Market Segmentation of India Electric Vehicle Market

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Github Project Link: https://github.com/Shivagni/

Problem Statement (EV Market)

We are part of a team working under an Electric Vehicle Startup, focusing on determining which vehicle or customer space to target for our EV development. Our goal is to analyze the Electric Vehicle (EV) market in India using segmentation analysis to formulate a feasible market entry strategy. We will target the segments most likely to adopt EVs by considering various factors, including Geographic, Demographic, Psychographic, and Behavioral segments, along with other relevant data.

1.0 Introduction

India's electric vehicle (EV) sector is witnessing rapid growth, driven by government incentives, environmental concerns, and technological advancements. Initiatives like the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme aim to significantly increase EV adoption, revolutionizing India's transportation towards sustainability.



India's EV objectives include achieving 30% of private car sales, 70% of commercial vehicle sales, 40% of bus sales, and 80% of two- and three-wheeler sales by 2030, translating to 80 million EVs on the road. The 'Make in India' initiative further emphasizes complete domestic EV production.

- **Global EV Market**: Valued at US\$ 255.54 billion in 2023, projected to reach US\$ 2,108.80 billion by 2033 (CAGR of 23.42%).
- Indian EV Market: Expected to grow from US\$ 3.21 billion in 2022 to US\$ 113.99 billion by 2029 (CAGR of 66.52%).

In 2023, EV sales in India grew by 49.25%, reaching 1.52 million units. The EV battery market is projected to grow from US\$ 16.77 billion in 2023 to US\$ 27.70 billion by 2028.

Source: PIB, Media research

1.1 Participants Structure

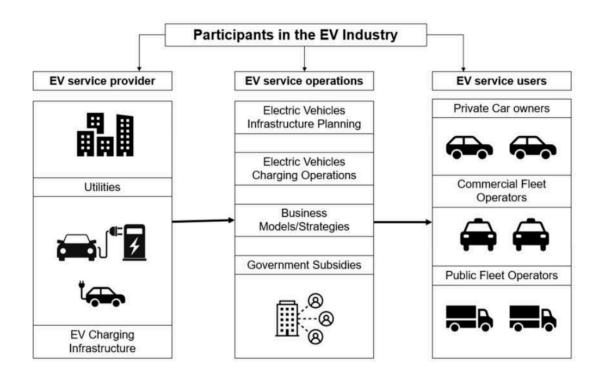


Figure 1 : Source: EY Parthenon Electrifying Indian Mobility, PIB

1.2 Data Collection

Data Sources:

Dataset 1 : State-wise Automobile Sales

Dataset 2 : EV Market data

Dataset 3: Purchasing Behaviour

2.0 Fermi Estimation

2.1 Assumptions Based on Publicly Available Data:

(Source: mordorintelligence)

1. Total Indian EV Market (2024): \$34.8 billion

2. Expected Market Growth Rate: 22.92% CAGR

3. Market Distribution by Vehicle Segment:

Two-wheelers: 60% of the marketThree-wheelers: 30% of the market

• Four-wheelers: 10% of the market

4. Urban/Rural Market Split:

• Urban: 80% of the market

• Rural: 20% of the market

5. Number of Vehicles in India:

Two-wheelers: 210 million
Three-wheelers: 6 million
Four-wheelers: 70 million

6. EV Penetration Rates:

• Two-wheelers: 10% in urban areas, 5% in rural areas

• Three-wheelers: 20% in urban areas, 6% in rural areas

• Four-wheelers: 5% in urban areas, 1% in rural areas

7. Number of Major Competitors:

Two-wheelers: 6Three-wheelers: 4Four-wheelers: 5

- 8. Average Market Share of a New Entrant: ~ 1-3% for all segments in the first year
- 9. Population of India: ~1.4 billion.
- 10. Vehicle Ownership: ~20% of the population owns vehicles (rough estimate).
- 11. EV Adoption Rate: Assume a conservative adoption rate (e.g., 5%)
- 12. Average EV Price: ~₹15 lakh (₹1.5 million)
- 13. Current EV Sales in India: 4 million

2.2 Market Size Estimation:

1. Calculate Vehicle Owners:

Vehicle Owners = Total Population × Percentage of Vehicle Owners = 1.4 billion × 0.20 = 280 million

