Project Report

Electric Vehicle Market Analysis in India: A Detailed Study for AtliQ Motors' Expansion Strategy (FY 2022-2024)

Introduction

AtliQ Motors, an automotive giant based in the USA, has achieved significant success in the North American electric and hybrid vehicle market. With a 25% market share, the company now aims to expand its operations in India, where its current market share stands at less than 2%. To understand the potential of the Indian EV market, Bruce Haryali, the Chief of AtliQ Motors India, assigned the task of conducting a comprehensive market study to the company's data analytics team. The primary objective of this study was to analyze existing EV and hybrid vehicle sales data to uncover key insights that would guide the company's expansion plans in India.

Objective

The primary objectives of this project were to:

- Analyze electric vehicle (EV) sales data in India from FY 2022 to FY 2024.
- Identify top-performing EV manufacturers and states based on sales volume and penetration rates.
- Detect trends in EV sales over time, both at the state and national levels.
- Forecast future sales and growth potential for electric vehicles in key regions.
- Provide actionable insights to AtliQ Motors to guide their market expansion strategy in India.
- Address specific business questions related to sales performance, growth rates, and revenue projections.

Tools and technologies used

Database: MySQL Workbench

Programming Language: SQL

Dataset: EV sales data for India, divided into three tables:

1. dim_date: This table contains 3 columns representing the date, fiscal year, and quarter, spanning from FY 2022 to FY 2024.

2. electric_vehicle_sales_by_makers: This table includes sales data for different makers categorized by vehicle type (2-Wheelers and 4-Wheelers) over the fiscal years 2022 to 2024.
3. electric_vehicle_sales_by_state: This table includes total EV sales and overall vehicle sales by state and month for the fiscal years 2022 to 2024.

Process

1. **Database Creation**: A new database, ev_sales_data, was created to store and manage the project tables.
2. **Data Import**: The datasets were imported into MySQL Workbench using the table import wizard.
3. **Data Cleaning & Preparation**:
    - The date column was standardized to ensure compatibility with MySQL's date format using the STR_TO_DATE() function.
    - The fiscal year column's data type was changed from text to year format for accurate querying.
    - The value of 'Andaman and Nicobar' was updated to 'Andaman and Nicobar Island' to make sure that they represent a single state.
4. **Analysis**:
    - The analysis was divided into 10 key queries, each addressing specific questions posed by AtliQ Motors. These queries were designed to uncover insights related to top-performing EV makers, state-wise penetration rates, sales trends, and growth projections.

Analysis Questions

The analysis focused on answering the following critical questions:

1. **Top and Bottom Makers**: Identify the top 3 and bottom 3 makers for 2-wheelers in FY 2023 and FY 2024 based on sales volume.
2. **Top States by EV Penetration**: Identify the top 5 states with the highest penetration rate for 2-wheelers and 4-wheelers in FY 2024.
3. **States with Declining Sales**: List the states with a decline in EV sales from FY 2022 to FY 2024.
4. **Quarterly Trends for Top 4-Wheeler Makers**: Analyze quarterly sales trends for the top 5 EV makers (4-wheelers) from FY 2022 to FY 2024.

5. **State Comparison**: Compare EV sales and penetration rates between Delhi and Karnataka for FY 2024.
6. **CAGR for Top 4-Wheeler Makers**: Calculate the compounded annual growth rate (CAGR) for 4-wheelers sold by the top 5 makers from FY 2022 to FY 2024.
7. **CAGR for Top States**: Identify the top 10 states with the highest CAGR in total vehicle sales from FY 2022 to FY 2024.
8. **Seasonal Trends**: Determine the peak and low seasons for EV sales based on data from FY 2022 to FY 2024.
9. **Projected Sales for 2030**: Forecast the projected number of EV sales for the top 10 states by penetration rate in 2030 using historical CAGR.
10. **Revenue Growth Estimate**: Estimate revenue growth rates for 2-wheelers and 4-wheelers for FY 2022 vs FY 2024 and FY 2023 vs FY 2024, assuming average unit prices of ₹85,000 for 2-wheelers and ₹15,00,000 for 4-wheelers.

Results

The analysis provided the following insights:

A. Top and Bottom Makers

- **Top 3 Makers (2-Wheelers):** For FY 2023, the top makers were Ola Electric, Okinawa, and Hero Electric, with Ola Electric leading. In FY 2024, the top makers were Ola Electric, TVS, and Ather, with Ola Electric again leading, having doubled its sales compared to FY 2023.
- **Bottom 3 Makers:** For FY 2023, the bottom makers were Jitendra, Being EV, and Pure EV. In FY 2024, the bottom makers were BattRE Electric, Revolt, and Kinetic Green.

