# Feynn Labs Internship

## 3rd TASK

## ON

## EV MARKET SEGMENTATION ANALYSIS

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# PROBLEM STATEMENT:

The objective is to conduct a comprehensive analysis of the Electric Vehicles (EV) Market in India through Segmentation analysis and devise a viable market entry strategy. This involves identifying and targeting segments that are more inclined to adopt the product based on Geographic, Demographic, Psychographic, and Behavioural factors.

The analysis encompasses various dimensions such as region, pricing, charging infrastructure, vehicle types (2-wheelers, 3-wheelers, 4-wheelers), retail outlets, manufacturers, vehicle body types (Hatchback, Sedan, SUV, Autorickshaw), safety features, etc.

# EV IN INDIA:

- India has six of the world's ten most polluted cities. The main cause of this growth in pollution is the use of fossil fuels. Almost all vehicles in India, including two-wheelers, four-wheelers, and trains in some places, operate on fossil fuels.

- India's Oil Import-overall India's dependency on crude oil imports is **86%**, which implies the country meets just **14%** of its own energy needs; the rest is imported. However, these imports need the use of US dollars, resulting in a reduction in the Indian Forex Reserve.

- All of these considerations support the transition from fossil fuels to electric automobiles. All developed countries are already transitioning to electric automobiles.

- Most Indian buyers believe that an electric vehicle will be ready by 2023, but the majority also believe that it would no longer be available until 2025. Consumers in India are looking for a lower price for EVs than those in other countries, with the global average tipping price for EVs being $36,000. (around Rs27 lakh).

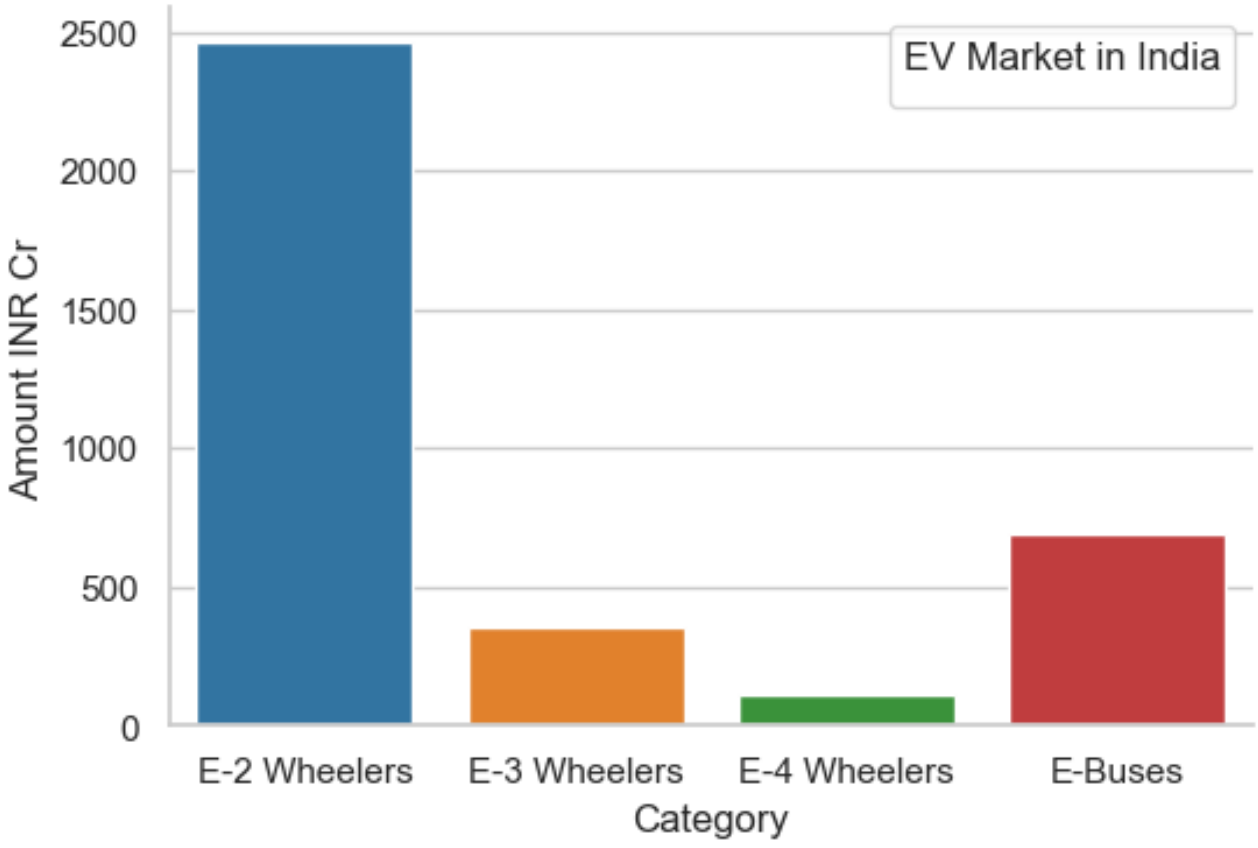
- The cost of lithium-ion batteries is roughly $250/kWh globally, which translates to approximately Rs5.7 lakh in battery prices alone. Currently, lithium-ion batteries account for half of the cost of an electric vehicle, making them more expensive than conventional vehicles.

# Electric Vehicles Market in India:

The Indian automobile industry is the world's fifth biggest, and it is anticipated to become the third largest by 2030. According to the India Energy Storage Alliance (IESA), the Indian EV market would develop at a 36% CAGR.