2. Estimate Potential EV Buyers:

Potential EV Buyers = Vehicle Owners × EV Adoption Rate = 280 million × 0.05 = 14 million

3. Market Size in Terms of Revenue:

Market Size = Potential EV Buyers × Average EV Price = 14 million × ₹15 lakh = ₹21 trillion

4. Two-Wheelers:

a. Urban Area:

- i. Potential Market Size: 210 million * 80% * 10% = 16.8 million EVs
- ii. Total Addressable Market for New Entrant: 16.8 million / 6 = 2.8 million EVs
- iii. Potential Market Share: 2.8 million * 1% = 28,000 EVs

b. Rural Area:

- i. Potential Market Size: 210 million * 20% * 5% = 2.1 million EVs
- ii. TAM for New Entrant: 2.1 million / 6 = 350,000 EVs
- iii. Potential Market Share: 350,000 * 1% = 3,500 EVs

5. Three-Wheelers:

a. Urban Area:

- i. Potential Market Size: 6 million * 80% * 20% = 9,60,000 EVs
- ii. TAM for New Entrant: 9.60,000 / 4 = 2,40,000 EVs
- iii. Potential Market Share: 2,40,000 * 1% = 2,400 EVs

b. Rural Area:

- i. Potential Market Size: 6 million * 20% * 6% = 72,000 EVs
- ii. TAM for New Entrant: 180,000 / 4 = 18,000 EVs
- iii. Potential Market Share: 18,000 * 1% = 180 EVs

6. Four-Wheelers:

a. Urban Area:

- i. Potential Market Size: 70 million * 80% * 5% = 2.8 million EVs
- ii. TAM for New Entrant: 2.8 million / 5 = 5.60.000 EVs
- iii. Potential Market Share: 5,60,000 * 1% = 5,600 EVs

b. Rural Area:

- i. Potential Market Size: 70 million * 20% * 1% = 140,000 EVs
- ii. TAM for New Entrant: 140,000 / 5 = 28,000 EVs
- iii. Potential Market Share: 28,000 * 1% = 280 EVs

2.3 Revenue Potential:

1. Estimate Sales Volume:

Estimate a feasible number of vehicles to sell in the first few years, e.g., 10,000 units.

2. Calculate Revenue:

Revenue = Sales Volume × Average EV Price =10,000 * ₹15 lakh = ₹1,500 crore

2.4 Market Share:

1. Estimate Market Share:

If there are 20 competitors and your startup captures 1% of the market:

Market Share =Total Market Size × Startup's Share

= ₹21 trillion × 0.01 = ₹210 billion

By combining detailed segmentation analysis with targeted data collection and Fermi estimation, we can develop a robust strategy for entering the Indian EV market.

3. Sales Data

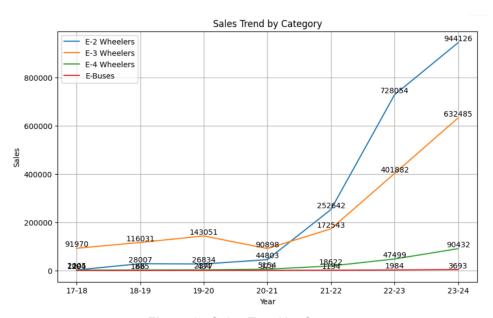


Figure 2: Sales Trend by Category

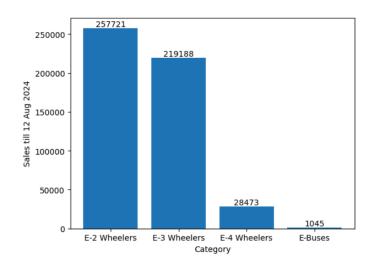


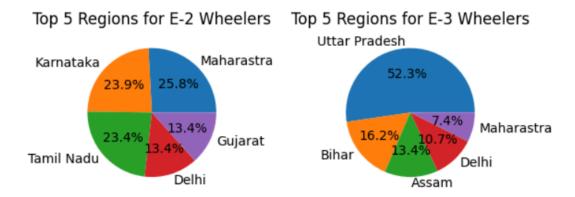
Figure 3: Sales in 2024 till August '24

After analyzing the data, the electric two-wheeler segment emerged as the most promising area for detailed analysis due to its strong growth and market leadership.

