

# Market Segment Analysis of EV Market in India



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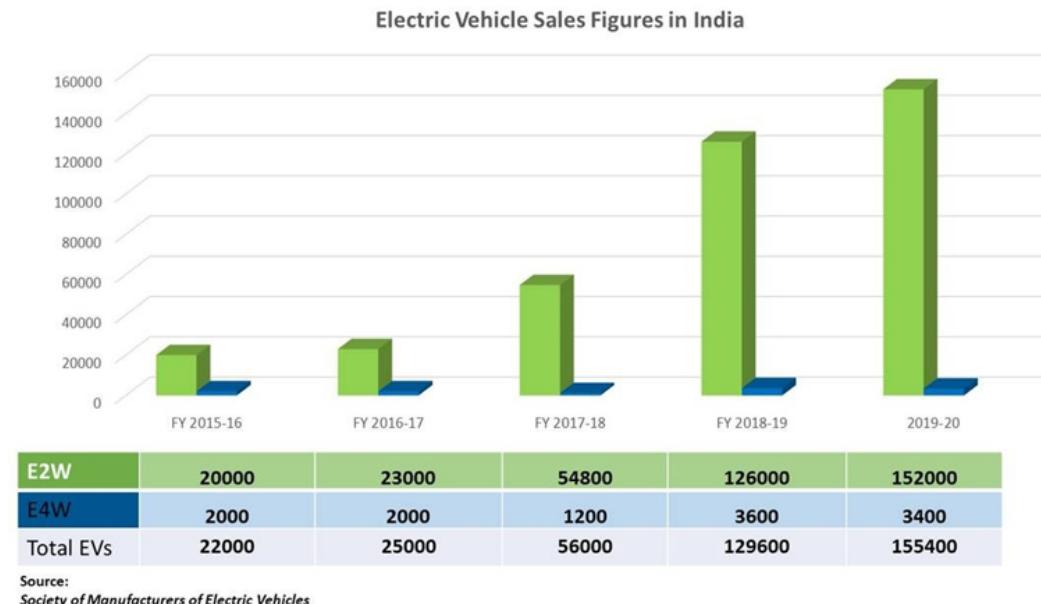
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## Market Overview

The global electric vehicle (EV) market is developing at a rapid pace. According to EV volumes, the overall electric vehicles reached a global share of 8.3% (including battery electric vehicles [BEVs] and Plug-in hybrid electric vehicles [PHEVs]) in 2021 from 4.2% in 2020 with 6.75 million vehicles on the road. This is an increase of 108% as of 2020. EVs are gaining attention across the globe as they help reduce emissions and depletion of natural resources. The Indian EV market is also evolving fast as close to 0.32 million vehicles were sold in 2021, up 168% YoY. Ongoing electric vehicle adoption in India is based on the Paris agreement to reduce carbon emissions, improve the air quality in urban areas, and reduce oil imports.

The global automotive industry is undergoing a paradigm shift in trying to switch to alternative/less energy-intensive options. India, too, is investing in this electric mobility shift.

The burden of oil imports, rising pollution, and as well as international commitments to combat global climate change are among the key factors motivating India's current policies to speed up the transition to e-mobility.



From the above graph, we can observe there is an average increase of 72% increase in sales of EVs in India.

## Assumptions

- In India, there are 30 crore registered vehicles.
- There are approximately 22 crore registered two-wheelers in India, with the remaining 8 crores being four-wheelers; trucks and other types of transport/construction vehicles are not included.
- The average increase for two-wheelers is 75% year on year, while the average increase for four-wheelers is 25% year on year.
- As of 2020, there are approximately 6 lakh electric vehicles in the country, with approximately 5.4 lakh being two-wheelers and 0.6 lakh being four-wheelers.
- The total number of vehicles remains constant.
- EVs are the only green substitute technology for gasoline/diesel vehicles.

## Calculations:

Let's see how long it will take for EVs to produce 80% of vehicles in each category.

- For two-wheelers,  

$$18 = 0.054 \times (1 + 0.75)^t$$

$$t = 10.38 \text{ years.}$$
- For four-wheelers  

$$8 = 0.006 \times (1 + 0.25)^t$$

$$t = 32 \text{ years}$$

## Conclusion:

So, by 2030 for two-wheelers and 2050 for four-wheelers, 80% of India's total vehicles will be electric.

From the above analysis of the Indian automobile industry, we can see that there is a lot of potential to grow, as the market has just started picking up the pace.

# Situational Analysis

Before developing a marketing strategic plan, a situation analysis must be completed. EV adoption is rapidly increasing across all market segments. With the government's encouragement and benefits such as subsidies and low fuel costs, customers across all demographics are eager to adopt EVs as their primary mode of transportation.

**1. Customer Usage:**

Whether a customer will adopt EV or not will depend on their daily routines, i.e., the average distance they travel each day, the higher their average daily run, the higher will be the savings in the long run.

**2. Mileage:**

Mileage will also play a key role especially in the Indian market as most customers look for higher range in less charge, compromising in speed.

**3. Safety:**

EVs built quality has to be at par with their gasoline counterparts as there have been numerous reported incidents of batteries catching fire. Dealing with this issue will be critical especially for the hot climate in many parts of India for most of the duration in a year.

**4. Quality:**

Comfort, build quality of the materials used, additional features will help in attracting new customers.

# Data Sources

Data was scraped from multiple websites using Selenium, such as bikewale and carwale, and user reviews were collected in which they shared their experiences with the available EV products on the market.

I have considered two datasets for the analysis.