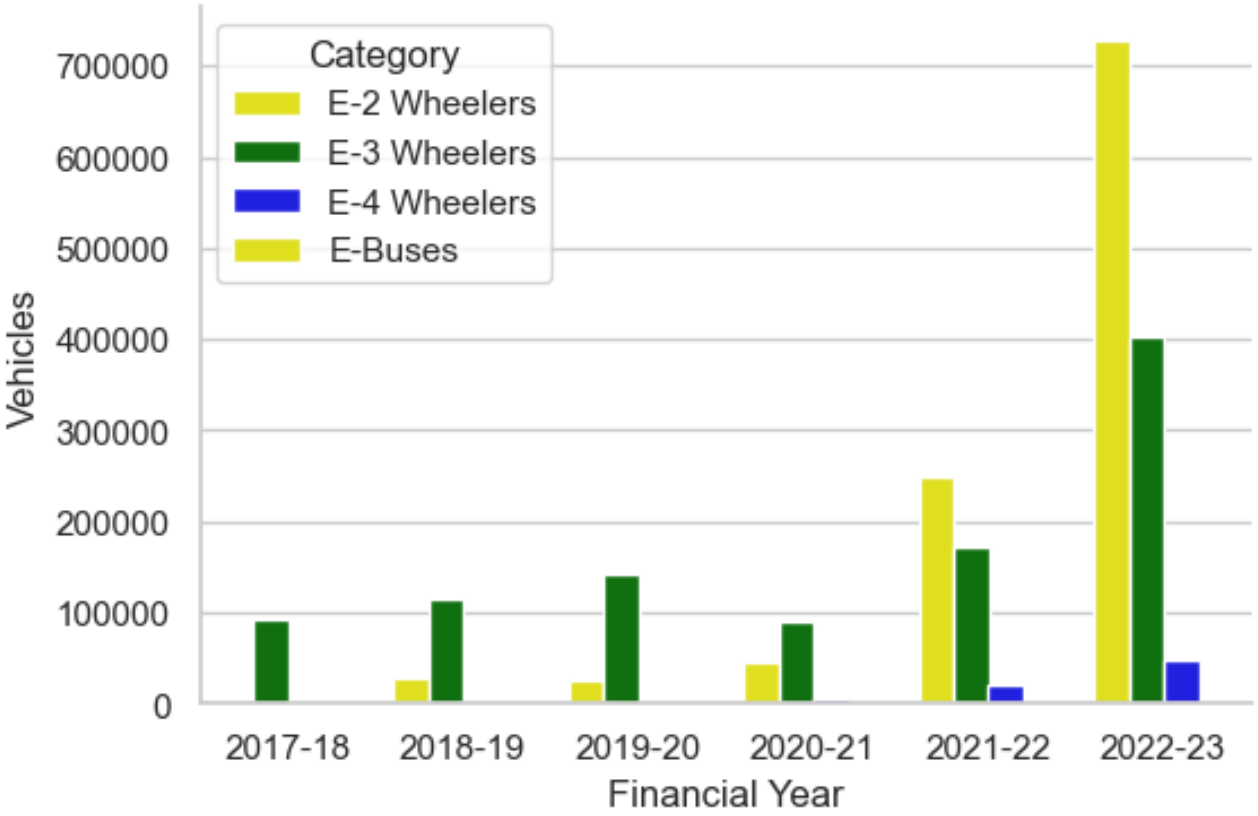
As India's population grows and demand for automobiles increases, reliance on conventional energy supplies is no longer a viable option, as the country imports over 80% of its crude oil.

By 2030, NITI Aayog expects to reach 70% EV market penetration for all commercial vehicles, 30% for private vehicles, 40% for buses, and 80% for two and three-wheelers. This is consistent to reach net zero carbon emissions by 2070.




The Indian electric vehicle market was worth **3618** Crores INR in 2023, and it is predicted to grow to USD 15,397.19 million by 2027, at a CAGR of 47.09% during the forecast period (2022-2027)

**Fiscal year 2023 has ended and sales of electric vehicles (EVs) in India have scaled a new high, charging past the 100,000-units mark for the sixth month in a row. What's more, they have crossed the million-units milestone over the past 12 months.**