3.1 Sector Composition

e-2Ws	Units	% Share	E3Ws	Units	% Share	ePVs	Units	% Share	eBuses	Units	% Share
Maharashtra	2,72,502	17%	Uttar Pradesh	4,63,393	39%	Maharashtra	26,629	19%	Maharashtra	1,459	27%
Karnataka	2,29,582	14%	Bihar	1,43,863	12%	Telangana	20,188	15%	Delhi	981	18%
Tamil Nadu	1,54,563	10%	Assam	1,18,630	10%	Karnataka	15,636	11%	Uttar Pradesh	758	1496
Telangana	1,36,269	8%	Delhi	94,389	8%	Delhi	15,357	11%	Gujarat	563	1196
Gujarat	1,34,247	8%	Rajasthan	61,842	5%	Kerala	13,083	10%	Karnataka	553	10%
Rajasthan	1,15,161	7%	Madhya Pradesh	45,231	4%	Gujarat	8,728	6%	J&K	130	2%
Kerala	86,381	5%	Haryana	40,280	3%	Tamil Nadu	8,089	6%	Kerala	117	2%
Delhi	70,048	4%	West Bengal	37,039	3%	Rajasthan	5,297	4%	West Bengal	105	2%
Uttar Pradesh	61,706	4%	Uttarakhand	30,195	2%	Uttar Pradesh	3,683	3%	Himachal	84	2%
Andhra Pradesh	60,243	4%	Jharkhand	21,154	2%	West Bengal	3,321	2%	Chandigarh	80	2%

Table 1 : Source : EVReadyIndia



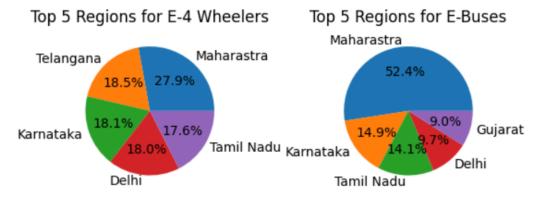


Figure 4: Top 5 players in each category of EVs

Distribution of Electric Vehicle Types

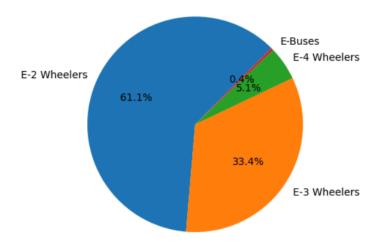


Figure 5: Distribution of EV Types

• As of 2024 E2W constitutes the largest share of the total electric vehicles sold (by volume), accounting for ~61%.

4. Product segments

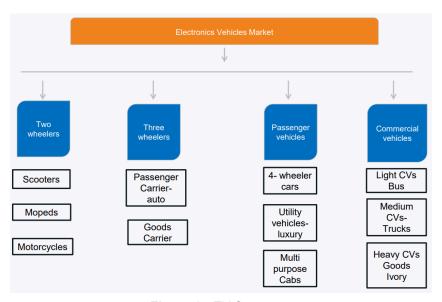


Figure 6: EV Segments

4.1 Robust growth

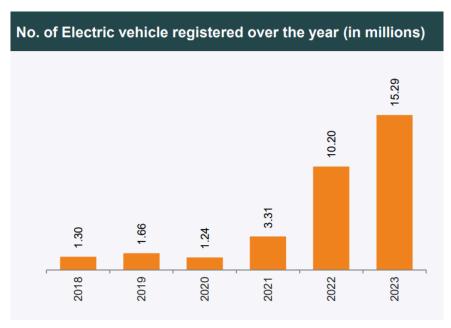


Figure 7: No of EVs registered year-wise

- EV Sales (FY24): 1,752,406 units, a 40.31% YoY growth.
- E2W Growth: Sales surged from 143,000 in 2021 to 859,376 in 2023.

4.2 EV Infrastructure



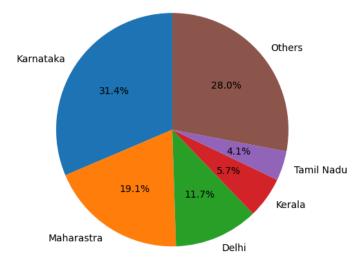


Figure 8 : Distribution of Charging Stations by Region

• Current Status: 12,146 public EV charging stations as of February 2024.

• **State-Specific Goals**: Maharashtra and Karnataka are leading with specific EV targets.