## 1. The first dataset consists of user reviews for E4W.

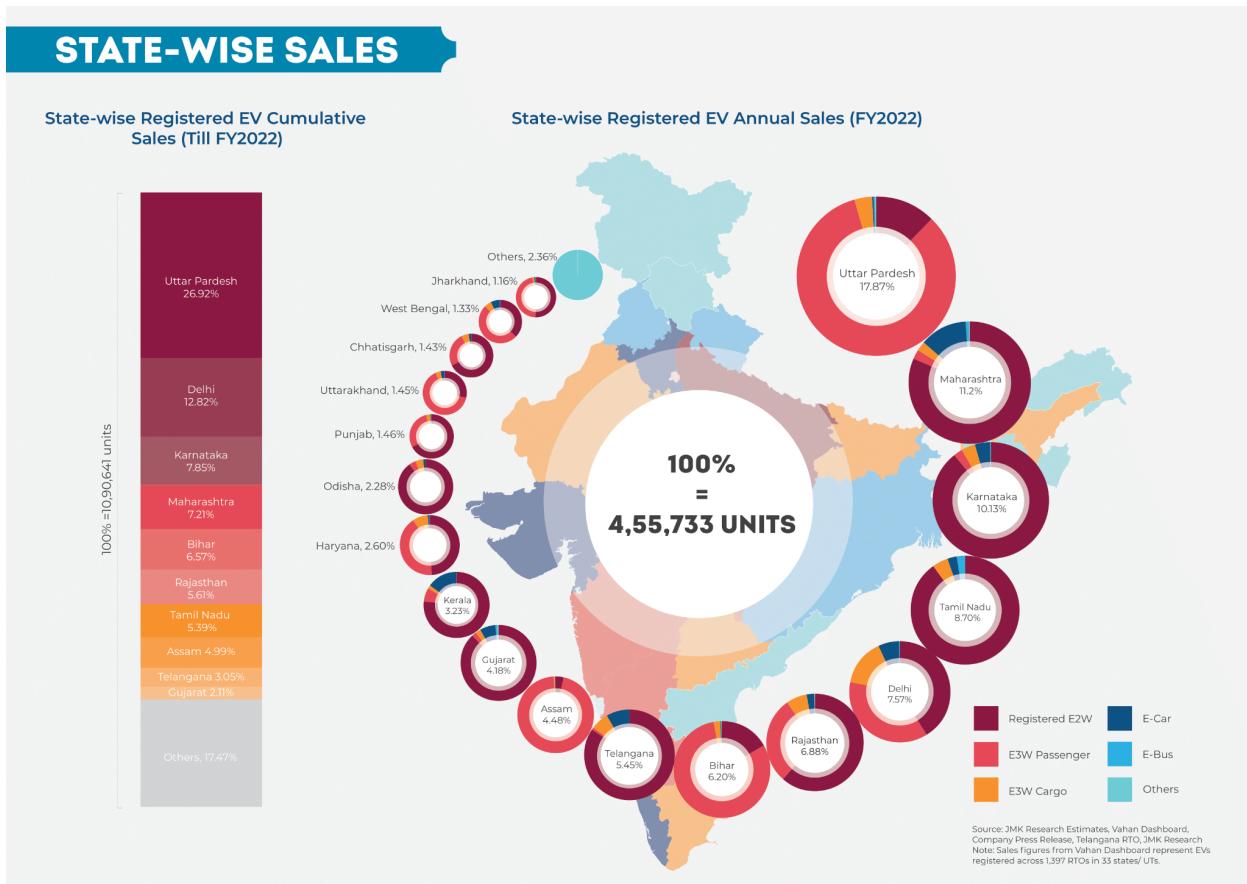
	review	Exterior	Comfort	Performance	Fuel Economy	Value for Money	Condition	driven
0	I chose the base model, i.e., the XM variant. ...	4.0	5.0	5.0	5.0	4.0	New	Few thousand kilometers
1	Very fine experience.While driving Tata Nexon ...	5.0	4.0	3.0	4.0	4.0	New	Few thousand kilometers
2	Amazing car for daily usage please plan the ch...	5.0	5.0	5.0	5.0	5.0	New	Few hundred kilometers
3	After driving Nexon EV for a few times, i feel...	4.0	4.0	3.0	4.0	4.0	Not Purchased	Did a short drive once
4	Really very Amazing experience.Just loved that...	5.0	5.0	5.0	5.0	5.0	Used	Few hundred kilometers
5	Yes you can go for electric vehicle because it...	4.0	4.0	4.0	5.0	4.0	Used	Did a short drive once
6	Good car with good safety and comfort with all...	5.0	5.0	5.0	5.0	5.0	New	Did a short drive once
7	India's first safest and nature saver car. Ama...	5.0	4.0	4.0	5.0	5.0	Not Purchased	Few hundred kilometers
8	This nice car this future ka electric best in ...	5.0	5.0	5.0	5.0	5.0	Used	Did a short drive once
9	Need to increase mileage, battery capacity so ...	4.0	4.0	4.0	3.0	4.0	Not Purchased	Haven't driven it

## 2. The second dataset consists of user reviews for E2W.

	review	Used it for	Owned for	Ridden for	Visual Appeal	Reliability	Performance	Comfort	Service Experience	Extra Features	Maintenance cost	Value for Money
0	Let's start it from its exterior. The ola s1 p...	Daily Commute	Never owned	NaN	4.0	5.0	5.0	4.0	4.0	NaN	NaN	NaN
1	Took six months more than the promised deliver...	Daily Commute	< 3 months	< 5000 kms	2.0	1.0	2.0	3.0	1.0	NaN	NaN	NaN
2	1. Buying experience: they really made us wait...	Daily Commute	< 3 months	< 5000 kms	5.0	4.0	5.0	4.0	NaN	NaN	NaN	NaN
3	Everything is fantastic. You must try the crui...	Everything	< 3 months	< 5000 kms	5.0	4.0	4.0	4.0	5.0	NaN	NaN	NaN
4	It is just amazing and the top speed on paper ...	Daily Commute	6 months-1 yr	5000-10000 kms	5.0	5.0	5.0	5.0	3.0	NaN	NaN	NaN
5	Bought online, door delivery service.\nSmooth ...	Daily Commute	< 3 months	< 5000 kms	5.0	5.0	5.0	5.0	3.0	NaN	NaN	NaN
6	I riding ola s1 pro its amazing i want to purc...	Daily Commute	Never owned	NaN	4.0	5.0	5.0	5.0	5.0	NaN	NaN	NaN
7	Please don't buy ola. They have the most worst...	Daily Commute	3-6 months	< 5000 kms	1.0	1.0	1.0	1.0	1.0	NaN	NaN	NaN
8	Buying experience was very good. Scooter was d...	Daily Commute	6 months-1 yr	< 5000 kms	5.0	5.0	5.0	4.0	4.0	NaN	NaN	NaN
9	Buying experience was little complicated but r...	Daily Commute	< 3 months	< 5000 kms	5.0	4.0	5.0	4.0	4.0	NaN	NaN	NaN