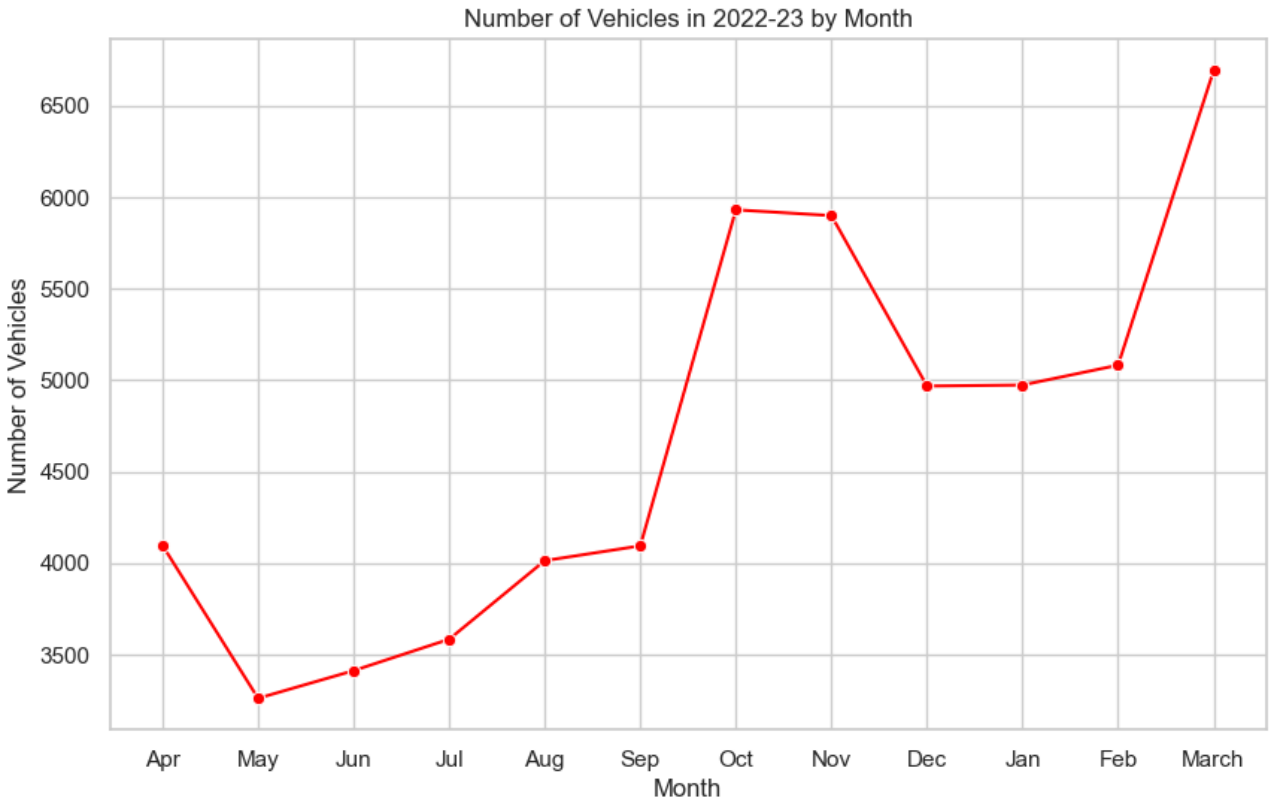

As per Vahan data, cumulative sales till 6pm on March 31, 2023 were 11,71,944 units, hitting the million milestone for the first time in a fiscal. In CY2022, EV sales in India had clocked a total of 10,23,735 units.

FY2023's 11,71,944 units are a robust 155% year-on-year increase on FY2022's 458,746 units and point to the surge in consumer demand for EVs, in the face of stiff petrol and diesel prices as well as CNG.

The charge of the EV brigade can be gleaned from the fact that sales have scaled a new high for a month in March 2023 – 131,175 units, beating the previous best of 121,389 units in November 2022 (see data table below). The monthly shift to six-figure sales began in festive October 2022 and has continued right till March 2023.

Leading the charge are the two low-hanging fruit of the industry – two- and three-wheelers. Two-wheelers, the most affordable EV sub-segment, with 720,733 units saw YoY growth of 185% (FY2022: 252,539 units) and accounts for 61.5% of total EV sales in India. Electric three-wheelers, across both

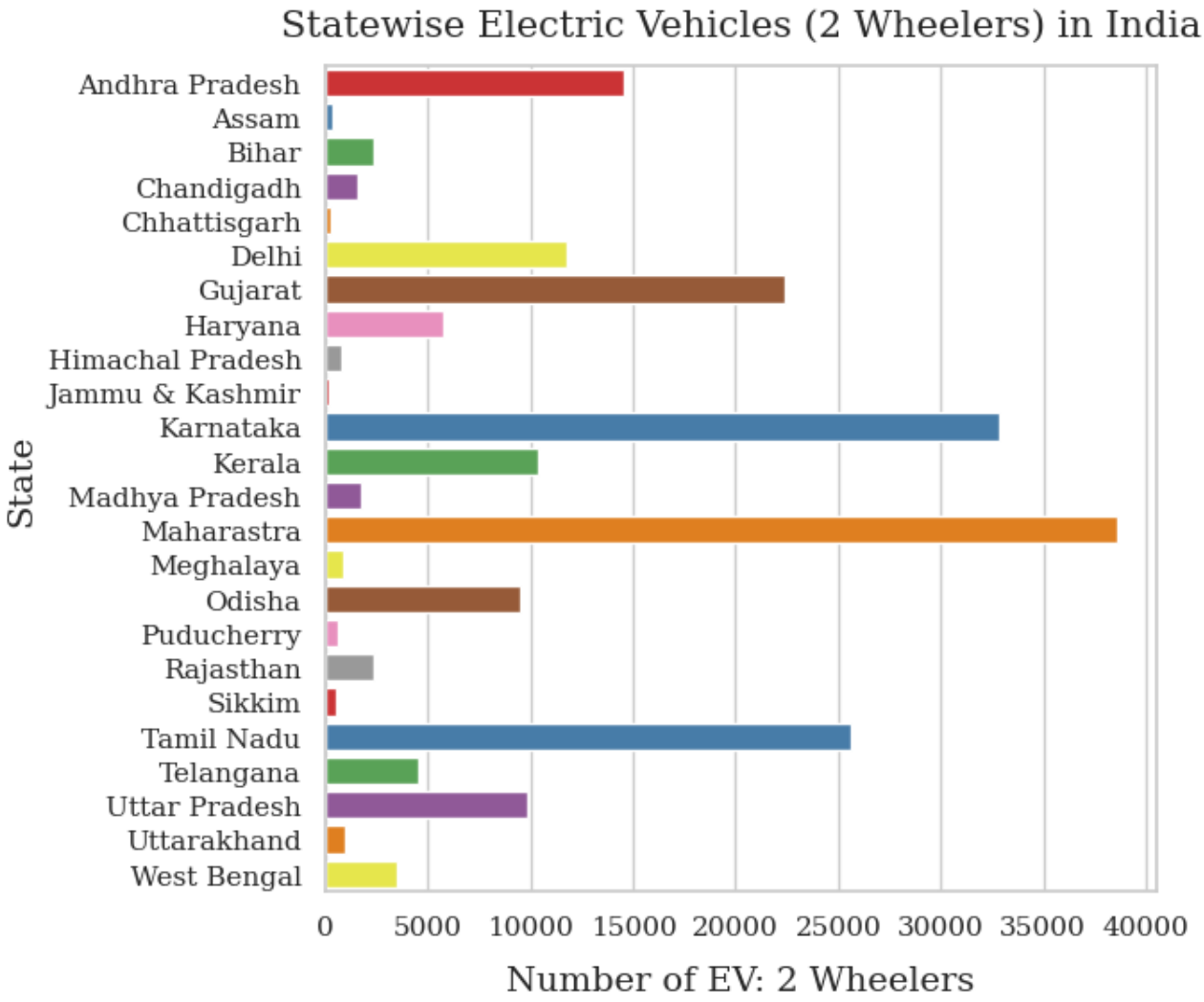
passenger- and cargo-transporting model, sold a total of 399,540 units, up 47% YoY (FY2022: 188,447 units) and accounted for 34% of total EV sales in FY2023. Thus, combined two- and three-wheeler EV sales comprise an overwhelming 95% of the record EV industry sales.




