EV MARKET SEGMENTATION ANALYSIS IN INDIA

B PAVAN SRINIVASARAO

GIT HUBLINK:

https://github.com/BilluriPavan1903/EV-MARKET-ANALYSIS-AND-SEGMENATION-IN-INDIA-MARKET-

ABSTRACT :

The project mainly focus on the indian ev market trends mainly focus on the segmentation analysis, and we have collect the different reviews from the customers and collected the sales and production sales from the different companies in india , we mainly focus on the two wheelers and uses nlp process for the sentimental analysis and k means algorithm for the identify the segmentations resulting to give 4 segments , on that segments we were selecting the best segment to target those customer

Segment 1, which constitutes 39% of the consumer base, is identified as the main target for our strategic efforts. This group offers a significant market potential and is the ideal focus for our venture. Recommendations include designing electric two-wheelers with technical specifications that cater to Segment 1's preferences, ensuring prices are set around the median to maintain affordability and competitiveness. This strategy aims to effectively position our venture within India's electric vehicle market.

1.0 Introduction:

India is witnessing a significant transformation in its transportation sector, driven by the widespread adoption of Electric Vehicles (EVs). The rapid urbanization, growing population, and rising income levels have fueled the embrace of EVs as an eco-friendly alternative. Among these, electric two-wheelers have become pioneers due to their affordability and broad consumer acceptance. These vehicles are reshaping India's mobility landscape, offering a sustainable solution to the challenges of pollution and greenhouse gas emissions.

The Indian government has played a crucial role in fostering this change by implementing policies that encourage local manufacturing and support a robust network of manufacturers, dealers, and service providers. In 2023, the electric two-wheeler market in India reached a peak, symbolizing the success of these efforts and the growing acceptance of clean mobility solutions.

This study delves into the core of this transformation, focusing on the electric vehicle industry with a particular emphasis on electric two-wheelers. By combining behavioral segments, psychographic data, and detailed vehicle specifications, we provide informed EV price recommendations. This comprehensive approach aims to empower consumers, policymakers, and industry stakeholders alike. By understanding the diverse facets of consumer behavior and preferences, this study illuminates the path toward a sustainable, environmentally conscious, and consumer-centric electric transportation system in India.

2.0 Problem Statement and Fermi Estimation

2.1 problem statement :

To strategically position our Electric Vehicle (EV) Startup in the Indian market, we need to utilize data-driven insights derived from sales data, customer reviews (encompassing behavioral and psychographic data), and technical specifications of electric vehicles. Our objective is to employ these insights to effectively segment the market and recommend target segments for our electric vehicles

2.2 FERMI ESTIMATION :

1.1.1 Data Collection and Assessment

- Gather sales data, electric vehicle customer reviews, and technical specifications.
- Evaluate the reliability and comprehensiveness of the collected data.

1.1.2 Segmentation Using Behavioral Variables

- Utilize behavioral data to identify patterns and segments within the customer base.
- Estimate the size and characteristics of each segment using data-driven techniques.

1.1.3 Analysis of Psychographic Data

- Analyze psychographic data within each behavioral segment to discern customer preferences and motivations.
- Estimate the psychographic traits and preferences of customers within each segment.

1.1.4 Technical Specification and Price Analysis

- Evaluate technical specifications of electric vehicles within identified segments.
- Estimate the impact of technical features on customer preferences and purchasing decisions.

1.1.5 Target Segment Selection

- Select target segments based on a thorough analysis of behavioral, psychographic, and technical factors.

1.1.6 Customization of Marketing Mix

- Develop a customized marketing mix tailored specifically for the selected target segments.
- Estimate the effectiveness of various marketing strategies within the selected target segments, aligning them with customer preferences.

1.1.7 Segment Recommendation

- Combine segment analysis results and marketing mix customization findings to finalize segment recommendations.

- Recommend target segments with the highest estimated market potential, ensuring a focused and targeted market entry strategy.

By following these systematic steps, employing Fermi estimation at each stage, our Electric Vehicle Startup aims to make informed decisions, precisely target market segments, and tailor our marketing approach to meet the unique demands and preferences of our customers, ensuring a successful market entry and sustained growth.

3.0 Data Sources and Collection

For this project, data was gathered from three distinct sources. The primary dataset, obtained from the Society of Manufacturers of Electric Vehicles, spanning 2017 to 2023, catalogues sales figures of electric two-wheelers, three-wheelers, four-wheelers, and buses[1]. This dataset provides a comprehensive view of market trends and customer preferences over time.

The second dataset, extracted from bikewale.com, comprises electric two-wheeler customer reviews, offering vital behavioral and psychographic insights[2]. These qualitative inputs proved invaluable in understanding customer behavior.

Lastly, the third dataset from bikewale.com presents detailed technical specifications and pricing information of electric two-wheelers[2]. This data allowed us to assess the technical feasibility and price points crucial for our market segmentation strategy.

By integrating these datasets, a robust understanding of the electric vehicle market was developed. Real sales data, customer sentiments, and technical specifics formed the foundation of our analysis, ensuring a data-driven, market-relevant segmentation approach.

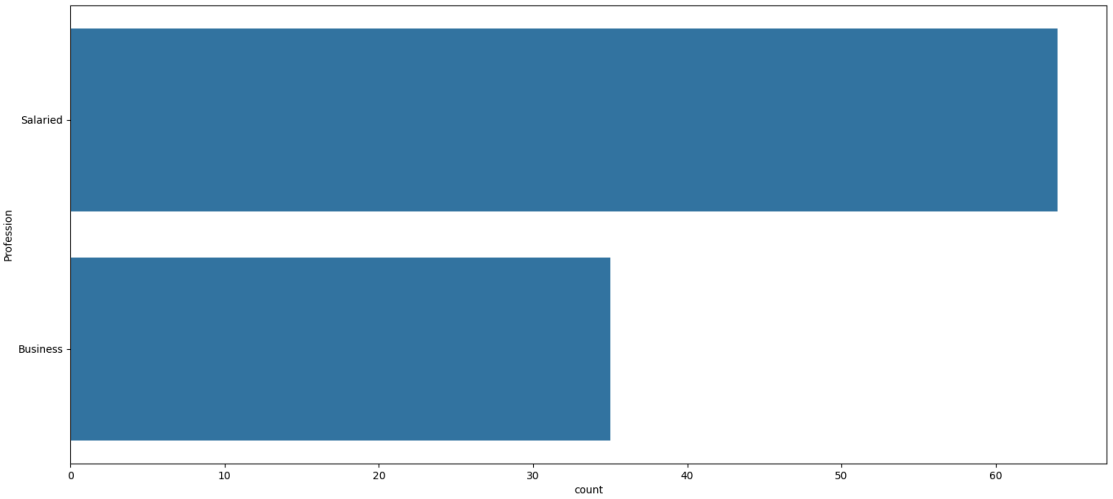
4.0 Data Pre-processing

The data pre-processing phase of this project employed a systematic approach using Python libraries like numpy, pandas, matplotlib, seaborn, and nltk. The initial task was to manage the sales data, which was spread across 10 separate Excel sheets. By utilizing pandas, these sheets were merged into a single cohesive dataset, laying the groundwork for further analysis. Ensuring the correctness of electric vehicle manufacturer names was a key focus, accomplished through precise replacement operations.