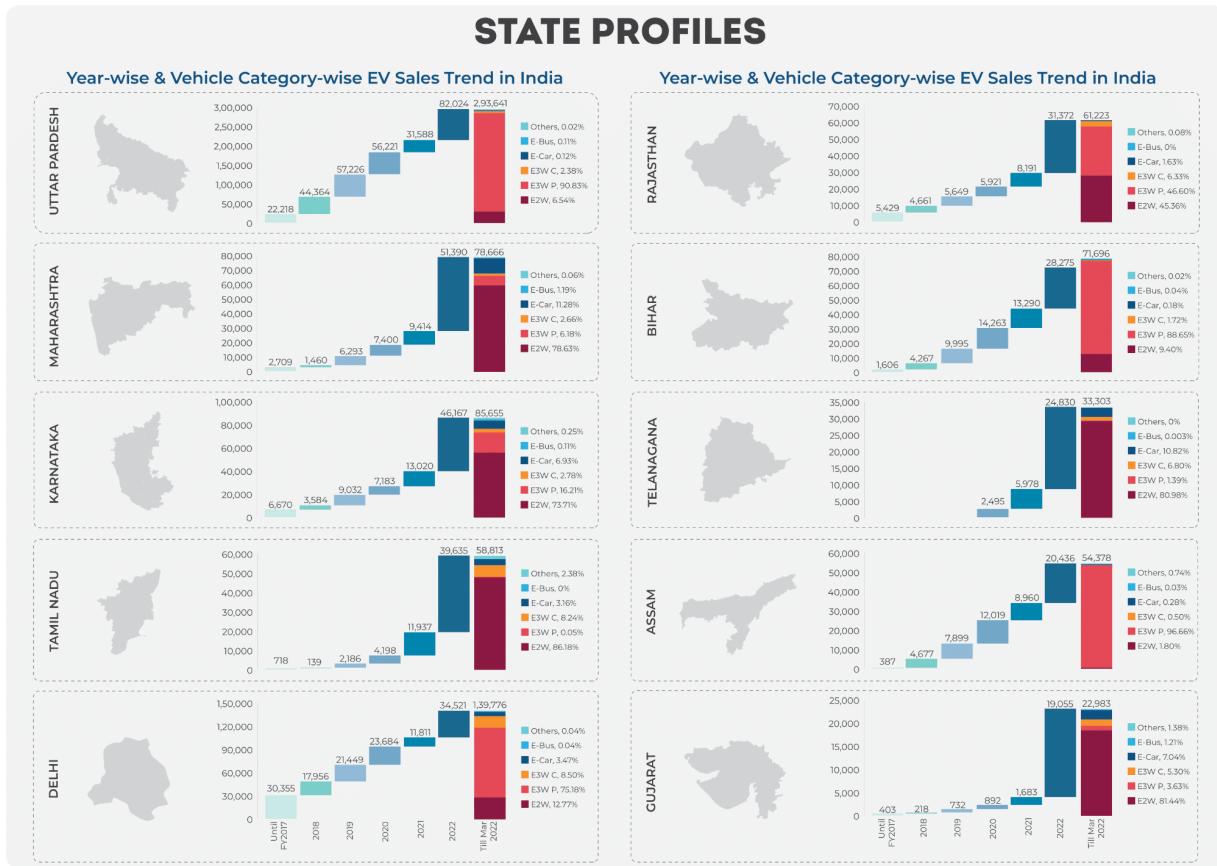
# Analysis

## Geography Analysis



From the above data we can see that UP leads the way in the total number of EV sales.

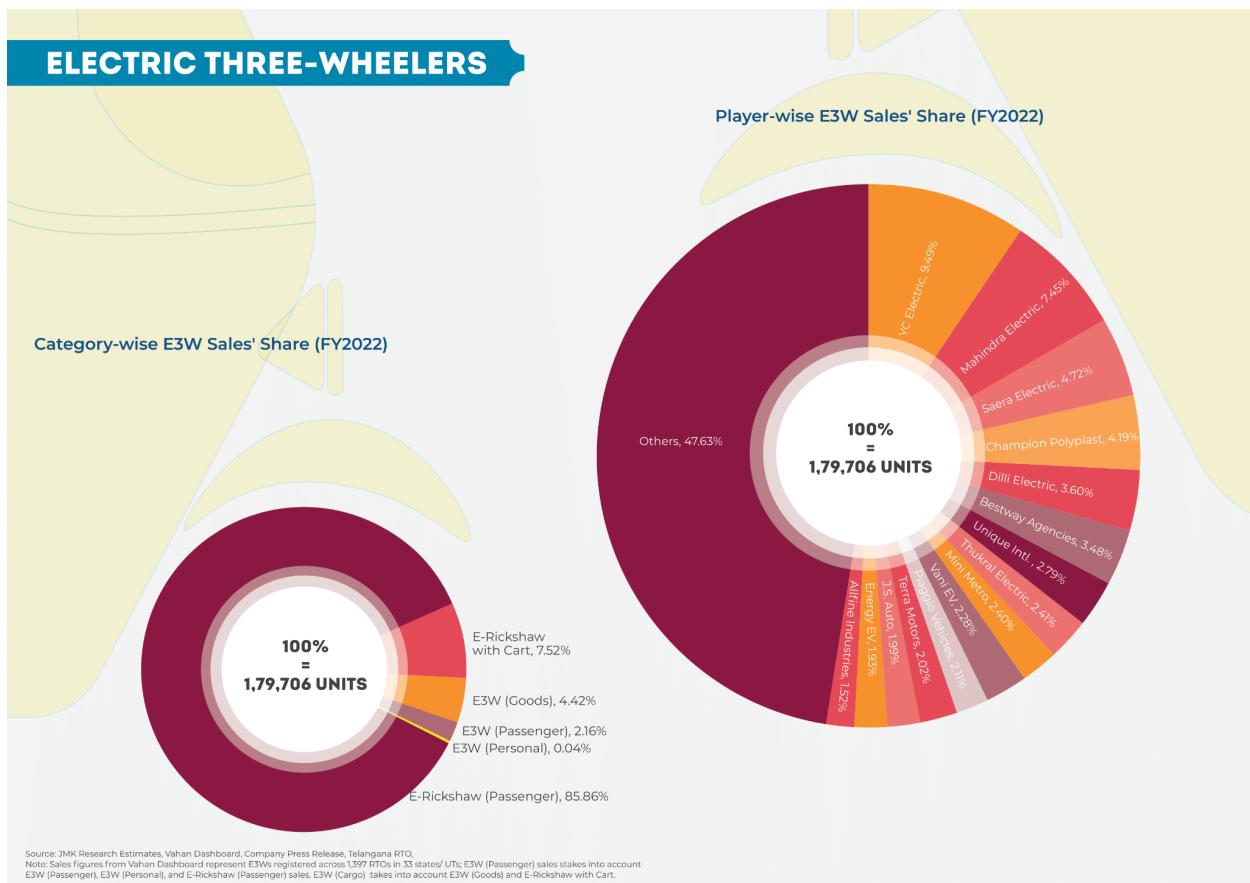
But if we look at the top states in EV sales closely,



Some important insights we can make from the available data:

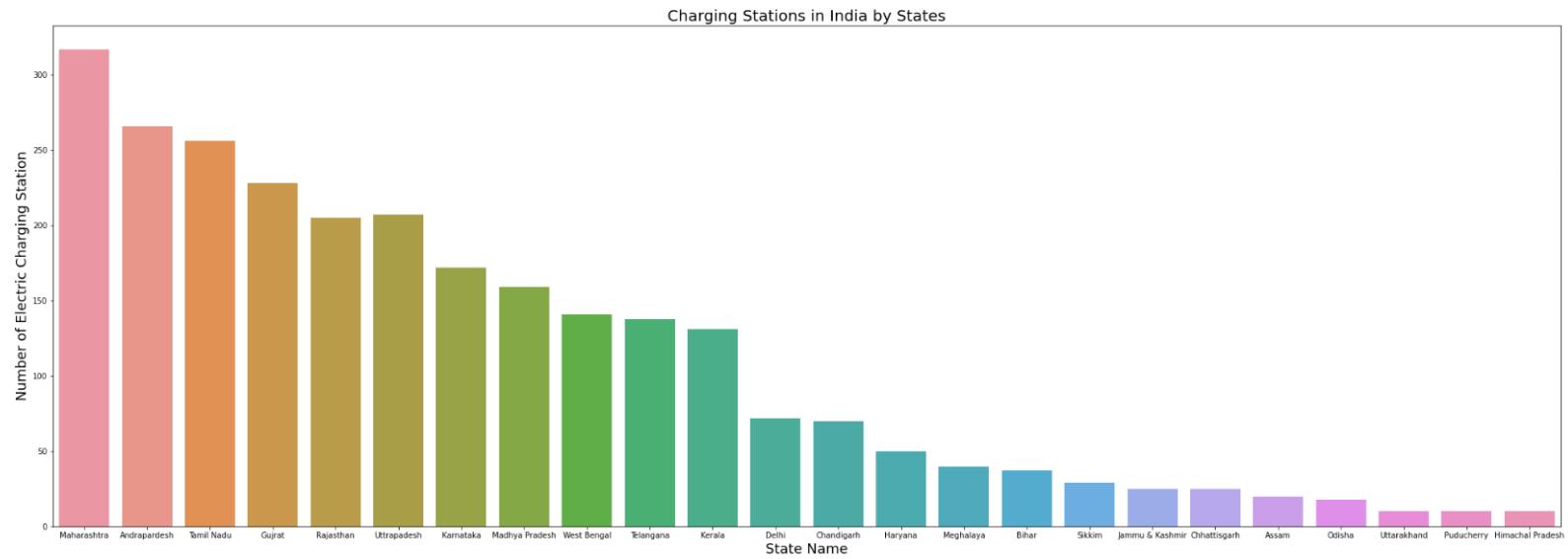
- UP leads the number in total EV sales but most sales are in the 3-wheeler segment i.e, for transport.
- Tamil Nadu has the highest percentage of two-wheeler EV sales of the total sales in that state i.e 86%.
- Maharashtra has the highest percentage of four-wheeler EV sales of the total sales in that state i.e 11%.
- Likewise we can observe percentage sales in other segments.