5.0. Policies to boost Electric Vehicle manufacturing

FAME II: Focuses on electrifying public and shared transportation.

State Policies: Bihar and Tamil Nadu have introduced specific policies to promote EV adoption and manufacturing.

Source: Media Sources, JMK Research

1. Emerging Companies in the Electric Vehicle Landscape

- 1. **Ather Energy:** Partnered with Hero MotoCorp for a fast-charging network; opened a second plant in Tamil Nadu.
- 2. **BluSmart:** Operates 7,000 EVs; partnered with Tata Power for 100% renewable energy charging.
- 3. **OLA Electric:** Allied with Buddh International Circuit for MotoGP; raised \$385 million.
- 4. **Yulu:** Raised \$19.25 million; partnered with Zepto for green hyperlocal deliveries.
- 5. **E Motorad:** Invested \$3.5 million in E-cycle production in India.
- 6. Revolt Motors: Acquired by Rattan India; surpassed 100 dealerships.
- 7. **ElectricPe:** Partnered with Greaves Finance; expanded services with mobility centers.

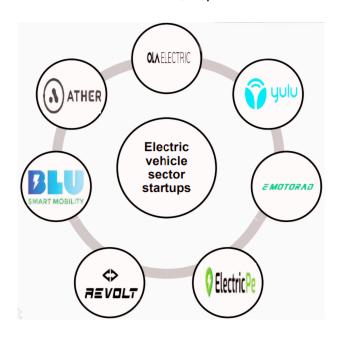


Figure 9: Emerging Companies in the Electric Vehicle Landscape

7. Major Key Battery Producers in India

- 1. **Exide:** Major Indian battery manufacturer with a diverse range of EV batteries.
- 2. **Amaron:** Technological pioneer and leading producer of lead-acid batteries for automotive and industrial sectors.
- 3. **Okaya Power:** Premier battery maker specializing in high-density, fast-charging EV batteries with extended lifespan.
- 4. Livguard Energy: Emerging player offering widely acclaimed EV batteries.
- 5. **HBL:** Leading research-based Indian company, major battery manufacturer.
- 6. **Nexcharge:** Provides scalable energy storage solutions using cutting-edge technology.

Source: Respective Company websites, News articles, PIB

Result: The EV market segmentation analysis in India using decision tree modeling yielded insightful findings. It identified distinct consumer segments based on key features like acceleration, speed, efficiency, range, rapid charging, seating capacity, powertrain, and price. These insights shed light on consumer preferences, highlighting factors such as rapid charging and range as crucial in driving EV adoption. The analysis also pointed towards opportunities for market expansion and product development. Overall, it provided valuable guidance for stakeholders to tailor offerings and incentives, accelerating the growth of the EV market in India.

8. Vehicle Segments and Market Size

The Electric Vehicle (EV) market in India spans various segments, each with distinct characteristics:

1. 2-Wheelers

Dominance: The most prominent segment, driven by affordability and high demand in urban areas.

2. 3-Wheelers

Usage: Widely used for public transportation and delivery services.

3. Passenger Cars

Adoption: Growing, especially in metropolitan regions.

4. Electric Buses

Penetration: Gradually entering public transportation systems in key states.

9. Key Variables for Market Segmentation

To effectively segment the Indian EV market, focus on these four influential factors:

- **Vehicle Type** (2-Wheeler, 3-Wheeler, Passenger Car, Bus): This is a natural division of the market, as each vehicle type has a unique customer base, use case, and market dynamics. For example, 2-wheelers are favored by urban commuters, while electric buses serve public transport needs. Targeted strategies can be developed based on these distinctions.
- **Battery Capacity (kWh)**: Battery capacity determines the range and performance of an EV. Higher capacity appeals to long-distance travelers or those seeking better performance, while lower capacity suits short-range urban users. This factor is crucial for segmenting consumers based on usage needs and price sensitivity.
- **Price Range**: Price is a key differentiator in the market. Consumers at different price levels have varying expectations (e.g., luxury features vs. affordability). Segmenting by price range allows for clear distinctions between premium, mid-range, and budget segments, each catering to different demographics and preferences.
- Charging Infrastructure Availability: The presence of charging stations significantly influences EV adoption. Regions with abundant infrastructure see higher EV adoption, while areas with limited infrastructure experience slower growth. This factor is essential for geographic segmentation, highlighting regional differences in market potential.