With 720,733 units in the 365 days of FY2023, the electric two-wheeler industry has chalked

Handsome year-on-year growth of 185% (FY2022: 252,543 ). Ola Electric, with 151,344 units, is the market leader by a huge margin, averaging monthly retails of 12,612 units and ahead of the No. 2 player by 57,211 units – Okinawa Autotech sold a total of 94,133 units and retains the second place it held in FY2022. With this solid performance, Ola now has a 21% share of the e-two-wheeler retail market. It is also the sole player to surpass the 100,000 unit mark and by a big margin.

The top six OEMs have each sold over 75,000 units and their combined sales add up to 575,143 units, which comprises 80% of total sales in FY2023.



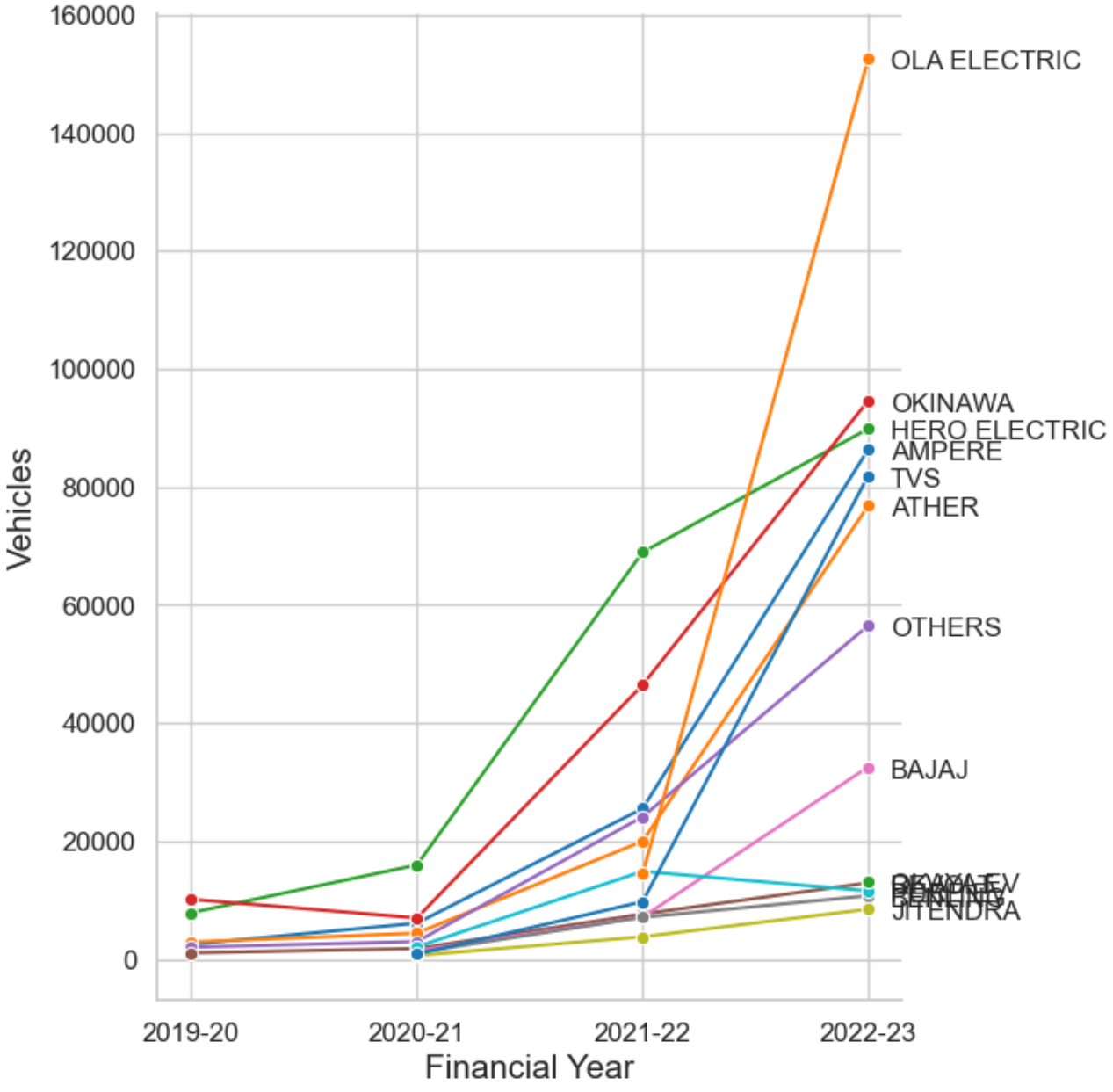

India EV Inc's strong growth trajectory has its footprint across multiple states and Union territories in terms of EV ownership. With nearly all States and Union Territories wooing EV buyers with EV-ownership friendly policies and measures, finding out how they fare on the EV ownership / user chart is important.