Total EV sales are dominated by E3W and E2W (i.e three-wheelers and two-wheelers). So when starting an EV business, one can also decide in which segment they want to provide EV's for maximum initial sales and fast growth.



**Above graph shows the breakdown of sales for E2Ws and E3Ws for FY-2022**

EV charging stations also play a key role in Geographical analysis as range anxiety is one of the major concerns for EV users.

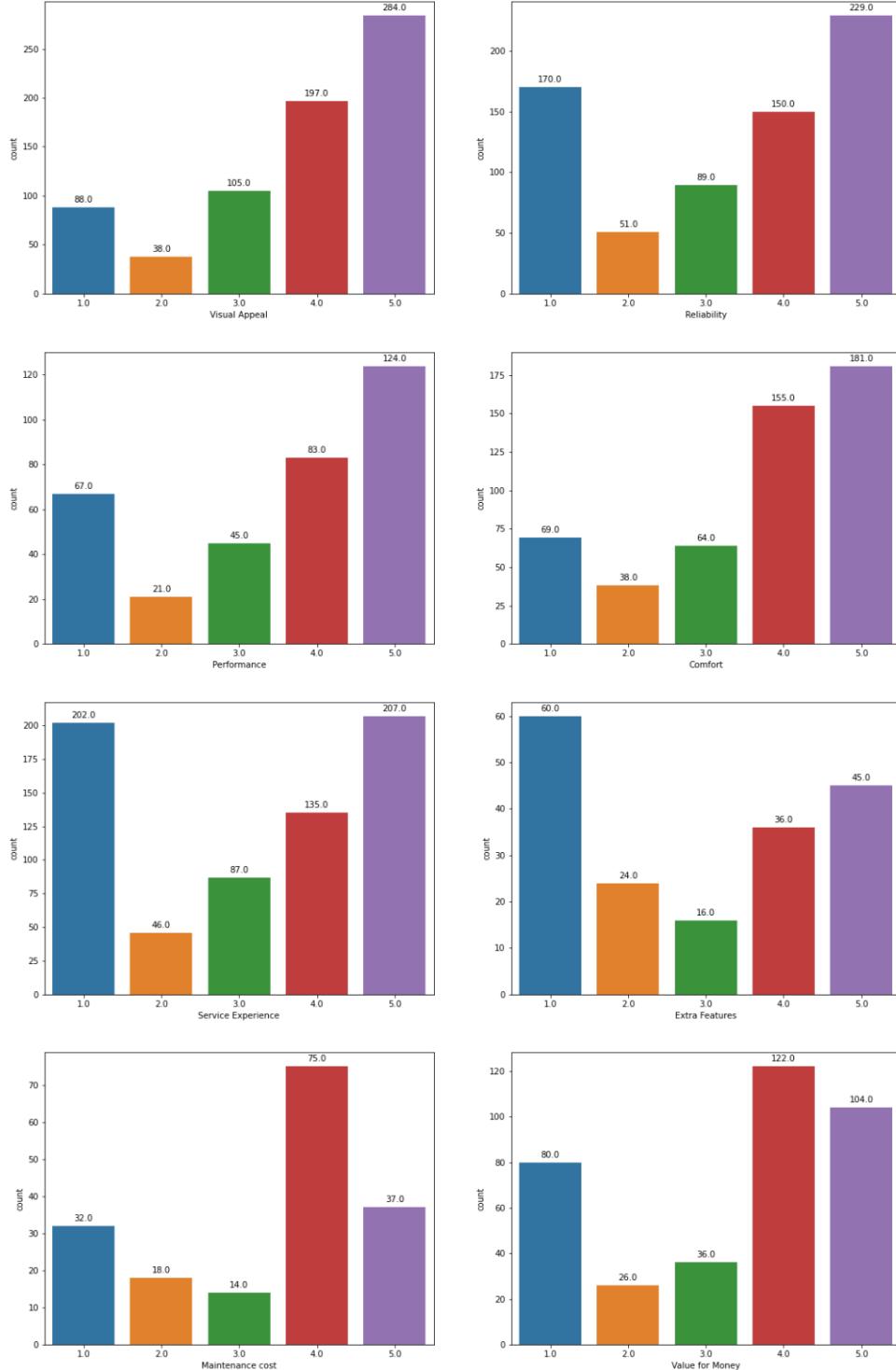


Top 5 States with most charging stations include : Maharashtra, Andhra Pradesh, Tamil Nadu, Gujarat, Rajasthan