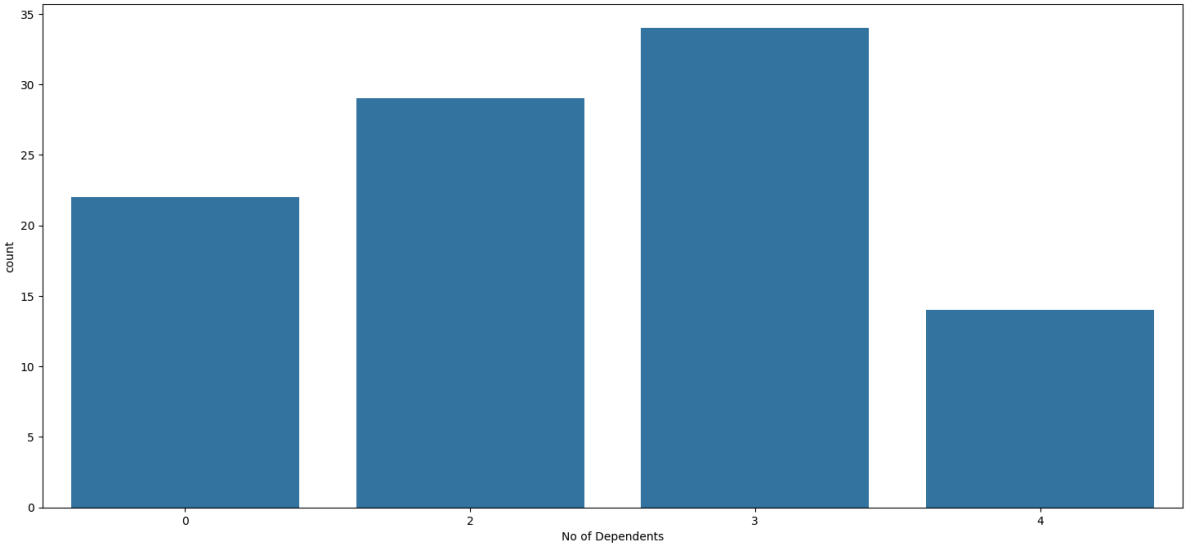
Once the data was consolidated, essential aggregation operations were performed on the sales data of electric two-wheelers, offering a detailed view of market trends. The next phase involved preparing the data for market segmentation. This included merging customer reviews and responses with the corresponding electric vehicle technical specifications. Null values were handled logically to maintain data integrity, ensuring a complete dataset. Sentiment analysis of customer reviews was conducted using nltk's natural language processing capabilities, providing valuable qualitative insights into customer sentiments. Subsequently, behavioral variables such as Visual Appeal, Reliability, Performance, Service Experience, Extra Features, Comfort, Maintenance Cost, and Value for Money were isolated and carefully prepared. These variables were crucial in laying the foundation for market segmentation analysis, offering a nuanced understanding of customer preferences and attitudes toward electric vehicles.

5.0 Segmentation Extraction :

CUSTOMER BEHAVIOUR :

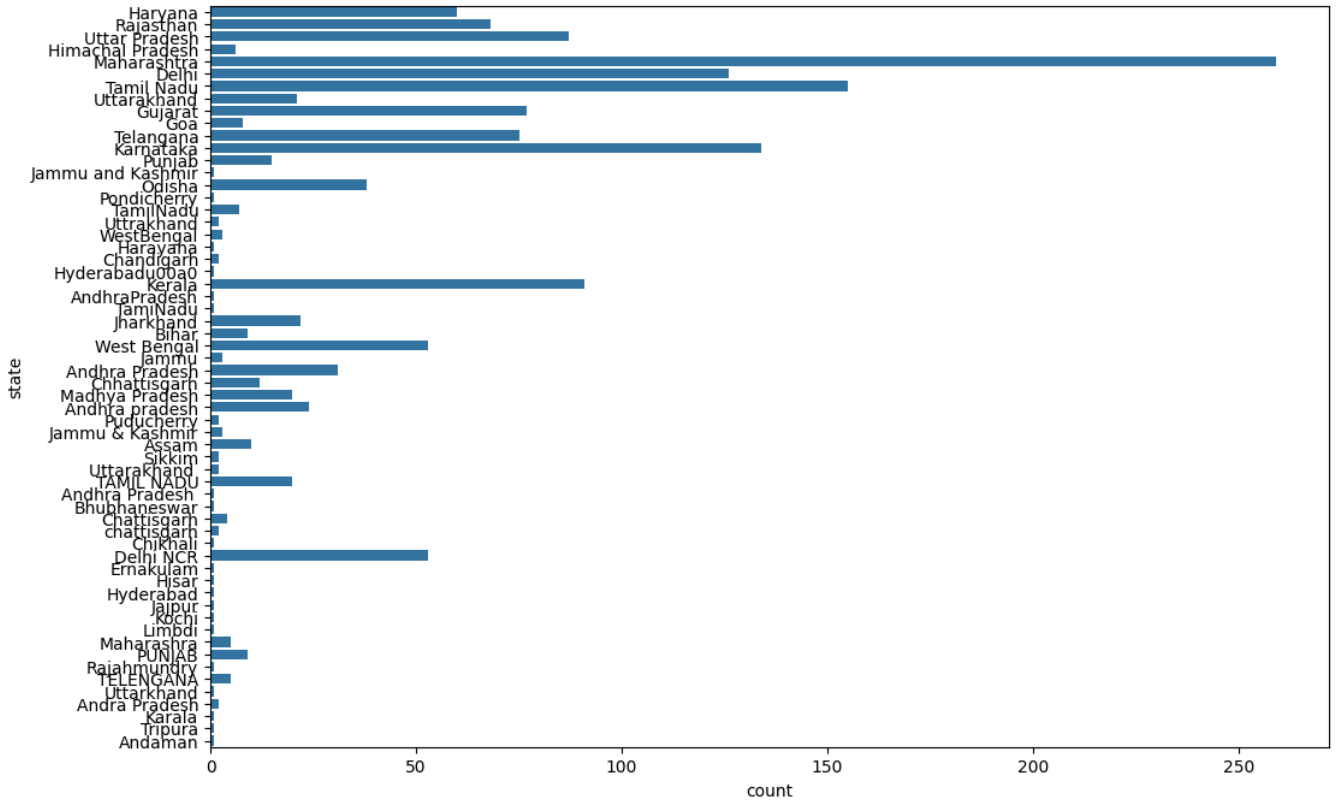


Most of the members are the salaried tho who wanted to buy the ev vehicles

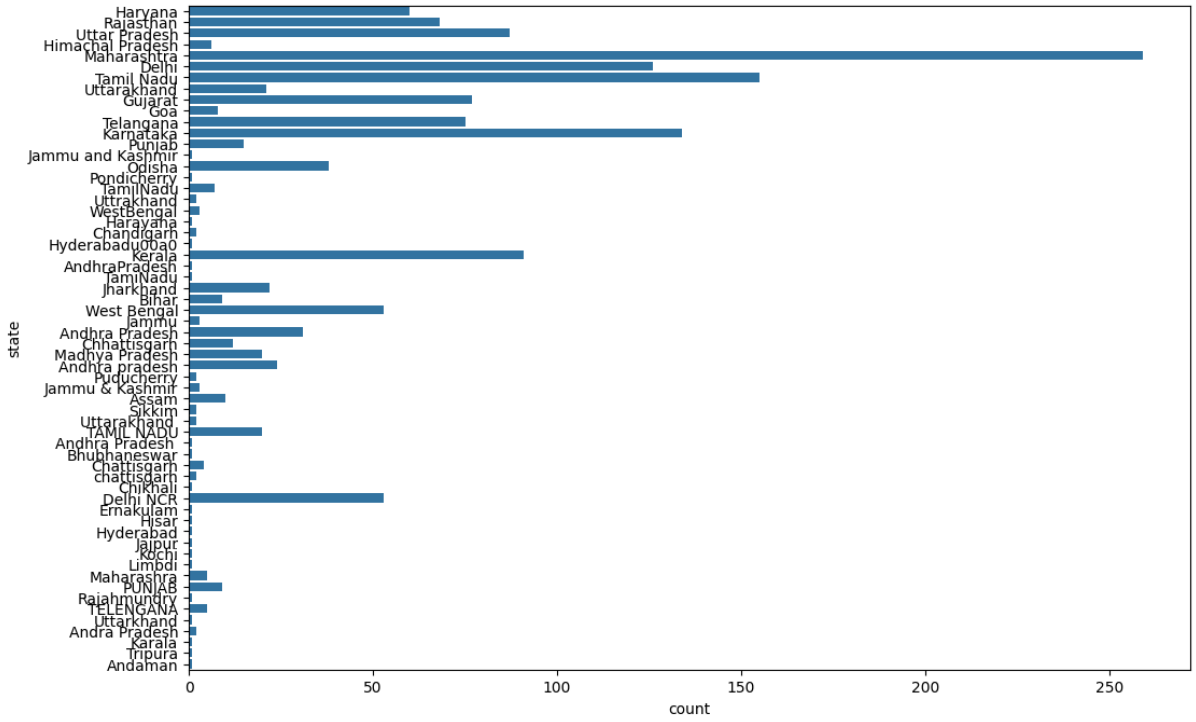


For the family there are mostly the two or three members completely depend upon that salaried person or business person