As per the data, of the total 29,50,563 EVs sold in India till end-September 2023, 12 states including one UT, each with six-figure sales, cumulatively account for 24,59,746 EVs or 83 percent. Three states – Uttar Pradesh, Maharashtra and Karnataka – together account for 11,07,013 EVs or 37.51% of the India total.

Southern India is increasingly where the EV action is what with Karnataka, Tamil Nadu, Telangana and Andhra Pradesh housing the manufacturing operations of the leading two-wheeler OEMs ranging from e-three-wheeler market leader Mahindra Last Mile Mobility's plant in Bengaluru to Ather Energy's state-of-the-art 420,000-units-per-annum facility at Hosur, Tamil Nadu or Hero MotoCorp's Vida-producing factory at Chittoor in Andhra Pradesh.

## Two-Wheeler EV Companies:

A deep dive into the Vahan retail sales data reveals that of the 170-odd OEMs in India's very competitive e-two-wheeler market, the top 10 EV makers have each sold more than 1,000 units each and cumulatively sold 83,920 units, accounting for 92% of the total sales in November 2023.




There are three EV OEMs – Ola Electric, TVS Motor Co and Bajaj Auto – with retail sales in five figures. While Ola and TVS have been clocking sales in thousands each month for quite some time now, Bajaj Auto is the latest company to do so, having recorded its best-ever monthly sale of 11,668 units in November 2023.

Market leader Ola Electric continues its dominance and how. At 29,764 units, its November sales are up 25% on October's 23,821 units and the second-best in the year to date after May's 28,728 units.

The company's market share has grown to 32% in November. What's more, the company has clocked cumulative sales of 236,441 units in the first 11 months of 2023 and will easily cross the 250,000 mark for the year, making it the first OEM in India to do so. The company is benefiting from its refreshed S1 series of e-scooters and has already garnered over 75,000 bookings, so expect it to maintain the strong momentum in the months ahead.

Like Ola, TVS Motor Co too had recorded its second-best monthly sales in November – 18,931 units, which is a month-on-month growth of 15% and gives it a market share of 21%. Between January and November, TVS has sold 153,960 iQubes. In September, the iQube rode past the cumulative 200,000 sales milestone in 45 months since launch in January 2020.

In August, the company had launched its new and premium EV flagship, the TVS X, priced at Rs 250,000, at a mega event in Dubai.

The industry's eyes are on Bajaj Auto, which had gone past the longstanding No. 3 OEM Ather Energy in October. The legacy player, which entered the EV market in January 2020 (just like TVS), maintains its newly-claimed No. 3 rank with best-ever monthly sales of 11,668 units, up 29% month on month (October 2023: 9,052 units).

Demand for the Chetak, Bajaj Auto's sole electric scooter, is rising with every passing month, which has helped the company move from fourth rank to a new and strong No. 3. The Bajaj Chetak had a market share of 13% in November, quite a jump from the 4% it had in January 2023. The company is looking to ramp up production as well as expand its network of exclusive Chetak showrooms. Expect Bajaj Auto to be among the EV newsmakers in the months to come.

While the initial cost of an electric scooter or motorcycle remains higher than its petrol-engined sibling, what is making a growing number of riders make the transition to e-mobility is the wallet-friendliness of EVs in the long term.

It is also likely that in the absence of clarity about the FAME subsidy being extended beyond April 2024, personal EV buyers as well as fleet buyers could be advancing their purchases. This could translate into strong demand for EV OEMs in the first three months of CY2024.

## K-Means Clustering:

Clustering is a widely used exploratory data analysis technique that aims to reveal the inherent structure of data. It involves identifying subgroups in the data where data points within the same subgroup exhibit high similarity, while those in different subgroups are dissimilar. The goal is to find homogeneous subgroups based on a similarity measure, such as Euclidean or correlation-based distance.

Clustering analysis can be conducted on either the basis of features, seeking subgroups of samples based on features, or on the basis of samples, seeking subgroups of features based on samples.