B. Top States by EV Penetration

- **2-Wheelers:** The top 5 states with the highest penetration rates in FY 2024 were Goa (17.99%), Kerala (13.52%), Karnataka (11.57%), Maharashtra (10.07%), and Delhi (9.40%).
- **4-Wheelers:** Kerala (5.76%), Chandigarh (4.50%), Delhi (4.29%), Karnataka (4.26%), and Goa (4.25%) had the highest penetration rates. Notably, 4-wheeler penetration was generally lower than 2-wheelers.

C. States with Declining EV Sales

- **Declining Sales:** Only two states/UTs experienced declines in EV sales from FY 2022 to FY 2024: Andaman and Nicobar Islands (-1.11% for 4-wheelers) and Ladakh (-0.42% for 2-wheelers). All other states showed growth in EV sales.

D. Quarterly Trends for Top 4-Wheeler Makers

- **Top 5 Makers (4-Wheelers):** Tata Motors, Mahindra & Mahindra, Hyundai Motors, MG Motor, and BYD India led the market in FY 2024.
- **Quarterly Sales Trends:** There were varied sales patterns across the makers:
    - **BYD India:** Highest sales in Q4.
    - **Hyundai Motors:** Steady sales across all quarters.
    - **Mahindra & Mahindra:** Highest sales in Q1 (13,286 units).
    - **MG Motor:** Consistent sales across all quarters.
    - **Tata Motors:** Increasing sales each quarter, from 13,953 in Q1 to 32,723 in Q4.
- **Aggregate Sales Trends:** Across all top 5 makers, sales showed an upward trend, with the highest sales in Q4 and lowest in Q1.

E. State Comparison

- **Delhi vs. Karnataka (FY 2024):** Karnataka had a higher penetration rate than Delhi in all months except December. Karnataka's penetration rate ranged from 7.02% to 16.09%, while Delhi's ranged from 5.04% to 14.18%.
- **Peak Sales:** Karnataka's highest sales were in March, while Delhi's peak sales occurred in December.
- **Total Sales:** Karnataka sold 160,989 EVs, while Delhi sold 46,724 EVs. Karnataka's overall penetration rate was 10.18%, compared to Delhi's 7.71%.

F. CAGR for Top 4-Wheeler Makers

- **Top 5 Makers (4-Wheelers):** Tata Motors, Mahindra & Mahindra, Hyundai Motors, MG Motor, and BYD India.
- **CAGR (2022-2024):** BYD India led with a 566.52% CAGR, followed by Hyundai Motors (255.48%), Mahindra & Mahindra (140.33%), MG Motor (131.53%), and Tata Motors (94.71%).
- **Insights:** Tata Motors, with the highest total sales, experienced the lowest CAGR due to its established dominance. BYD India and Hyundai Motors showed rapid growth, indicating a fast-expanding market.

G. CAGR for Top States

- **Highest CAGR (Total Vehicle Sales, FY 2022-2024):** The top states were Meghalaya, Goa, Karnataka, Delhi, Rajasthan, Gujarat, Assam, Mizoram, Arunachal Pradesh, and Andaman and Nicobar Islands.
- **Geographical Insights:** The list included four northeastern states, three western states, and Karnataka, Delhi, and Andaman and Nicobar Islands. Notably, Andaman and Nicobar Islands had declining EV sales but increasing total vehicle sales.

H. Seasonal Trends

- **Low vs. Peak Months (FY 2024):** April to September were low-sales months, while October to March were peak months. March recorded the highest sales (291,487 units), while June had the lowest (106,709 units).

I. Projected Sales for 2030

- **Top 10 States (Highest Penetration Rates):** Maharashtra is projected to lead with 1.4 million EV sales by FY 2030, followed by Karnataka (1.0 million) and Gujarat (6.7 lakh).
- **Insights:** Maharashtra's leadership could be attributed to factors such as government incentives and a focus on environmental sustainability.

J. Revenue Growth Estimate

- **Two-Wheelers:** Revenue growth for FY 2022 vs. FY 2024 was 269.28%, and for FY 2023 vs. FY 2024, it was 28.13%.
- **Four-Wheelers:** Revenue growth for FY 2022 vs. FY 2024 was 367.79%, and for FY 2023 vs. FY 2024, it was 83%.
- **Conclusion:** The four-wheeler segment showed higher revenue growth compared to two-wheelers, indicating a growing market for four-wheeler EVs in India.

Conclusion

The project successfully delivered critical insights into the electric vehicle market in India for FY 2022 to FY 2024. These insights will assist AtliQ Motors in making informed decisions as they plan their market expansion in India. The data-driven approach has provided clarity on top-performing regions, key trends, and future growth opportunities,

positioning AtliQ Motors to effectively capture market share in the rapidly growing EV sector in India.