10. Exploratory Data Analysis

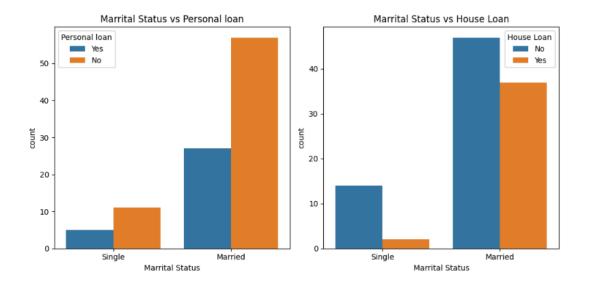


Figure 10: Loans taken vs Marital Status

Married households are considering loan options more as compared to Single individuals.

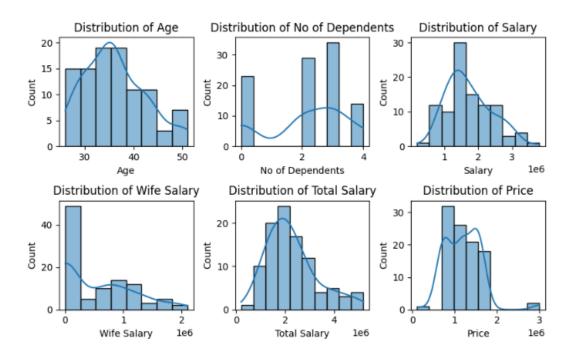


Figure 11: Univariate Analysis of various numeric features

Observations from the graphs:

Age: The distribution of age appears to be roughly normally distributed, with the majority of buyers between the ages of 30 and 50.

No of Dependents: Most buyers have 0-2 dependents, with the number of buyers decreasing as the number of dependents increases.

Salary, Wife Salary, Total Salary: These distributions are right-skewed, indicating a higher concentration of individuals with lower incomes and a smaller number of individuals with very high incomes.

Price: The distribution of EV prices is also right-skewed, suggesting that most EVs purchased are in the lower to mid-price range.

11. Indian Consumer Vehicles purchasing behaviour

Here are the key points we can derive from *Figure 12*:

- **Employment**: 65% of the customers are salaried employees, while 35% are self-employed.
- Marital Status: 85% of the customers are married, and 15% are single.
- **Spousal Employment**: 51% of customers have working spouses.
- **Education**: 55% of customers hold a Post Graduate degree, and 35% have a Graduate degree.
- Loans: 32% of customers have a personal loan, and 38% have a house loan.

- Vehicle Preferences: The most popular vehicle purchases are SUVs, followed by Balenos and Cretas.
- Dependents: Most customers have 2 to 3 dependents.