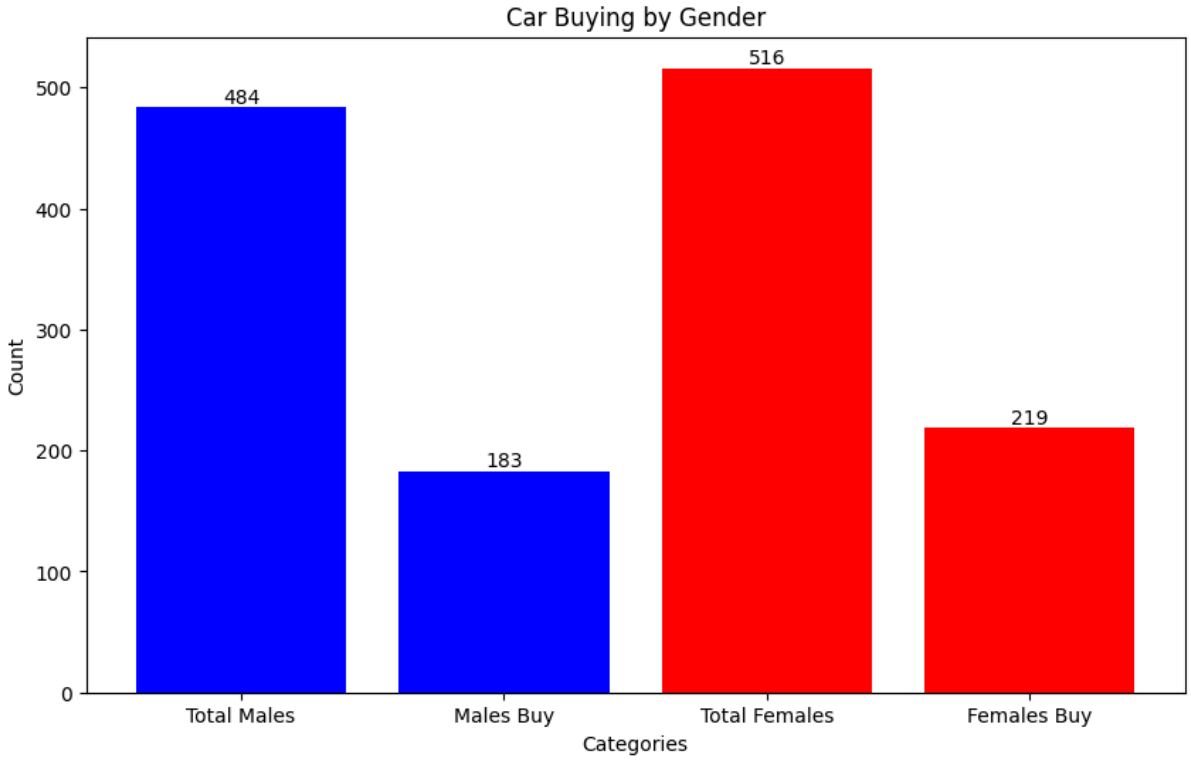
EV CHARGING STATIONS IN INDIA :



The no of most activated vehicles in india based on the region wise :



5.1
Sales and production details



a sample survey has be done most of the the females ration is very as compare to boys how to want to buy the electric vehicles

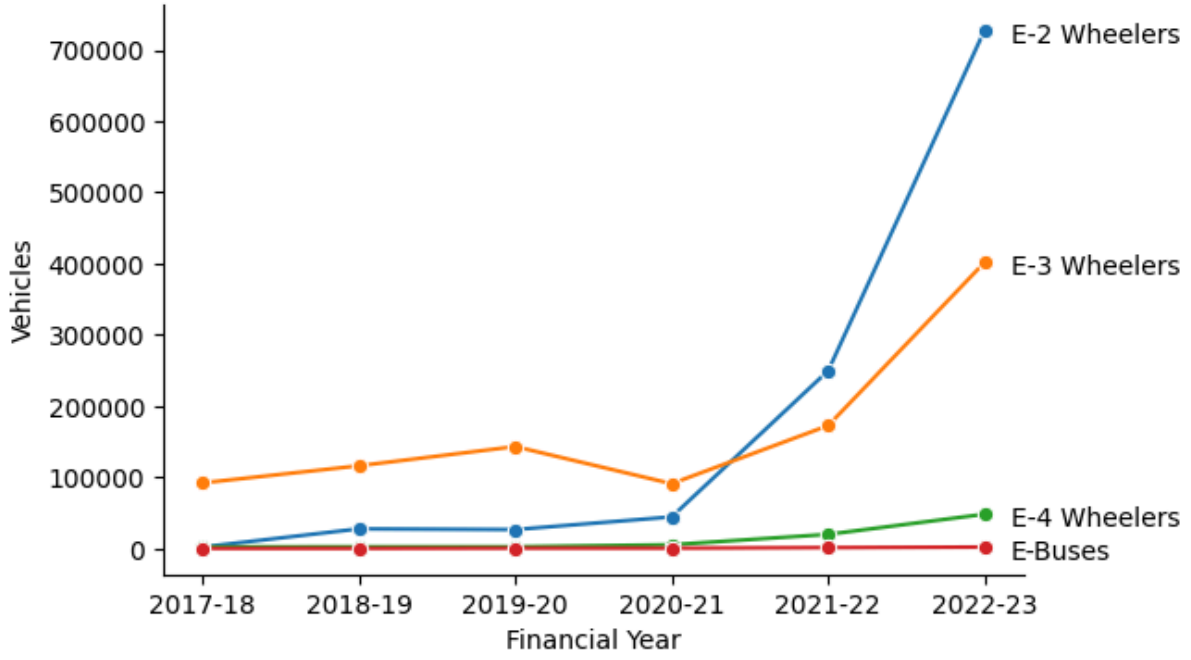


Figure 5.1 India's electric vehicle market

Figure 5.1 showcased the remarkable growth trajectory of India's two-wheeler market in 2023, underscoring its leading position within the industry.