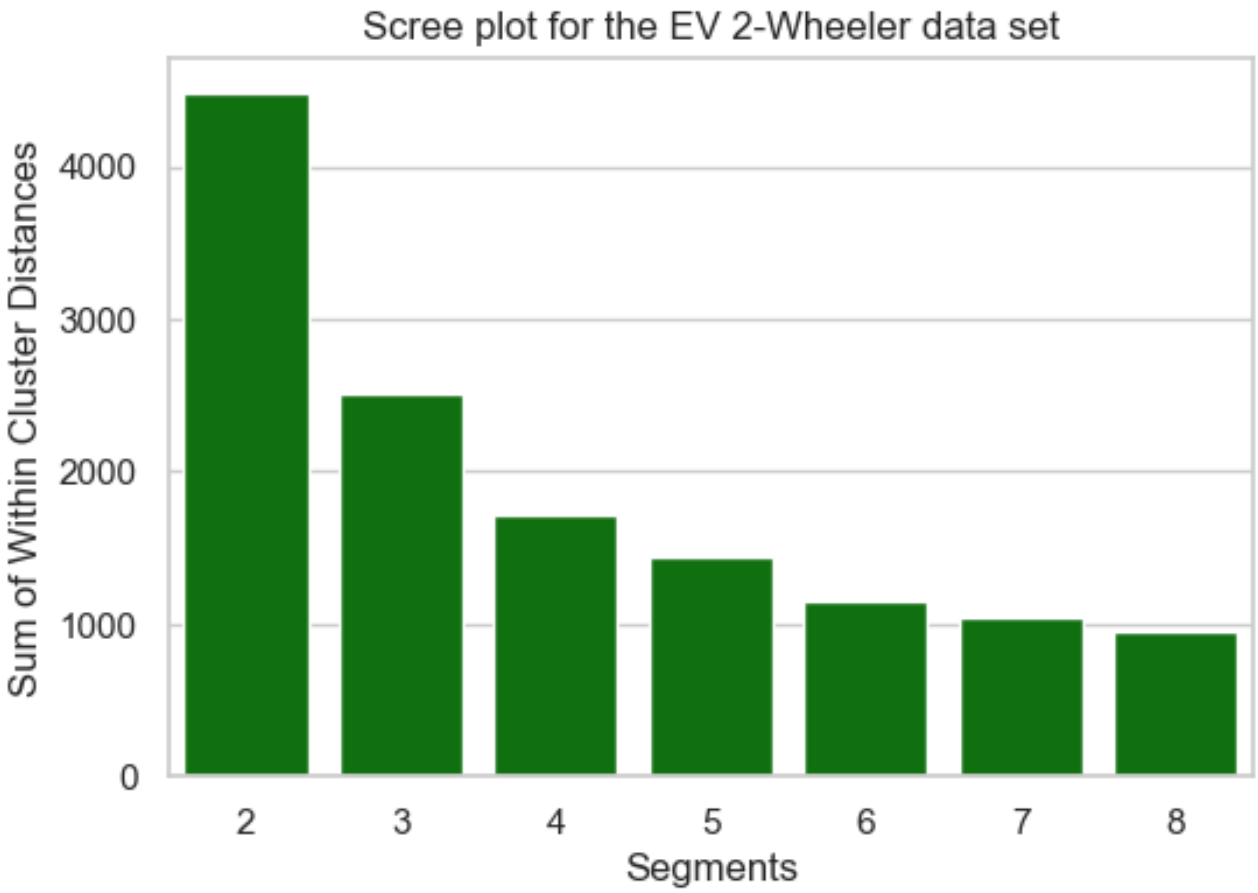
## K-Means Algorithm:

The K-Means algorithm is an iterative approach that divides the dataset into predefined, non-overlapping clusters. Each data point is assigned to a single cluster, aiming to maximize the similarity within clusters and minimize the dissimilarity between them. The algorithm initializes centroids by randomly selecting data points without replacement and iterates until there is no change in the assignment of data points to clusters.

The steps of the K-Means algorithm are as follows:

- Specify the number of clusters, K.
- Initialize centroids by shuffling the dataset and randomly selecting K data points as centroids.
- Iterate until centroids remain unchanged, ensuring that data point assignments to clusters do not change.

K-Means follows the expectation-maximization approach. The E-step involves assigning data points to the nearest cluster, while the M-step is computing the centroid of each cluster.