Distribution of Categorical Features

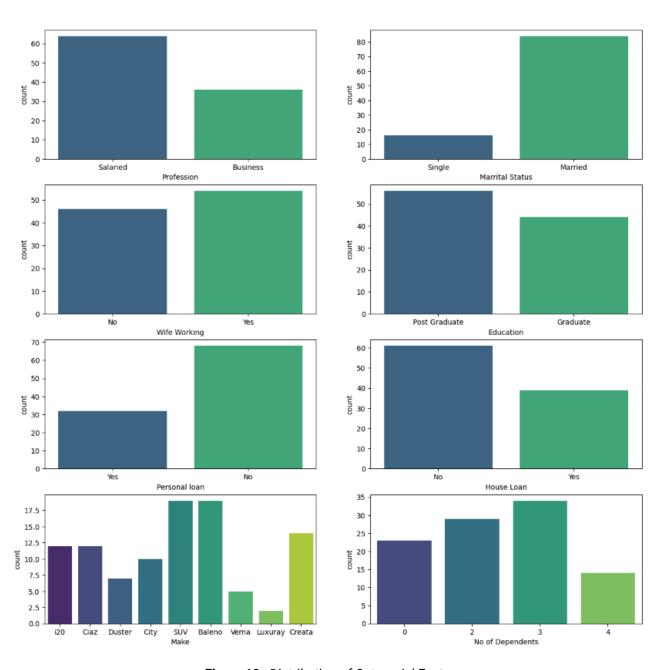


Figure 12: Distribution of Categorial Features

Cluster	Age	No of Dependents	Salary	Wife Salary	Total Salary	Price	Size	Profession	Marrital Status	Education	Personal loan	House Loan	Wife Working	Make
0	32.5	2.0	1400000.0	0.0	1650000.0	800000.0	18	Business	Married	Post Graduate	No	No	No	i20
1	41.5	3.0	2050000.0	0.0	2050000.0	1050000.0	20	Salaried	Married	Graduate	Yes	Yes	No	Baleno
2	37.0	3.0	2000000.0	1100000.0	3100000.0	1600000.0	35	Salaried	Married	Post Graduate	No	No	Yes	SUV
3	31.0	0.0	1300000.0	0.0	1400000.0	1100000.0	27	Salaried	Married	Post Graduate	No	No	No	Baleno

12. Describing Segments:

This section provides a detailed analysis of each consumer segment, highlighting their unique characteristics and behaviours:

Dataset 1: Segmentation Based on Indian Vehicle Buyer's Behaviour Data

Cluster 0: "Young Entrepreneur"

Age: 32.5 years
 Dependents: 2
 Salary: ₹1,400,000
 Wife's Salary: ₹0

Total Salary: ₹1,650,000Price of Car: ₹800,000

• Car Size: 18 (This could represent

size or model type)
Profession: Business
Marital Status: Married
Education: Post Graduate

Personal Loan: No
House Loan: No
Wife Working: No
Car Make: i20

Cluster 1: "Established Professional"

Age: 41.5 years
 Dependents: 3
 Salary: ₹2,050,000
 Wife's Salary: ₹0

Total Salary: ₹2,050,000Price of Car: ₹1,050,000

• Car Size: 20

Profession: Salaried
Marital Status: Married
Education: Graduate
Personal Loan: Yes
House Loan: Yes
Wife Working: No
Car Make: Baleno

Cluster 2: "Dual-Income Family"

Age: 37 yearsDependents: 3Salary: ₹2,000,000

Wife's Salary: ₹1,100,000
Total Salary: ₹3,100,000
Price of Car: ₹1,600,000

• Car Size: 35

Cluster 3: "Young Salaried Individual"

Age: 31 years
 Dependents: 0
 Salary: ₹1,300,000
 Wife's Salary: ₹0

Total Salary: ₹1,400,000
 Price of Car: ₹1,100,000

• Car Size: 27

Profession: Salaried
Marital Status: Married
Education: Post Graduate

Personal Loan: No
House Loan: No
Wife Working: Yes
Car Make: SUV

Profession: Salaried Marital Status: Married Education: Post Graduate

Personal Loan: No
House Loan: No
Wife Working: No
Car Make: Baleno

Dataset 2: Segmentation Based on Electric Vehicle State-wise Data

Segment 1: High Overall EV Adoption with Two-Wheeler Dominance

• Target States: Uttar Pradesh, Delhi, Karnataka

Why Focus Here:

- High Market Potential: These states have a large number of two-wheelers, indicating strong demand and a mature market for electric two-wheelers.
- Established Infrastructure: High EV adoption suggests that these states may already have some level of charging infrastructure, making it easier to scale operations.
- Urban Demand: States like Delhi and Karnataka have large urban populations, driving demand for personal mobility solutions like electric scooters and bikes.

2. Segment 2: Moderate EV Adoption with Four-Wheeler Dominance

• Target States: Tamil Nadu, Gujarat, Kerala

- Why Focus Here:
 - Growing Market for Electric Cars: The dominance of four-wheelers indicates
 potential for growth in the electric car segment, which is still in its early stages.
 - Room for Expansion: These states are showing moderate adoption rates, suggesting that with the right strategies (e.g., incentives, infrastructure), there's significant potential to capture market share.

3. Segment 3: Low EV Adoption with Three-Wheeler Dominance

Target States: Bihar, Assam, West Bengal

- Why Focus Here:
 - Untapped Potential: Low overall adoption suggests a market that's still developing, presenting opportunities for early entry and growth.
 - Commercial Focus: The dominance of three-wheelers indicates a focus on commercial use, such as public transport and last-mile delivery, where there is growing demand for cost-effective, sustainable solutions.

Strategic Rationale:

- **High ROI Potential:** Focusing on segments with high or moderate adoption ensures quicker returns on investment due to existing demand and infrastructure.
- **First-Mover Advantage:** Targeting segments with low adoption but specific vehicle dominance (like three-wheelers) allows you to establish a strong market presence early.
- **Diverse Market Coverage:** By investing across segments with different vehicle dominance (two-wheelers, four-wheelers, and three-wheelers), you can diversify risk and capitalize on multiple growth areas.