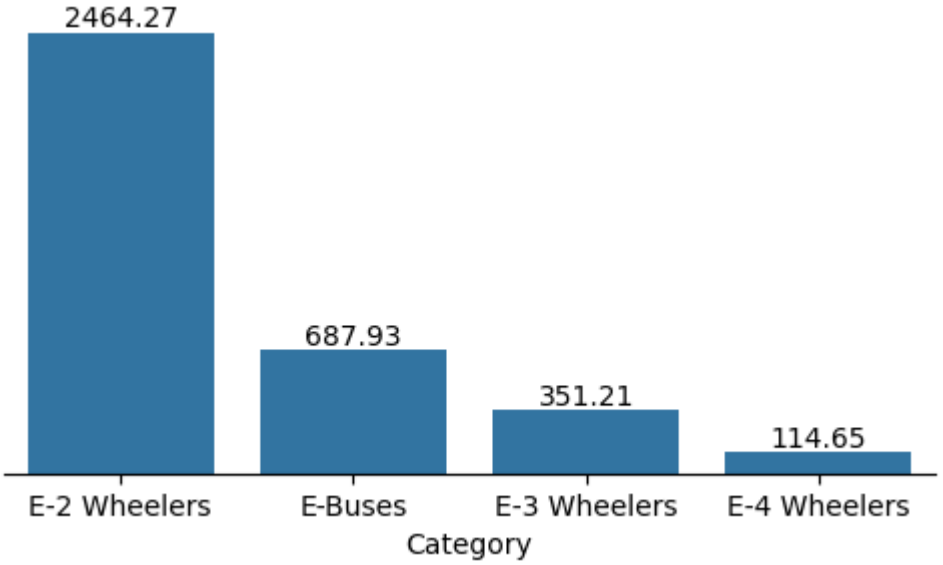


Figure 5.2 India’s electric vehicle industry in crores

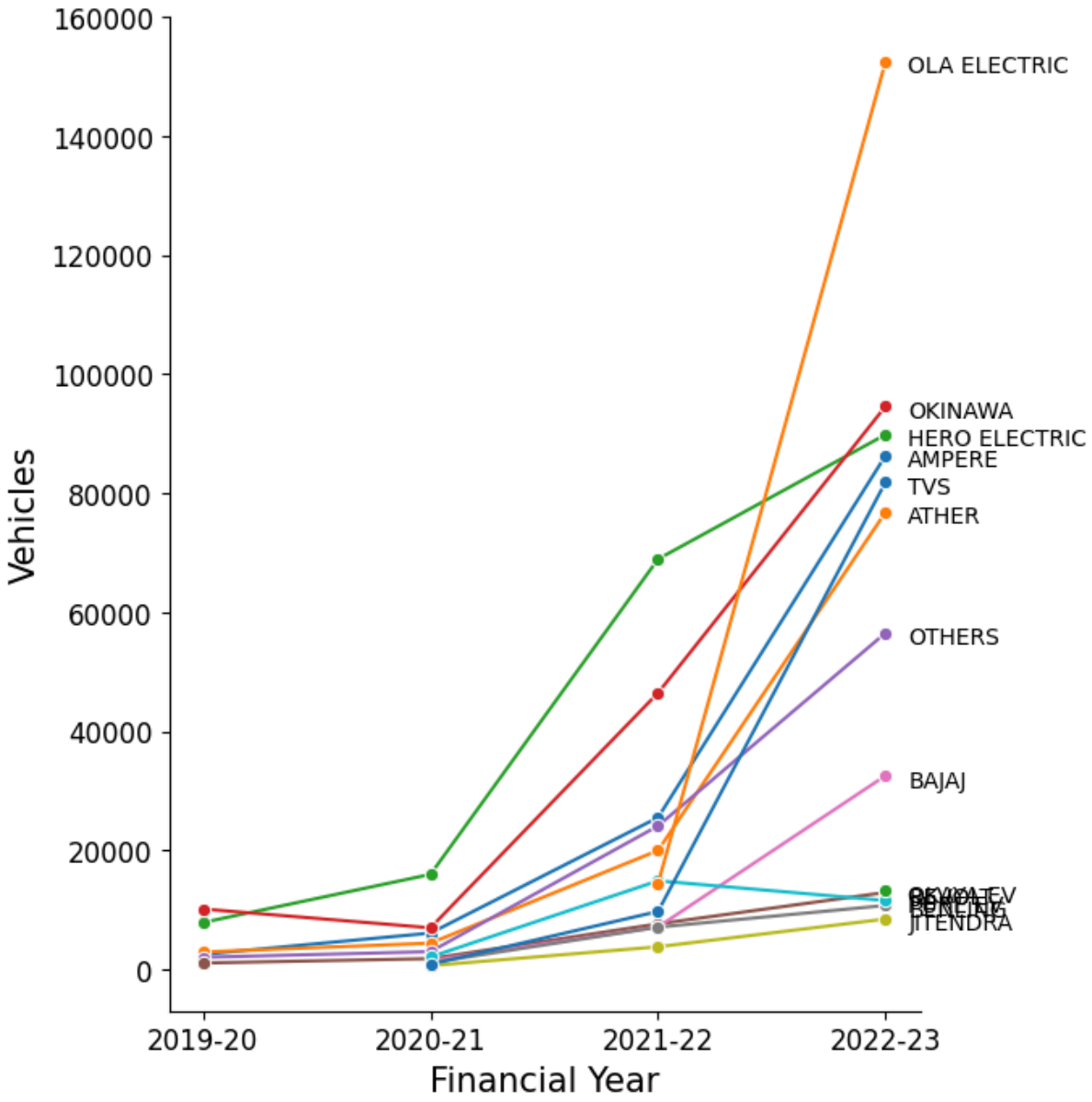


Figure 5.3 Top electric two-wheeler companies

Figure 5.3 honed in on specific electric two-wheeler companies, with Ola Electric emerging as the market leader in 2023, illustrating industry leadership and market competitiveness.

Upon in-depth analysis of these figures, it became evident that the electric two-wheeler segment was the most promising area for our detailed study. The robust growth, revenue dominance, and market leadership collectively indicated its prominence and potential, making it the ideal focus for our detailed study.