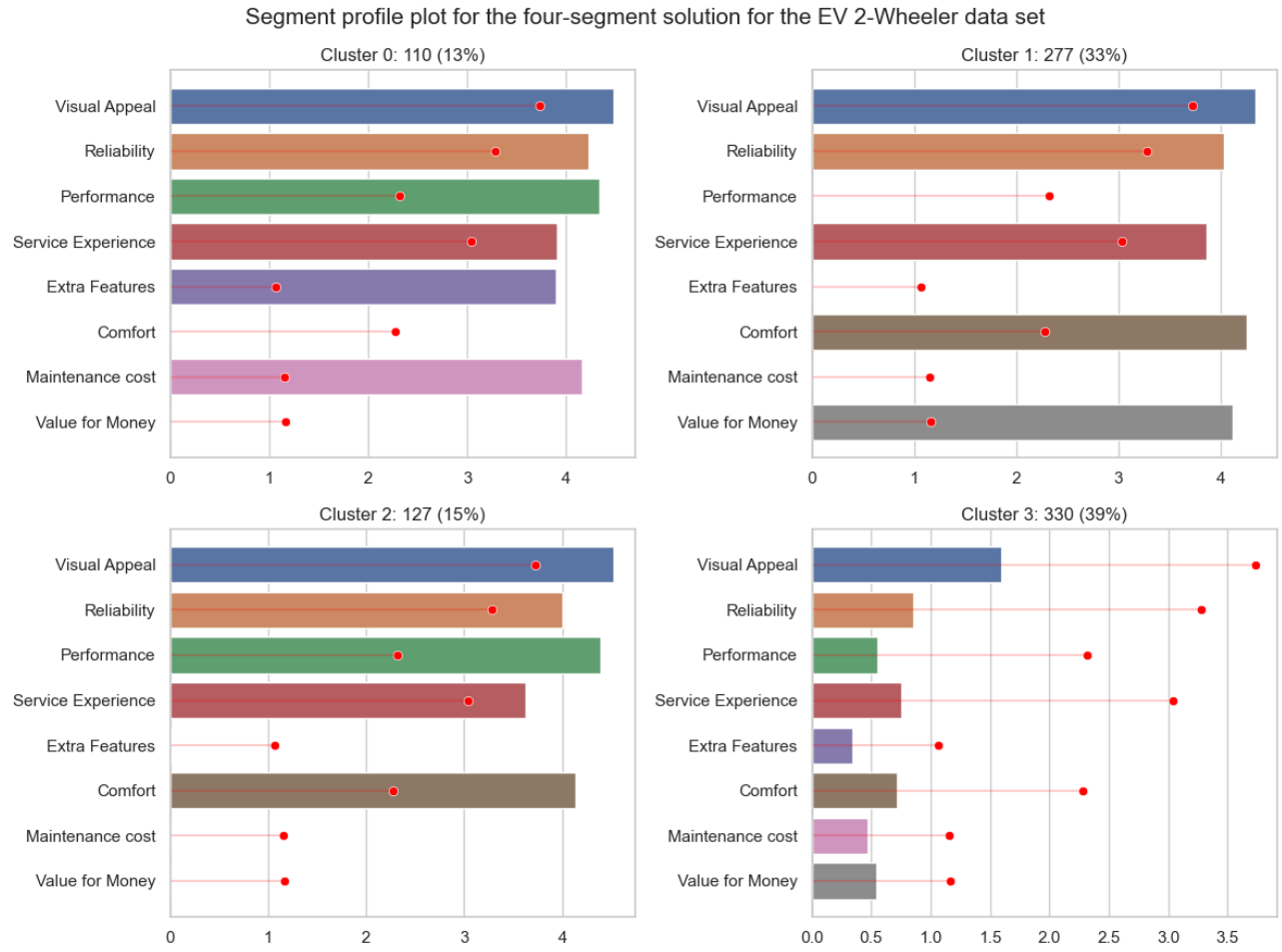



The decision-making process was significantly guided by the scree plot above, revealing a distinct elbow at four segments. This marked point indicated a substantial reduction in distances, signifying the optimal number of segments for our analysis.

Based on the analysis, the target segment can be narrowed down to EVs having:

**Psychographic factors** such as Comfort and Value for Money
**Behavioral factors** such as good Acceleration and viable Price range
**Geographic factors** such as States which are more market friendly

In conclusion, the target segment should comprise of EVs having **Acceleration** of 7.5-10 sec, High
in **Comfort** and **Value for Money** ratings, have a **Price** range of 20-30 Lakhs, and be focused
mainly on **States** such as Maharashtra, Karnataka, Tamil Nadu and Rajasthan.



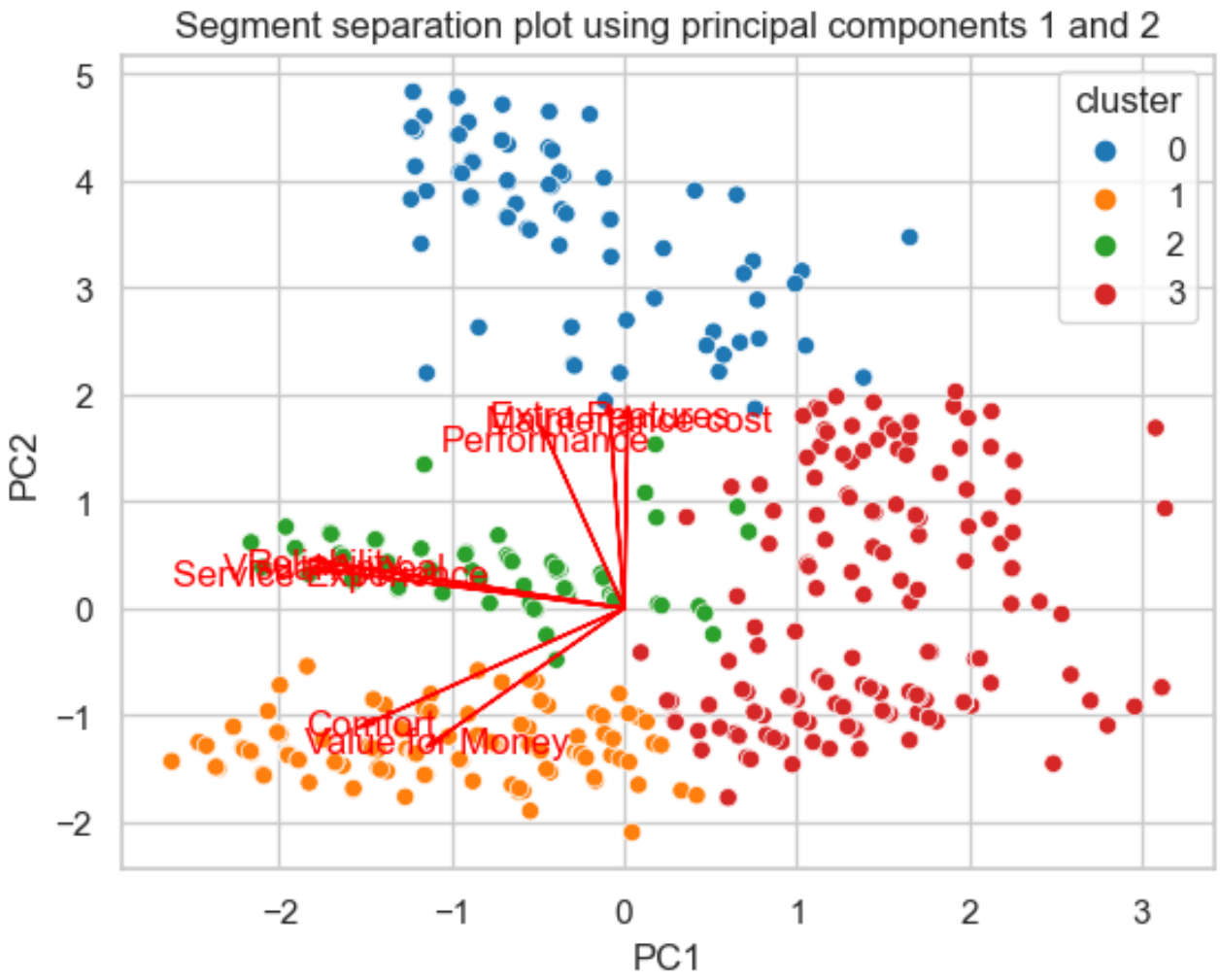

The graph vividly illustrates the varied perspectives within different consumer segments.