By strategically focusing on these segments, you can tailor your approach to the specific needs and characteristics of each region, maximizing the potential for success in the Indian EV market.

13. Selection Of Target Segment

To develop a successful strategy for an EV startup entering the Indian market, the focus should be on two key customer segments: **High-Income Families** and **Affluent Young Professionals**, and two geographic segments: **High EV Adoption with Two-Wheeler Dominance** and **Moderate EV Adoption with Four-Wheeler Dominance**.

Strategy for Customer Segments:

- 1. High-Income Families:
 - o **Opportunity:** This segment is ideal for luxury electric vehicles.
 - Strategy: Develop premium EVs with advanced features, focus on luxury, and partner with high-end dealerships.
- 2. Affluent Young Professionals:
 - o **Opportunity:** Potential for stylish, high-performance electric cars.
 - Strategy: Offer EVs that combine technology and performance, emphasize sustainability, and create flexible financing options.

Strategy for Geographic Segments:

- 1. High EV Adoption with Two-Wheeler Dominance:
 - Opportunity: Strong market for electric two-wheelers.
 - Strategy: Expand the range of electric two-wheelers, invest in charging infrastructure, and partner with local dealers.
- 2. Moderate EV Adoption with Four-Wheeler Dominance:
 - Opportunity: Potential for growth in electric cars.
 - Strategy: Develop budget-friendly electric four-wheelers, focus on vehicle range, and build charging networks.

These segments provide the best potential for growth, leveraging current EV adoption trends and customer behavior.

14. Customizing the Marketing Mix for Target Segments

1. High-Income Families:

• Product:

- Focus on luxury electric vehicles that showcase cutting-edge technology, premium materials, and superior performance.
- Incorporate bespoke options such as personalized interiors, exclusive features, and high-end finishes.

Price:

- Implement premium pricing strategies to reflect the exclusivity and luxury of the product.
- Offer customizable packages with add-ons that enhance the exclusivity and bespoke nature of the vehicle.

Place:

- Utilize high-end showrooms located in affluent areas and exclusive online platforms that offer a personalized shopping experience.
- Ensure a high-touch service experience, including concierge services, home delivery, and VIP customer care.

Promotion:

- Highlight the luxury, environmental benefits, and status appeal of the vehicle through elite advertising campaigns.
- Host exclusive events, such as private showings and luxury brand collaborations, to create an aspirational brand image.
- Leverage partnerships with luxury brands to enhance the exclusivity of promotional activities.

2. Affluent Young Professionals:

• Product:

- Offer stylish, technologically advanced electric vehicles with a focus on modern design, sustainability, and performance.
- Ensure the vehicles are equipped with innovative features, such as connected car technology and advanced driver assistance systems.

Price:

- Set price points that are accessible yet reflect the quality and innovation of the product.
- Offer flexible financing options and subscription models to appeal to this segment's preference for convenience and flexibility.

Place:

- Capitalize on modern online platforms for seamless purchasing experiences, along with sleek dealerships located in urban areas.
- Offer convenient test-drive options and delivery services that cater to their busy lifestyles.

Promotion:

- Focus on digital marketing strategies, utilizing social media, influencer collaborations, and content marketing to reach this tech-savvy segment.
- Highlight the innovative features, sustainability, and contemporary design of the vehicles in promotional campaigns.
- Engage in partnerships with tech influencers and brands that resonate with this demographic's desire for modernity and quality.

By customizing the marketing mix in this way, the EV startup can effectively engage with both High-Income Families and Affluent Young Professionals, driving brand loyalty and market penetration in their respective segments.

Key Points:

- **High Revenue Potential:** Focusing on these segments offers a substantial market opportunity with significant revenue potential.
- **Diverse Vehicle Types:** The opportunity spans both two-wheelers and four-wheelers, providing a comprehensive market approach.
- **Strategic Advantage:** Targeting High-Income Families and Affluent Young Professionals aligns with current trends and preferences, enhancing market penetration chances.

This analysis identifies High-Income Families and Affluent Young Professionals as the most lucrative segments for an EV startup in India, promising a robust financial return and growth potential.