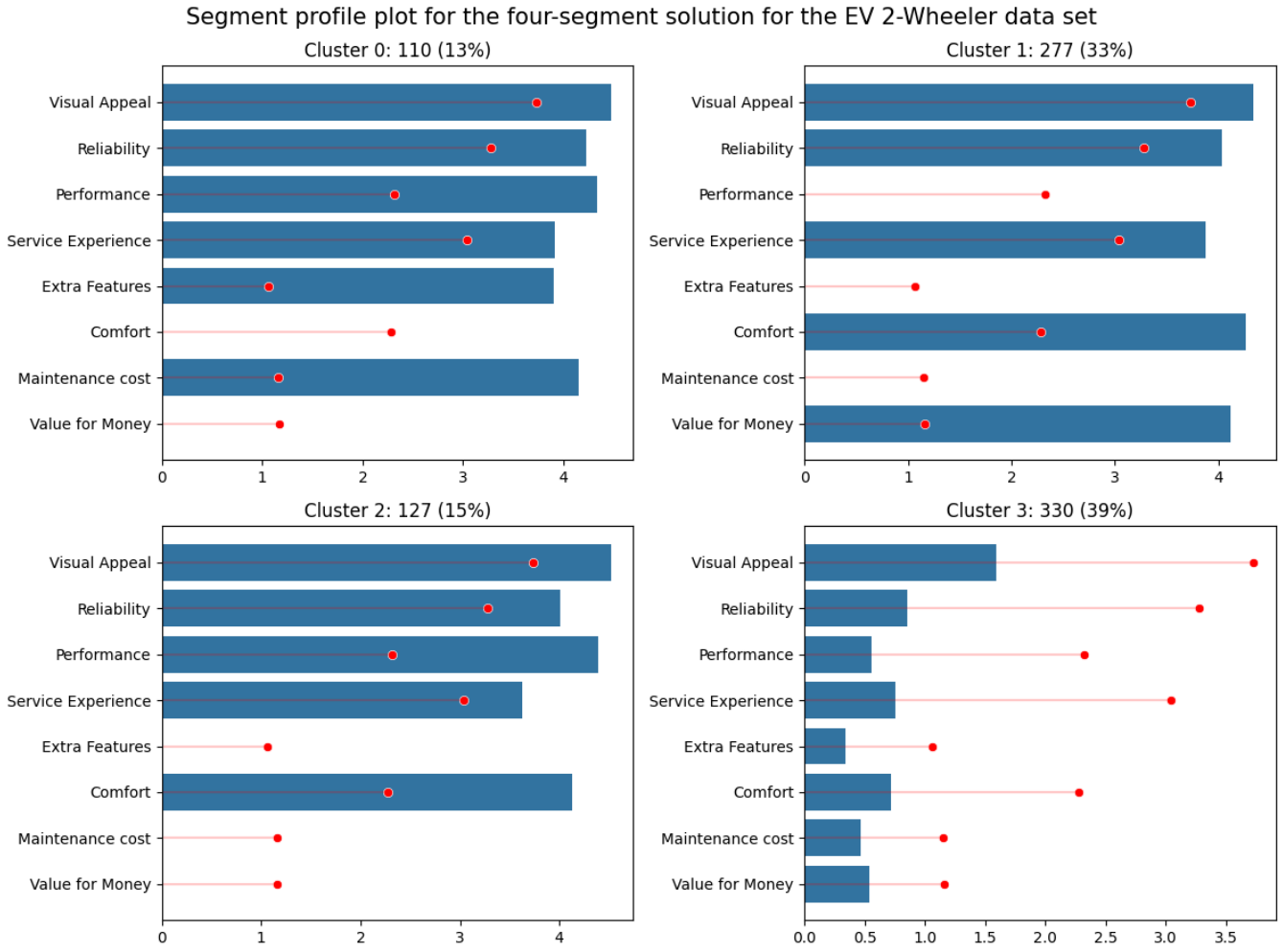
5.2 Using k-Means

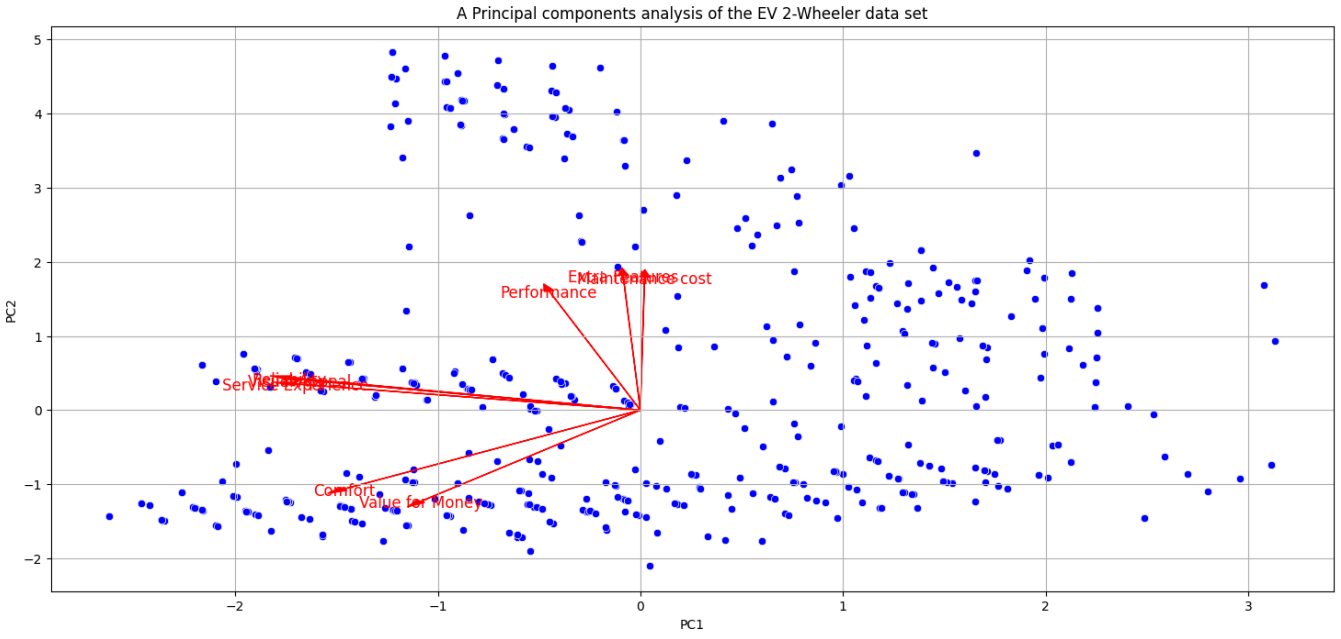
In this subsequent analysis, the standard k-means algorithm was utilized to investigate potential market segments within the electric two-wheeler customer reviews data. Various solutions were tested, ranging from two to eight market segments. The scree plot, as shown in Figure 5.4, played a crucial role in this process by displaying a noticeable elbow at four segments. This indicated a significant reduction in distances, pointing to the optimal number of segments for our analysis. Leveraging the insights from these analyses, our attention remained sharply focused on the electric two-wheeler market, ensuring precision and relevance in our segmentation approach.

6.0Profiling and Describing Segmentation

6.1 Profiling Segments

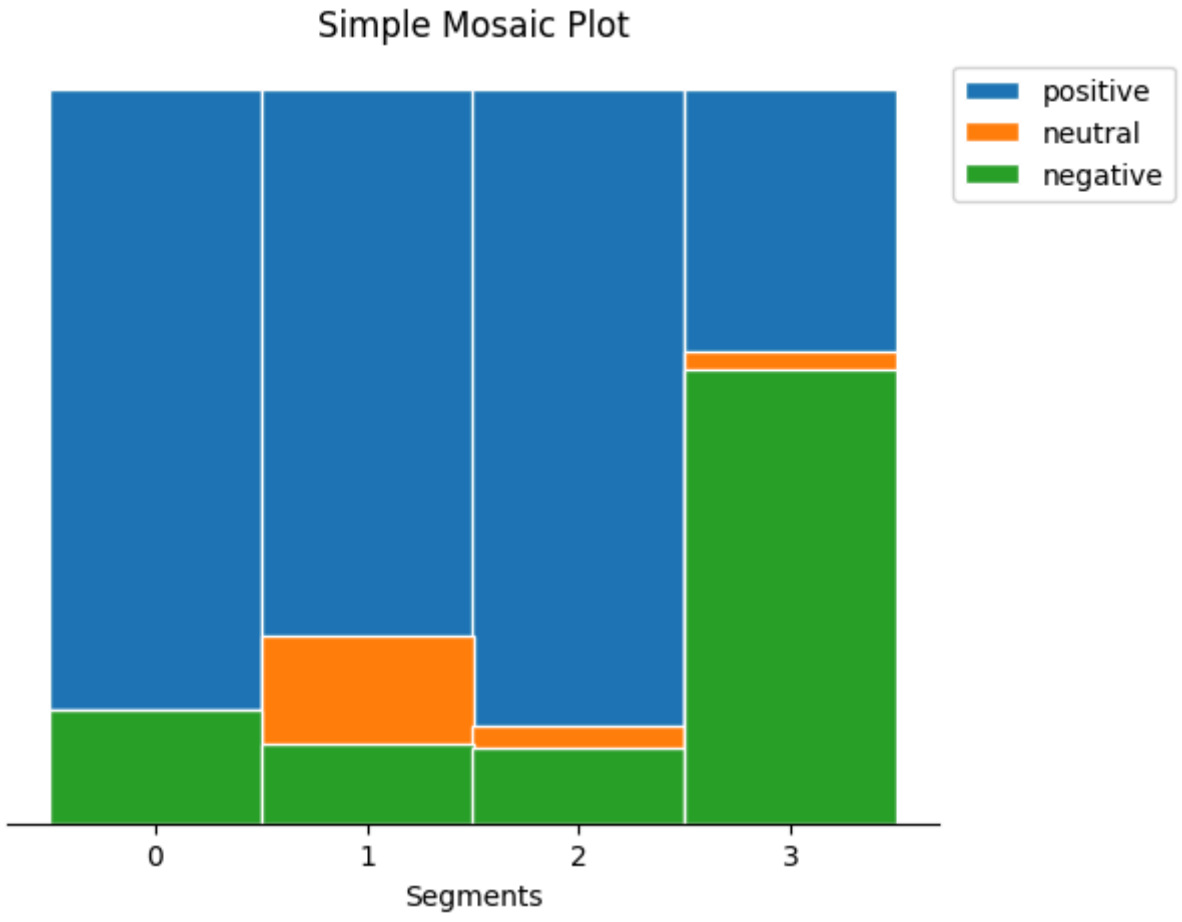
This section presents a detailed analysis of our consumer segments, as illustrated in Figure 6.1. The graph visually captures the diverse perceptions among different segments. Segment 0, representing 15% of consumers, values the electric two-wheeler vehicle for its visual appeal, reliability, performance, service experience, and comfort. Conversely, Segment 1 (39% of consumers) expresses dissatisfaction across all aspects, marking them as the largest but least satisfied group. Segment 2 (33% of consumers) appreciates visual appeal, reliability, service experience, comfort, and notably, perceives a strong value for money. Lastly, Segment 3 (13% of consumers), the smallest segment, values visual appeal, reliability, performance,services experience and maintenance cost showcasing distinct precipitations particularly on features and costs