- Segment 0, comprising 15% of consumers, highly values the electric two-wheeler for its aesthetic appeal, reliability, performance, service experience, and comfort.

- Segment 1, representing the largest group at 39%, expresses dissatisfaction across all aspects, making them the most substantial but least content segment.

- Segment 2, constituting 33% of consumers, holds appreciation for visual appeal, reliability, service experience, comfort, and notably emphasizes a strong perception of value for money.

- Segment 3, the smallest at 13%, places value on visual appeal, reliability, performance, service experience, additional features, and maintenance costs, showcasing distinctive perceptions, particularly regarding features and expenses.




**Above Figure, utilizing principal components, further emphasizes the differences among segments. Notably, Segment 1, despite being the largest segment, lacks specific opinions, making them unique in their lack of satisfaction.**

Analyzing the technical specifications of electric vehicles across various segments reveals distinctive trends. Segment 0 exhibits a preference for premium EVs with higher prices and extended riding ranges, catering to consumers who prioritize luxury and long-distance travel. Segment 1 focuses on budget-friendly options with lower prices and moderate riding ranges, suitable for daily commuting. Segments 2 and 3 prioritize affordability, with slight variations in riding range and speed preferences. Weight preferences differ, with Segments 0 and 1 favoring heavier vehicles, while Segments 2 and 3 prefer lighter options. Charging time also varies, with Segments 0 and 3 opting for longer durations for overnight charging, while Segments 1 and 2 prioritize faster charging for quick turnaround times. These nuanced preferences

significantly influence the electric vehicle market in India.es. These nuanced preferences shape the electric vehicle market in India.

## Target Segment Selection:

The strategic target segments for the electric vehicle market are identified as Segment 1 (39% of consumers) and Segment 2 (33% of consumers). Segment 1's diverse preferences and dissatisfaction points present an opportunity for enhancing customer satisfaction and loyalty by addressing specific demands. Segment 2 values visual appeal, reliability, service experience, and comfort, offering a chance to tailor electric vehicles to meet these expectations and emphasize value for money. The strategy involves addressing dissatisfaction points in Segment 1 and enhancing positive elements in Segment 2, aligning electric vehicles with the distinct expectations of each segment to ensure a competitive advantage and sustained market growth.

## Customization of the Marketing Mix:

In our electric vehicle market strategy, customization of the marketing mix is crucial for appealing to Segment 1 and Segment 2, our target segments.

Product customization involves enhancing features based on specific desires, addressing dissatisfaction points for Segment 1, and emphasizing visual appeal and value for money for Segment 2. Diverse offerings cater to varied tastes and budgets within each segment.

Price customization includes competitive pricing for Segment 1 and a slightly higher price point for value-added features in Segment 2.

Promotion customization focuses on targeted advertising and tailored promotional events for each segment's preferences.

Place customization establishes accessible distribution channels in urban areas for Segment 1 and suburban/semi-urban regions for Segment 2, with a strong emphasis on an online presence and customer support.

People and Process Customization involves training customer service representatives to address segment-specific concerns and ensuring efficient processes for customization requests and service appointments. This

tailored approach ensures our electric vehicles align with the distinct needs of Segment 1 and Segment 2, enhancing market relevance and customer preference.

## Potential Early Market Customer Base:

In the analysis of the early market customer base, two primary segments are identified: Segment 1 with 330 members (39% of consumers) and Segment 2 with 277 members (33% of consumers). The target price range for Segment 1 falls between ₹51,094 and ₹1,67,844, and for Segment 2, it ranges from ₹51,094 to ₹1,37,890. By multiplying the number of potential customers in each segment by the targeted price range, potential profits can be calculated. For example, with a target price of ₹1,20,000 for Segment 1, the potential profit amounts to ₹39.60 crores, and for Segment 2 with a target price of ₹1,10,000, the potential profit is ₹30.47 crores. Segment 1, being larger in potential market share, is the primary focus for early market penetration efforts due to its significant profit opportunity.

## Most Optimal Market Segments:

After thorough analysis and evaluation, Segment 1, constituting 39% of consumers, has been identified as the optimal market segment for electric two-wheeler vehicles. With a substantial customer base and a balanced blend of technical specifications and price range, this segment offers significant market potential. The recommended technical specifications for Segment 1 include a price range of ₹70,688 to ₹1,29,063, riding range of 89 to 180 km, top speed of 58 to 116 kmph, weight of 76 to 120 kg, battery charging time of 3 to 5 hours, and rated power of 1200 to 5500 W. This targeted approach ensures alignment with the diverse needs and preferences of the market, laying the foundation for a successful and sustainable venture into the electric vehicle market.

## Conclusion:

In summary, our in-depth analysis of India's electric vehicle market led us to identify Segment 1 as the optimal target. With a significant 39% consumer base, this segment represents a substantial market opportunity. By tailoring our electric two-wheeler specifications to meet the preferences of this segment, we ensure our products align seamlessly with the demands of a large customer base. This strategic decision is grounded in a thorough understanding of market segmentation, consumer behavior, and technical specifications. These insights provide a clear direction for our market entry, emphasizing precision and relevance in both product development and marketing strategies. Moving forward, this approach equips us with a solid foundation, ensuring our offerings resonate effectively within India's evolving electric vehicle landscape.