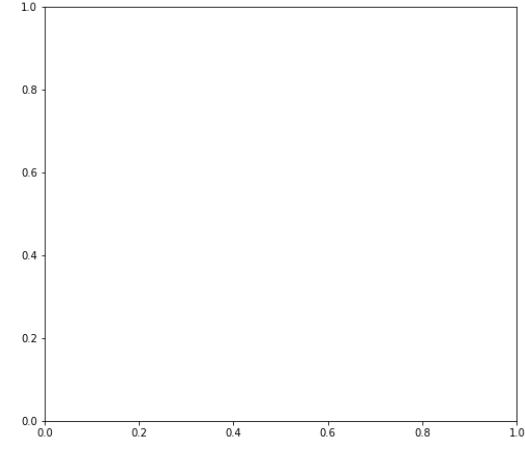
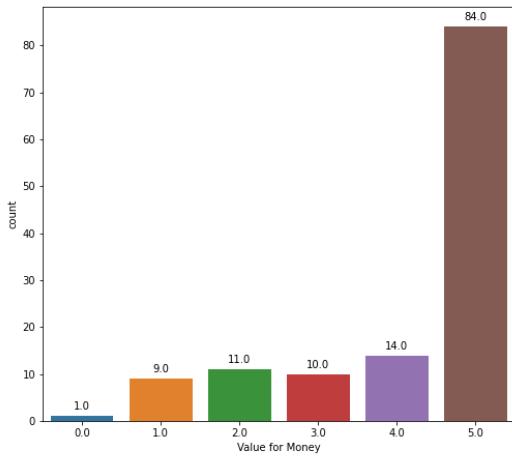
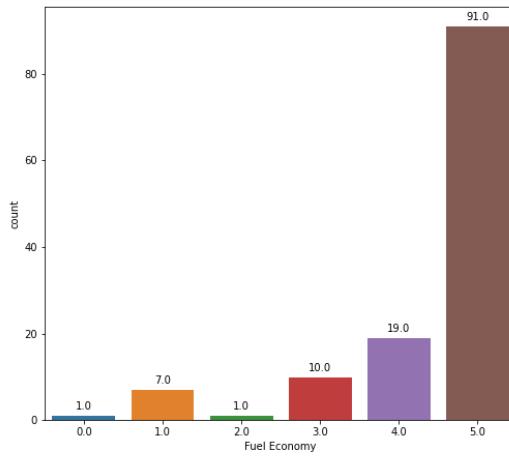
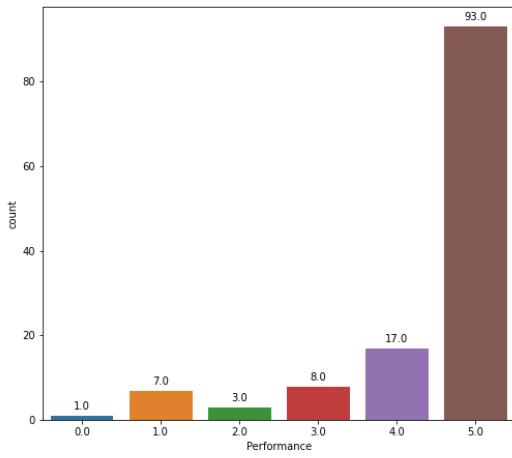
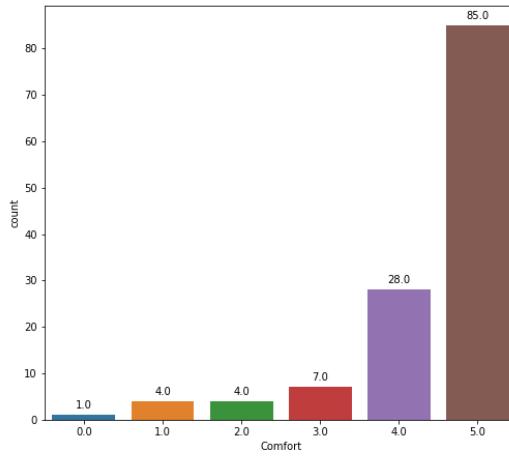
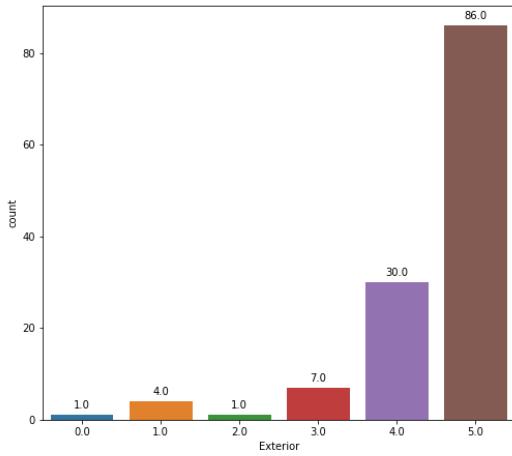
## Psychographic Analysis

Here we can analyse all the preferences and reviews of the customers on various aspects.

For E2Ws:



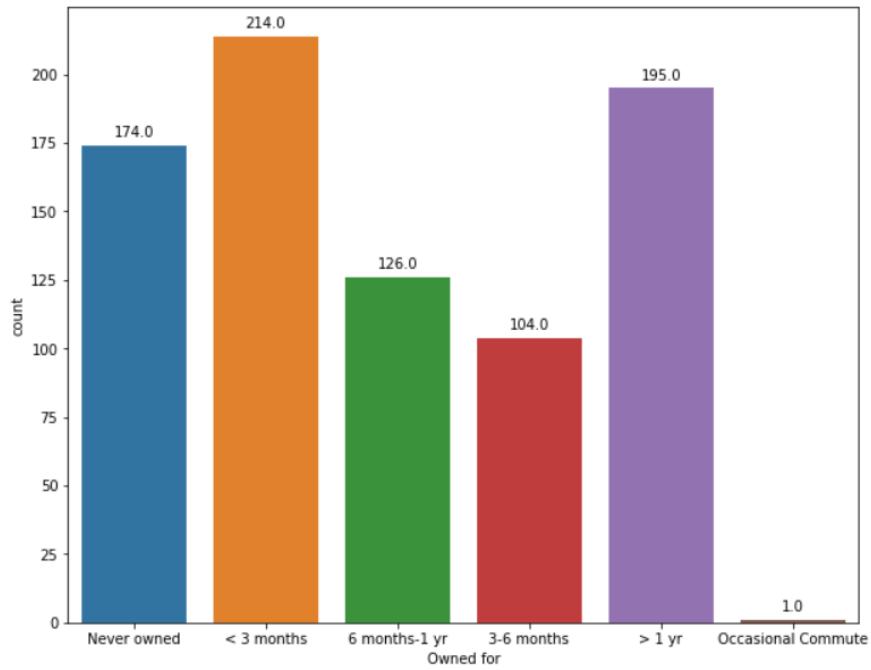
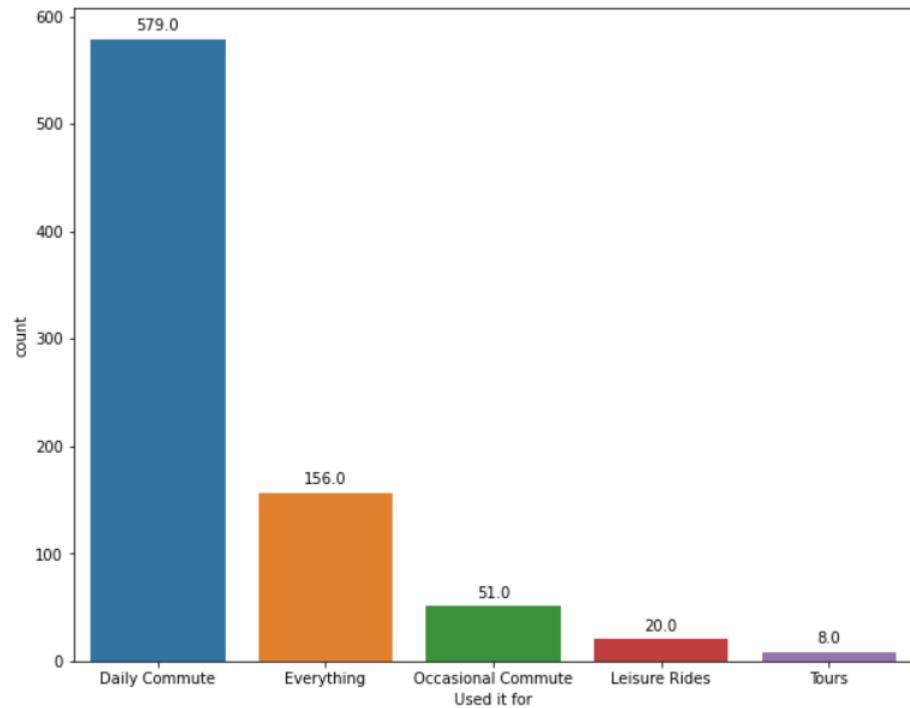
For E4Ws:

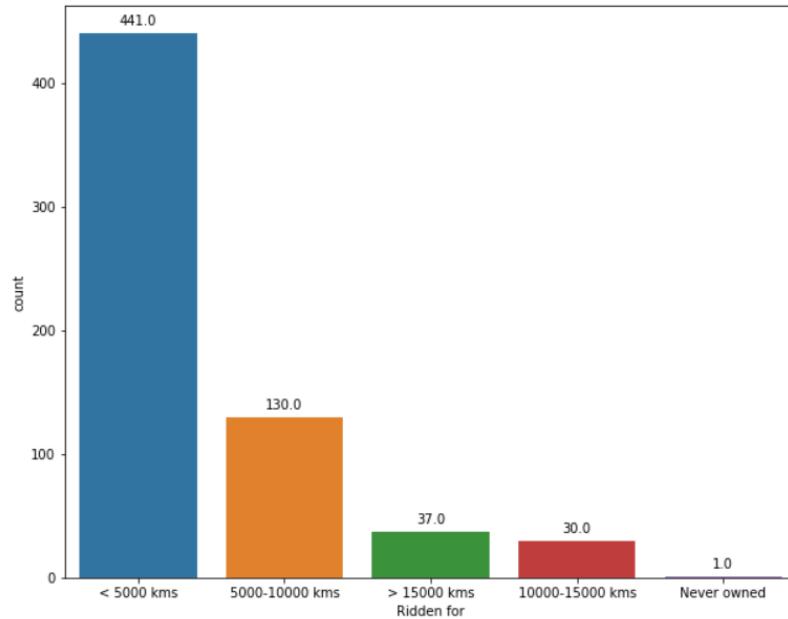


## Behavioral Analysis

We can look into the behavioral aspect of users,

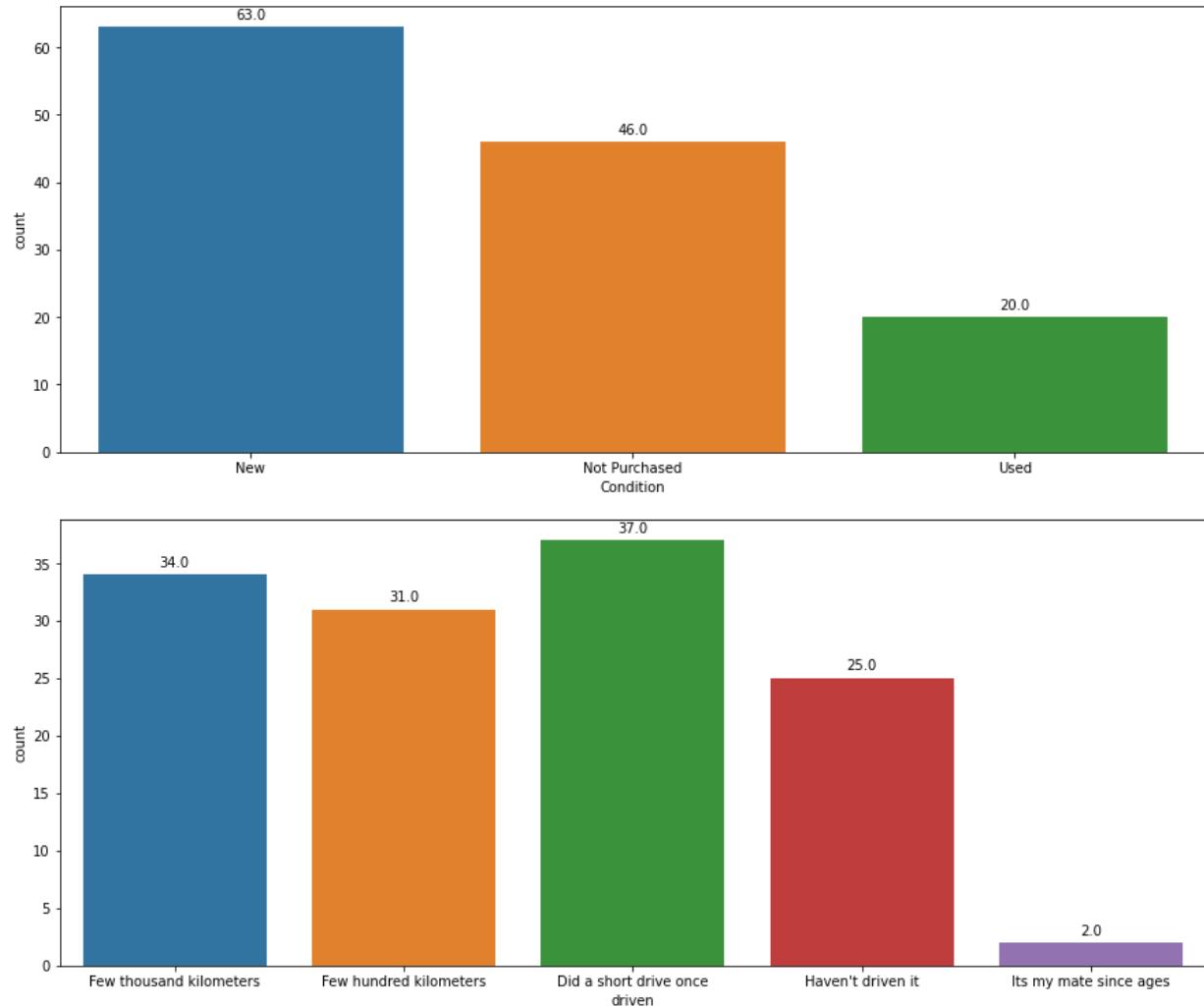
For E2Ws:





We can see that most users use E2Ws for daily commute only and many people who haven't owned an E2W also posted reviews, shows the interest of people towards EVs

For E4Ws:

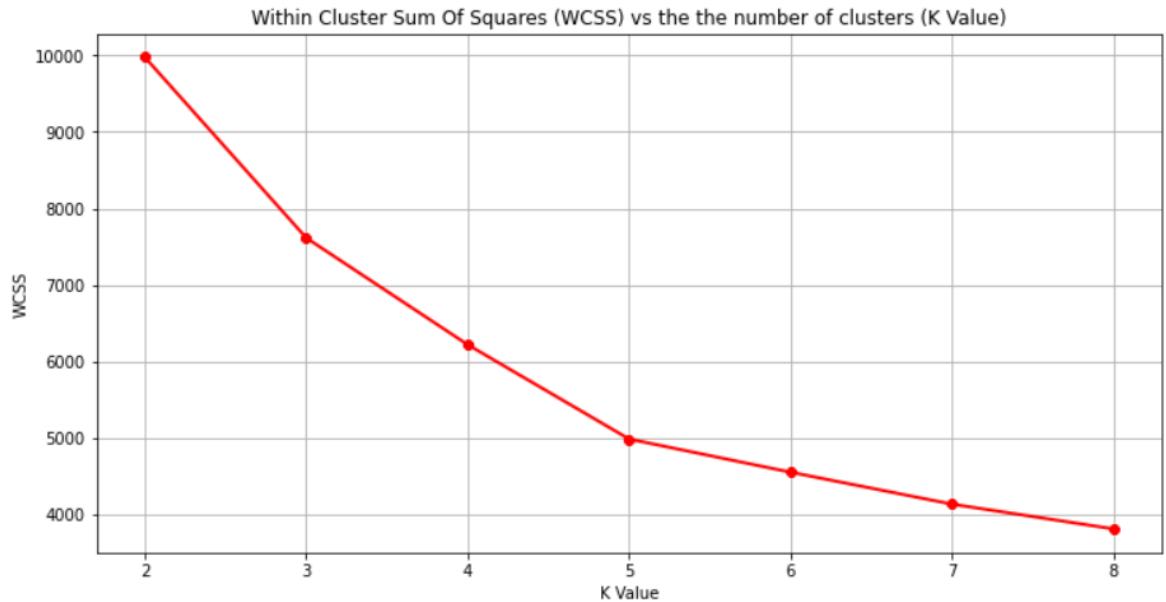


For E4W's, most people own a new EV and most of them have driven for short distances only, so no long term review is available.