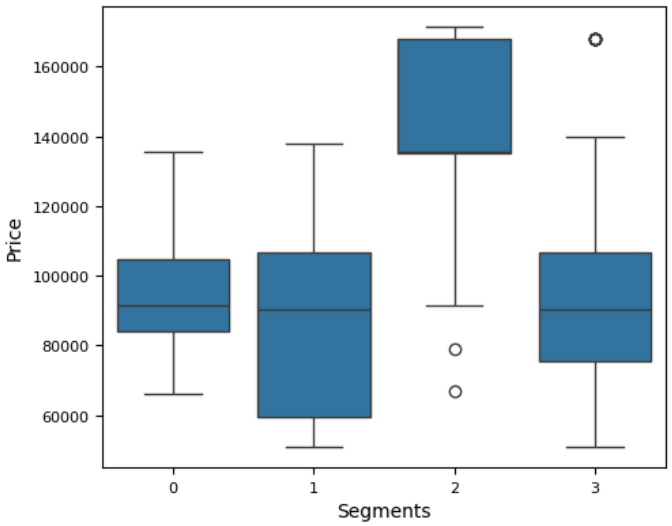

Segment profile plot for the four-segment solution for the EV 2-Wheeler data set
Cluster 0: 110 (13%)
Cluster 1: 277 (33%)
Cluster 2: 127 (15%)
Cluster 3: 330 (39%)
Visual Appeal
Reliability
Performance
Service Experience
Extra Features
Comfort
Maintenance cost
Value for Money

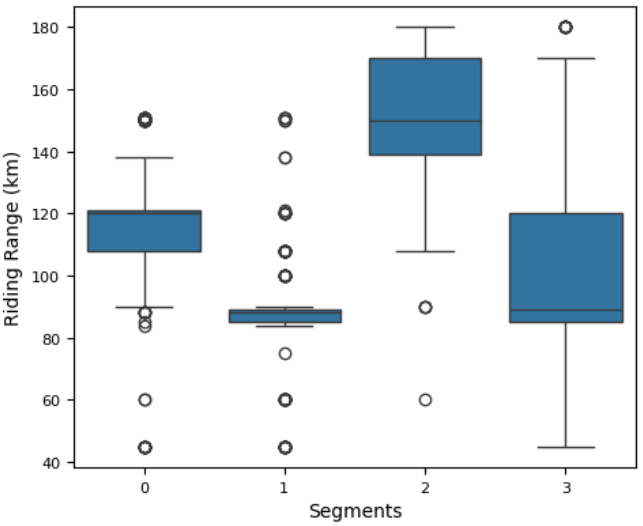

A Principal components analysis of the EV 2-Wheeler data set
PC1
PC2
Performance
Maintenance cost
Comfort
Value for Money

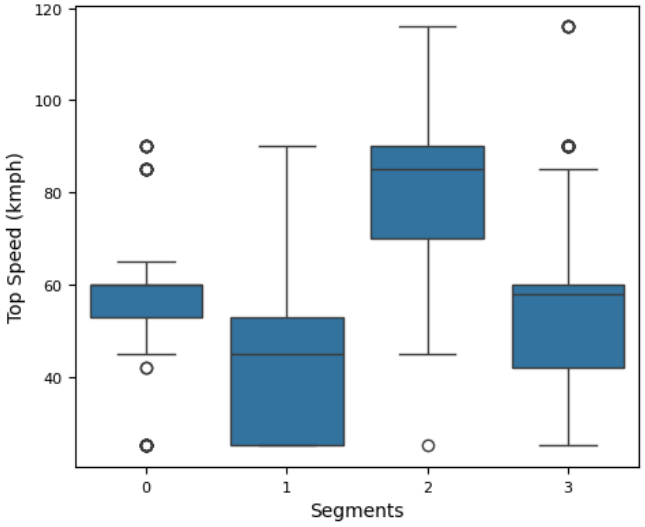
6.2 Describing Segments

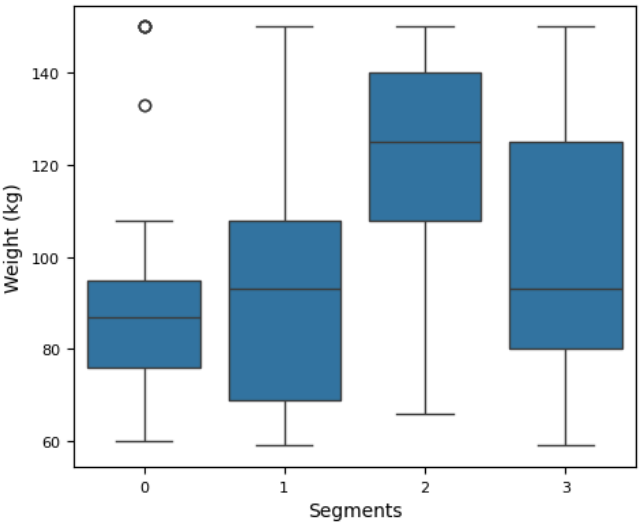
This section provides a comprehensive overview based on the insights derived from various mosaic plots and graphical representations. In Figure 6.3, the mosaic plot illustrates that all segments predominantly use electric vehicles for daily commuting, with limited usage for tours, occasional commuting, and leisure rides. Moving to Figure 6.4, the plot delineates the ownership duration of electric vehicles among segments. Segment 1 stands out, owning electric vehicles for more than a year, while Segment 0 has no prior ownership experience. Segment 2 members moderately own vehicles ranging from less than 3 months to over a year, and Segment 3 consumers have owned electric vehicles for a few days to less than 3 months.

