.

The price range of bikes is between ₹40,000 to ₹1,40,000.

In India, electric 3 wheelers are available between the price range of ₹1.5 Lakh and ₹3 Lakh depending on the brand and their features.

Customizing the Marketing 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. 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 segment targeted, ability of the companies to pay, ability of customers to pay supply – demand and a host of other direct and indirect factors.

• **Product:** refers to the product actually being sold – In this case, the service. 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 manufacturing and several others.