# Segmentation

## Using K-Means

- For E2Ws:
  - Using Elbow method to find the optimum K value.



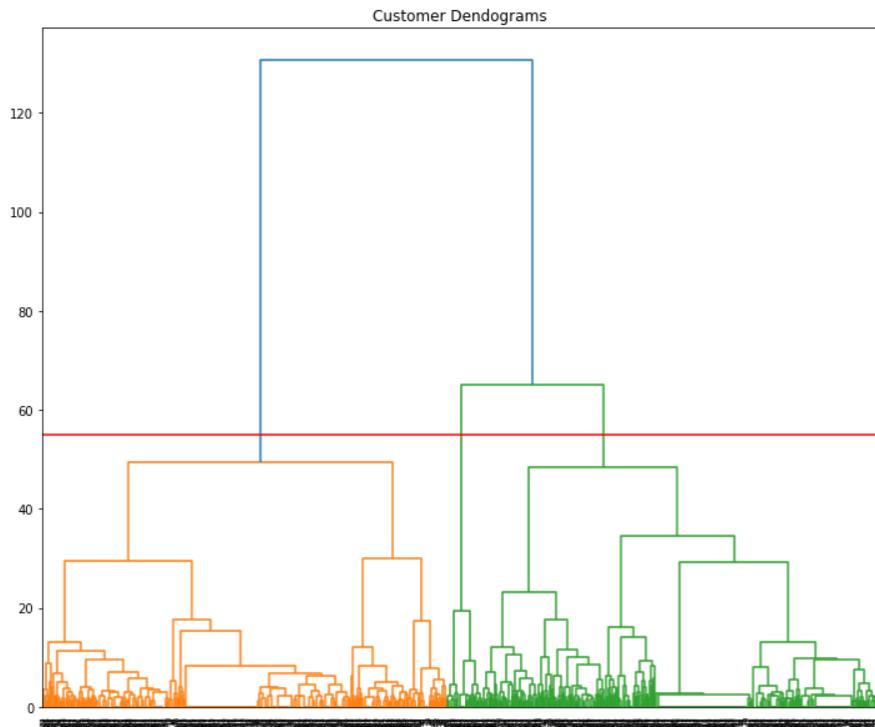
We clearly observe an elbow at k=3

- Using Silhouette Score

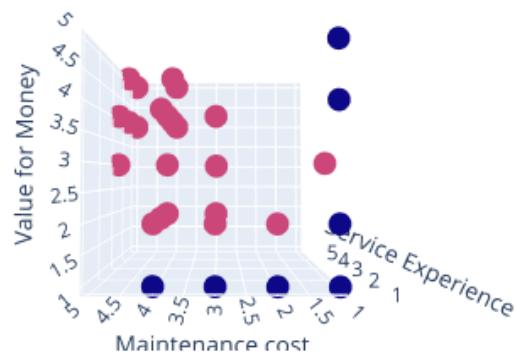
```
For n_clusters = 2 The average silhouette_score is : 0.4382798385117127
For n_clusters = 3 The average silhouette_score is : 0.47197983697315826
For n_clusters = 4 The average silhouette_score is : 0.44966426821874844
For n_clusters = 5 The average silhouette_score is : 0.4110356880565707
For n_clusters = 6 The average silhouette_score is : 0.3803659233066803
For n_clusters = 7 The average silhouette_score is : 0.38054950742527416
For n_clusters = 8 The average silhouette_score is : 0.3717438932186394
```

**Silhouette Score** also gives optimal clusters as 3

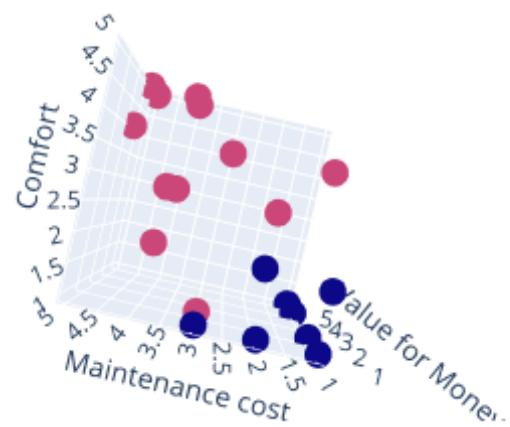
- Using Dendograms



This also gives optimal clusters as 3



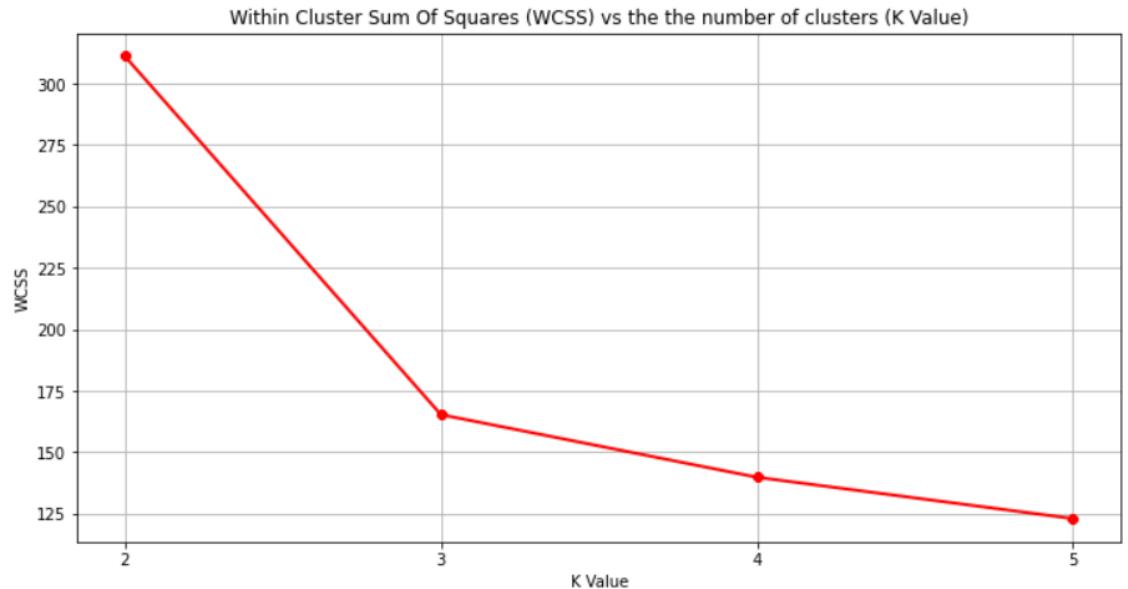
Cluster Plot for Service Experience, Maintenance cost and Value for Money



**Cluster Plot for Comfort, Maintenance cost and Value for Money**

- **For E4Ws:**

- Using Elbow method to find the optimum K value.