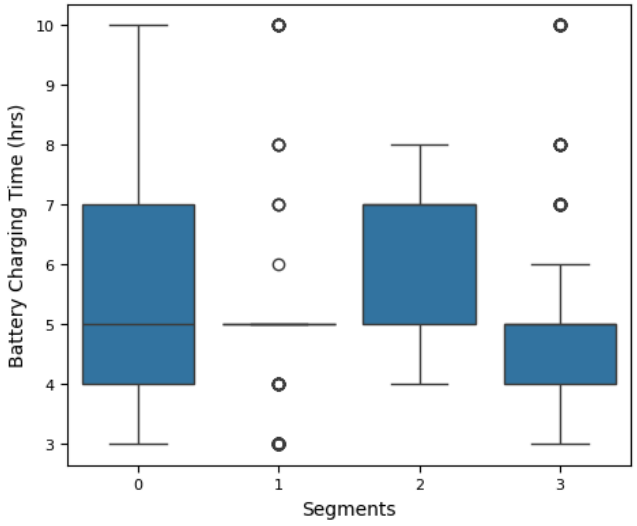


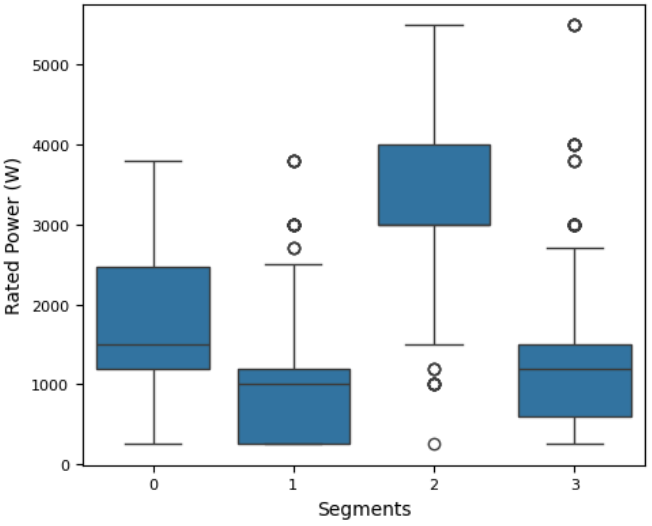

Price
160000
140000
120000
100000
80000
60000
0
1
2
3
Segments


Riding Range (km)
180
160
140
120
100
80
60
40
0
1
2
3
Segments

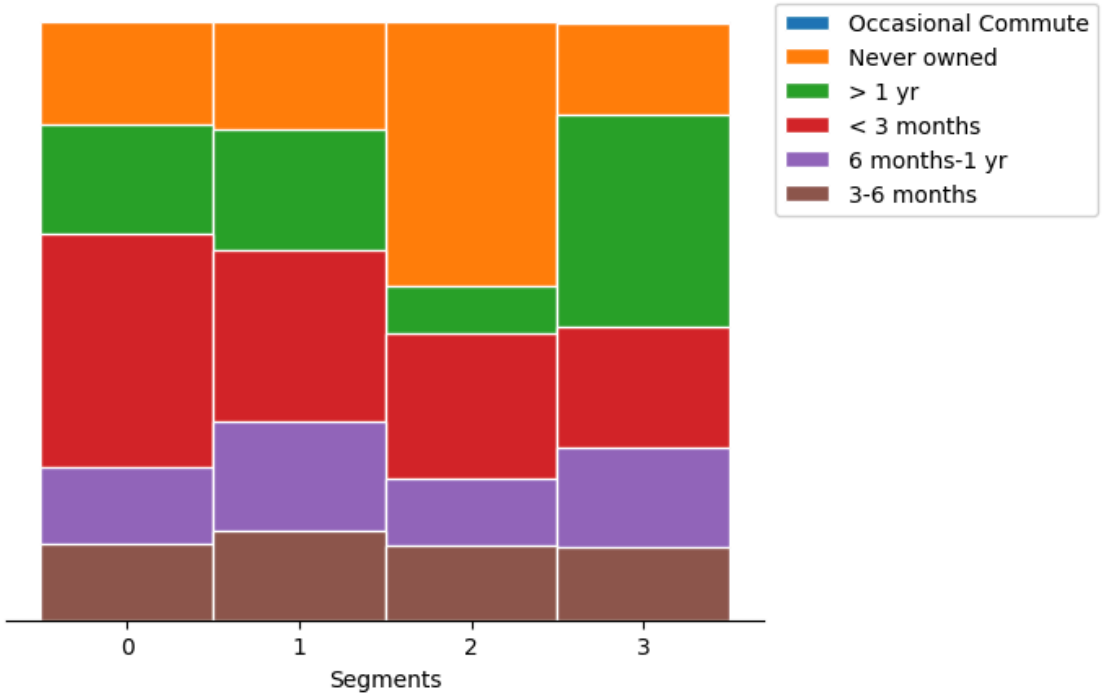

Top Speed (kmph)
120
100
80
60
40
0
1
2
3
Segments

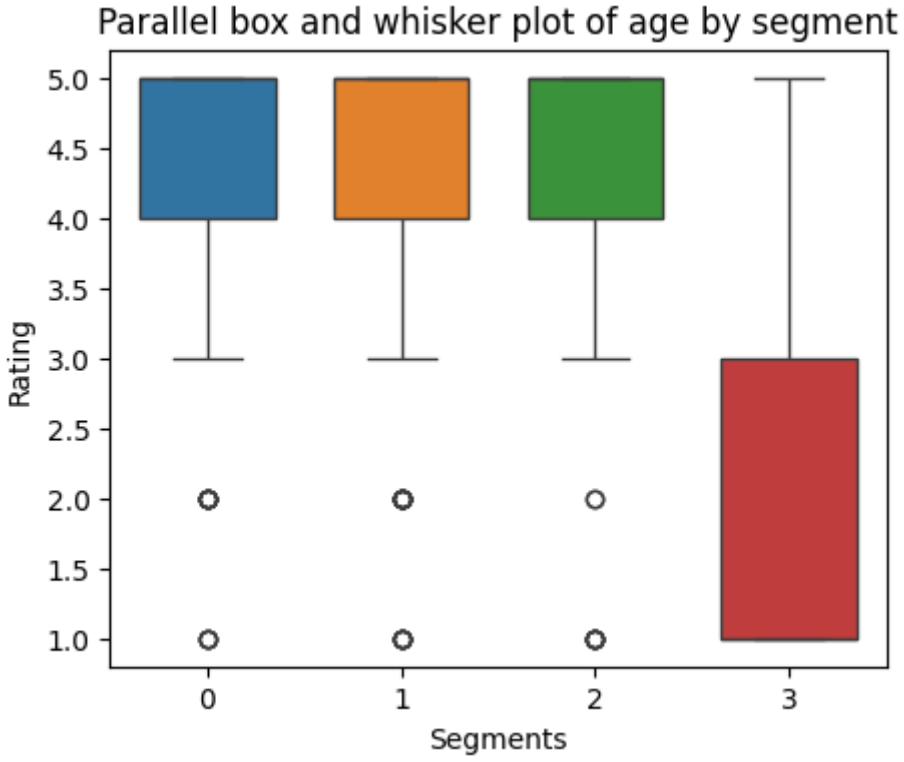

Weight (kg)
140
120
100
80
60
0
1
2
3
Segments

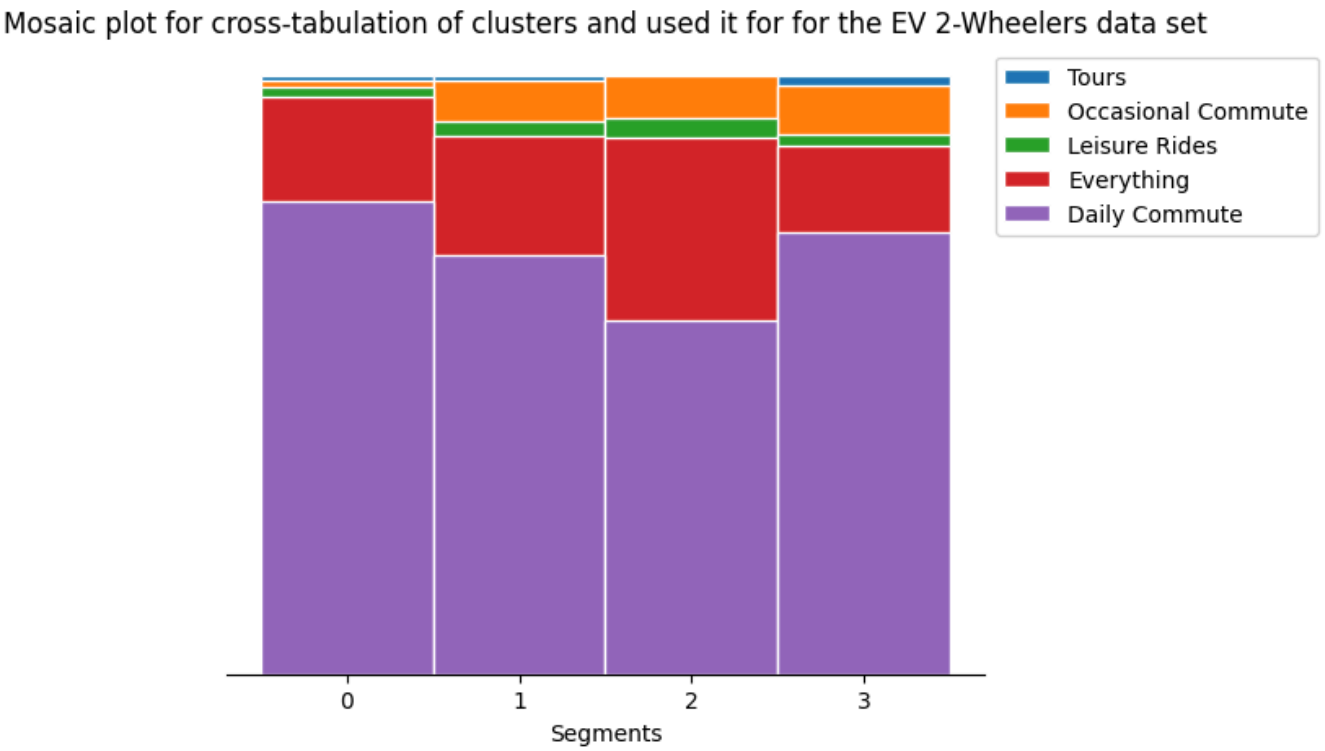

Battery Charging Time (hrs)
10
9
8
7
6
5
4
3
0
1
2
3
Segments


Rated Power (W)
5000
4000
3000
2000
1000
0
0
1
2
3
Segments

Mosaic plot for cross-tabulation of clusters and owned for for the EV 2-Wheelers data set







7.0 Profiling and Describing Segmentation

In our strategic selection for the target segment of the electric vehicle market, Segment 1 and Segment 2 stand out as key focus areas.

Segment 1

- **Size**: 39% of consumers
- **Characteristics**: Diverse perceptions and preferences with notable dissatisfaction across multiple aspects.
- **Opportunity**: Addressing the specific concerns of this large group can significantly enhance customer satisfaction and build brand loyalty.
- **Strategy**: By identifying and addressing their unique dissatisfaction points, we can tailor our electric vehicles to meet their demands and expectations.

Segment 2

- **Size**: 33% of consumers
- **Characteristics**: Value visual appeal, reliability, service experience, and comfort.
- **Opportunity**: Customizing our electric vehicles to align with their specific preferences can strongly resonate with this group.
- **Strategy**: Emphasizing features they value, such as value for money, can enhance their customer experience and reinforce brand loyalty.

Combined Strategy

1. **Segment 1**: Focus on addressing dissatisfaction points. Crafting vehicles that directly counter their concerns can lead to improved satisfaction and loyalty within this significant market share.
2. **Segment 2**: Build on positive perceptions. Enhance features they already value, ensuring a positive experience and reinforcing brand loyalty.

8.0 Customizing the Marketing Mix

Product Customization

- **Segment 1 (39% of consumers)**:
  - **Focus**: Improve performance and service experience.
  - **Diverse Offerings**: Provide a range of options to cater to different tastes and budgets, addressing varied dissatisfaction points.
- **Segment 2 (33% of consumers)**:
  - **Focus**: Emphasize visual appeal and value for money.
  - **Diverse Offerings**: Ensure a broad spectrum of choices, aligning with their specific desires.

Price Customization

- **Segment 1**:
  - **Approach**: Offer affordable pricing structures to attract cost-conscious consumers.
- **Segment 2**:
  - **Approach**: Implement slightly higher price points for value-added features, aligning with their willingness to pay for enhanced benefits.

Promotion Customization

- **Segment 1**:
  - **Focus**: Highlight reliability and service improvements in advertising campaigns.
  - **Methods**: Utilize targeted promotional events and online campaigns to engage effectively.
- **Segment 2**:
  - **Focus**: Emphasize aesthetics and affordability in promotional materials.
  - **Methods**: Tailor advertising efforts to resonate with their preferences.

Place Customization

- **Segment 1**:
  - **Strategy**: Establish accessible distribution channels in urban areas.
- **Segment 2**:
  - **Strategy**: Focus on suburban and semi-urban regions for distribution.
- **Online Presence**:
  - **Enhancements**: Strengthen online purchasing experiences with virtual showrooms and robust customer support platforms.

People and Process Customization

- **Customer Service**:
  - **Training**: Equip representatives to address segment-specific concerns empathetically.
- **Processes**:
  - **Streamlining**: Ensure efficient handling of customization requests and service appointments to enhance satisfaction and loyalty.

9.0 Potential Early Market Customer Base

In the analysis of the potential early market customer base, two primary segments emerge: Segment 1, encompassing 330 members (39% of consumers), and Segment 2, comprising 277 members (33% of consumers). Analyzing the price range data, the logical target price for Segment 1 falls between ₹51,094 and ₹1,67,844, while for Segment 2, it ranges from ₹51,094 to ₹1,37,890.

Calculating the potential sales (profit) in this early market scenario involves multiplying the number of potential customers in each segment by our targeted price range. For instance, if our target price for Segment 1 is set at ₹1,20,000 the potential profit from this segment alone would amount to ₹39.60 crores. Similarly, for Segment 2 with a target price of ₹1,10,000, the potential profit would be ₹30.47 crores.

Segment 1 demonstrates the larger potential, with a significantly higher market share and a broader customer base, making it a primary focus for our early market penetration efforts.

These calculated potential profits underscore the substantial market opportunity within these segments, guiding our strategic decisions effectively

10.0Most Optimal Market Segments

In the context of selecting the most optimal market segment for our electric two-wheeler vehicles, thorough analysis and evaluation have pointed to Segment 1 as the ideal choice. Representing 39% of consumers, this segment boasts significant opportunities and a large customer base, making it a strategic target for market penetration. Its substantial market potential, coupled with its balanced blend of technical specifications and price range, positions it as the most promising market segment for our electric vehicles.

The recommended technical specification range for Segment 1, presented in Table 10.1, ensuring alignment with the diverse needs and preferences of the market:

Table 10.1 Technical specification of electric vehicle two-wheeler for segment 1

Specification	**Recommended Range (in INR)**
Price	70,688 – 1,29,063
Riding range	89 - 180 km
Top speed	58 - 116 kmph
Weight	76 - 120 kg
Battery charging time	3 - 5 hours
Rated power	1200 - 5500 W

This comprehensive analysis ensures our market entry strategy is finely tuned to cater to the demands and expectations of the chosen segment, setting the stage for a successful and sustainable venture into the electric vehicle market.

11.0 Conclusion

In conclusion, our thorough analysis of India's electric vehicle market highlights Segment 1 as the primary target for our electric two-wheelers. Representing 39% of the consumer base, this segment presents a significant market opportunity. By customizing our product specifications to align with the preferences of this segment, we ensure that our offerings meet the needs of a large customer base. This strategic focus is built on a comprehensive understanding of market segmentation, consumer behavior, and technical requirements, providing a clear and effective pathway for market entry.

Our detailed examination of the Indian electric vehicle market identified Segment 1 as the most promising target. With a notable 39% share of the consumer base, this segment offers a substantial market opportunity. By tailoring our electric two-wheeler specifications to match the preferences of this segment, we ensure that our products are well-aligned with the demands of a broad customer base. This strategic approach is based on an in-depth understanding of market segmentation, consumer behavior, and technical specifications.

These insights offer a clear direction for market entry, emphasizing precision and relevance in both product development and marketing strategies. Looking ahead, this approach provides a robust foundation, ensuring that our offerings effectively resonate within India's dynamic electric vehicle market.