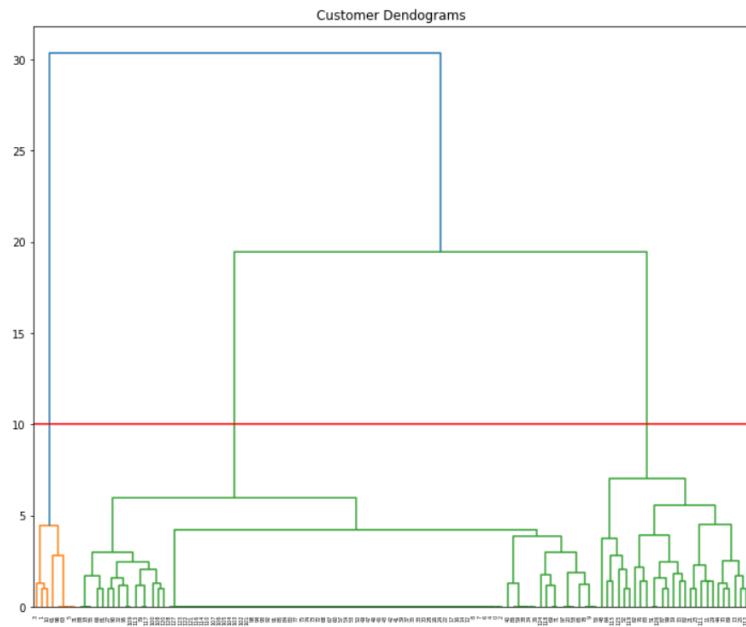
We clearly observe an elbow at k=3

- Using **Silhouette Score**

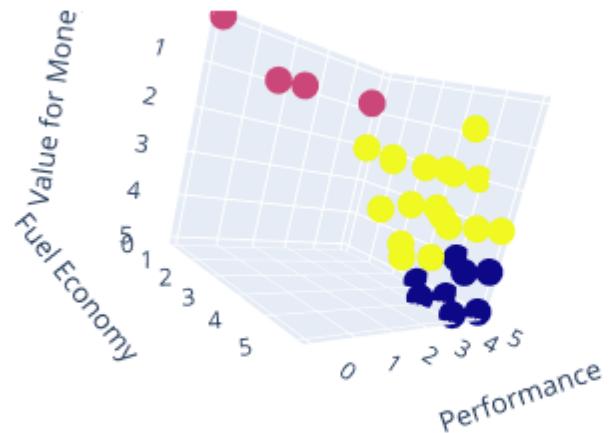
```
For n_clusters = 2 The average silhouette_score is : 0.7219919432326541
For n_clusters = 3 The average silhouette_score is : 0.6315470424676867
For n_clusters = 4 The average silhouette_score is : 0.5479325325802188
For n_clusters = 5 The average silhouette_score is : 0.542824572239918
```

**Silhouette Score** also gives optimal clusters as 3

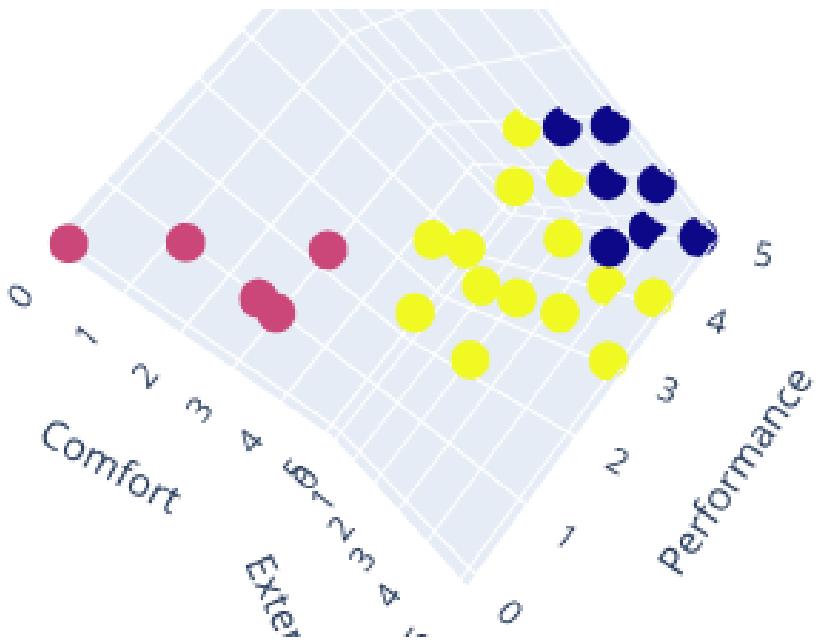
- Using Dendograms



This also gives optimal clusters as 5



Cluster Plot for Performance, Fuel Economy and Value for Money



**Cluster Plot** for Performance, Comfort and Exterior

# Target segment

## For E2Ws

So from the analysis we can see that the company can target for E2W's vehicles in many parts of the country as many states have reported high E2W sales, but the most favourable location seems to be southern India as many states there like Karnataka, Tamil Nadu, Telangana, Kerala have high percentage sales of E2Ws of the total EV sales also they have high numbers of charging stations which makes convenient for the customer to adopt an EV. The company should also focus on many aspects of vehicle especially on **reliability, comfort and service cost**, as most people use the vehicle for daily commute and hence provide suitable customer experience. Age doesn't seem to matter as people from every age group are interested to adopt E2W's their is definitely anxiety in terms of range, service costs and safety of battery which have been already mentioned if the company can solve those issues, it would help in building customer trust, which would eventually help grow the business.

## For E4Ws

So from the analysis we can see that the company can target for E4W's vehicles in many parts of the country as many states have reported high E4W sales, but the most favourable location again seems to be southern India as many states there like Karnataka, Tamil Nadu, Telangana, Kerala have high percentage sales of E4Ws of the total EV sales and they have high numbers of charging stations which makes convenient for the customer to adopt an EV. The company should also focus on many aspects of vehicle especially on **Performance, Range and service cost**, as people buy cars for long term. Age doesn't seem to matter as people from every age group are interested to adopt E4W's, their is definitely anxiety in terms of range, service costs and safety of battery which have been already mentioned if the company can solve those issues, it would help in building customer trust, which would eventually help grow the business.

# Marketing Mix

Setting prices for our products is both an art and a science. Most importantly, you must know and understand your cost of production. From there you can adjust based on product characteristics, a specific pricing strategy, customer price sensitivity, customer values, and other factors. Price contributes to the perception of your product, that is, when consumers see a product price it sends signals to them about quality, match with the market outlet, expectations for assistance, etc. Keeping accurate and complete records accounting for all steps – production, packaging, storage, promotion, transportation/distribution, and sales – will assist you in setting a price and making adjustments as necessary.

## 4Ps of Marketing Mix



## 4Ps of Marketing Mix

The 4Ps helps companies to review and define key issues that affect the marketing of its products and services and is often now referred to as the 7Ps framework for the digital marketing mix.

Marketing as a whole relies on all seven Ps.

It is essential to consider them as a whole, and not in isolation. Customers must experience a coherent view of your company and your product, and that can only come from viewing the customer experience from end-to-end across all seven Ps.

### **Importance of Marketing Mix**

It helps understand what our product or service can offer to our customers and helps plan a successful product offering. Helps with planning, developing and executing effective marketing strategies. Help determine whether your product or service is suitable for your customers.

**Product:** Since the company is starting with EVs, the product should manage all the concerns that have been mentioned.

**Price:** Price will largely depend on service parts and battery cost, i.e whether company sources them locally or imports them.

**Place:** Through the analysis we have seen that southern states are the best suitable for the company to register initial high sales.

**Promotion:** Promotion can be based on the analysis. More offers and promotions can be given to the segments that are more valuable to the company.

# Codes

Github Link: <https://github.com/blaze-fire/feynn-labs-project-2>

## References

- <https://www.carwale.com/>
- <https://www.bikewale.com/>