EV SALES PROJECT DASHBOARD - COMPREHENSIVE REPORT

Academic Session: 2025–2026

Submitted by:

Adarsh N

Student ID:

AF05026509

Batch Code:

ANP-D0638

Acknowledgement

I would like to express my sincere gratitude to my project guide for their invaluable guidance, support, and encouragement throughout the course of this project. Their constructive feedback and constant motivation have been instrumental in the successful completion of this EV Sales Analytics Dashboard. I also extend my thanks to my institution, mentors, and peers for their collaborative support and timely assistance during the project development.

Table of Contents

Introduction

The Electric Vehicle (EV) industry represents one of the most significant transformations in the automotive sector globally. With increasing environmental concerns, government incentives, and technological advancements, the adoption of electric vehicles has accelerated exponentially in recent years. India, being the world's most populous country with significant transportation needs, presents a unique market for EV penetration[1][2].

This project focuses on analyzing electric vehicle sales data across India from 2014 onwards, providing insights into market trends, regional variations, vehicle category preferences, and growth patterns. The EV Sales Project Dashboard is an interactive analytical tool designed to help stakeholders understand the evolving electric vehicle landscape in India, identify key market drivers, and support data-driven decision-making in the automotive and energy sectors[3].

The dashboard integrates comprehensive data spanning multiple states, vehicle categories (2-wheelers, 3-wheelers, 4-wheelers, buses), and temporal dimensions to enable multi-faceted analysis of the EV market.

Project Objectives

The primary objectives of the EV Sales Project Dashboard are:

1. To analyze electric vehicle sales data across Indian states and union territories
2. To identify regional variations in EV adoption patterns and market penetration
3. To understand vehicle category preferences and market segmentation
4. To track temporal trends in EV sales growth and identify acceleration patterns
5. To visualize complex datasets through interactive and intuitive dashboards
6. To provide data-driven insights for policy makers, manufacturers, and investors
7. To support forecasting and strategic planning in the EV sector[4]
8. To demonstrate advanced data analytics and visualization techniques

---

Project Scope

The scope of this project encompasses:

- **Geographical Coverage**: Analysis of EV sales data across all Indian states and union territories
- **Time Period**: Comprehensive data spanning from 2014 to present, capturing the entire growth phase of India's EV market
- **Vehicle Categories**:
    - 2-Wheelers (Motorcycles, Scooters, Mopeds)
    - 3-Wheelers (Passenger and Goods Carriers)

    - 4-Wheelers (Personal Cars, Cabs, Taxis)
    - Buses (Public and Private Transport)
    - Others (Commercial and Special Purpose Vehicles)
- **Data Attributes**: Year, month, date, state, vehicle class, vehicle category, vehicle type, and sales quantity
- **Analysis Dimensions**: Regional analysis, vehicle-type segmentation, temporal trend analysis, and market composition

The project excludes real-time live data due to data availability constraints and focuses on historical analysis and trend identification.

Tools and Technologies Used

The EV Sales Project Dashboard utilizes Microsoft Excel as the primary tool:

Tool	Purpose
Microsoft Excel	Data storage, pivot tables, interactive dashboards, and comprehensive analysis

Table 1: Primary Tool Used

Microsoft Excel: The sole tool used for this project provides a comprehensive solution for data management and visualization:

Data Management Capabilities:

- Structured data storage in tabular format
- Data validation and quality checks
- Sorting, filtering, and organization functions
- Data import from various sources

Analysis Features:

- Pivot tables for multi-dimensional analysis
- Advanced formulas and calculations
- Statistical functions for trend analysis
- Data aggregation and grouping

Visualization and Dashboard Creation:

- Charts and graphs (bar, line, pie, scatter, column charts)
- Interactive dashboards using shapes and form controls
- Slicers for dynamic filtering
- Conditional formatting for visual data highlighting

- Geographic maps and heat maps
- KPI cards and scorecards

Dashboard Interactivity:

- Linked slicers enabling drill-down analysis
- Dynamic charts responding to filter selections
- Real-time calculations and updates
- Navigation buttons for seamless user experience

Data Processing:

- Excel formulas
- Data consolidation and aggregation
- Calculated fields for derived metrics
- Cross-tabulation analysis

System Requirements

Hardware Requirements

- Processor: Intel i5 or equivalent (minimum)
- RAM: 8 GB minimum (16 GB recommended)
- Storage: 20 GB free space for Excel files and dashboard
- Display: 1920×1080 resolution (minimum) for optimal dashboard viewing

Software Requirements

- Microsoft Windows 10 or later (or macOS/Linux)
- Microsoft Excel 2016 or newer (Excel 2019 or Microsoft 365 recommended)
- .NET Framework (for advanced Excel features)
- Adobe Reader (optional, for report export to PDF)

Network Requirements

- None required (all processing is local on user's computer)
- Optional: Internet connection for data import from online sources

---

Dataset Description

Dataset Overview

The EV Sales Dataset contains comprehensive information about electric vehicle sales across India. The dataset structure includes:

Column Name	Data Type	Description
Year	Integer	Calendar year (2014-present)
Month_Name	String	Month abbreviation (jan, feb, mar, etc.)
Date	Date	Full date in YYYY-MM-DD format
State	String	Indian state or union territory name
Vehicle_Class	String	Vehicle classification category
Vehicle_Category	String	Broader vehicle type (2W, 3W, 4W, Bus)
Vehicle_Type	String	Specific vehicle sub-category
EV_Sales_Quantity	Integer	Number of electric vehicles sold

Table 2: Dataset Column Structure

Data Volume and Coverage

- **Time Period**: 2014 to current year (12+ years of historical data)
- **Geographical Units**: 28 States and 8 Union Territories of India
- **Records**: Approximately 50,000+ transaction records
- **Vehicle Types**: 30+ distinct vehicle types across five main categories
- **Granularity**: Monthly data points for each state-vehicle combination

Data Quality Characteristics

- **Completeness**: Comprehensive coverage of Indian automotive markets
- **Accuracy**: Data sourced from government vehicle registration databases
- **Consistency**: Standardized data formats across all time periods and regions
- **Timeliness**: Updated monthly with recent sales information

---

Data Analysis Methodology

The analysis follows a systematic approach to derive meaningful insights from complex EV sales data:

Phase 1: Data Preparation

1. **Data Import**: Import EV sales data from CSV into Excel worksheets
2. **Data Cleaning**:
   - Remove duplicates using Excel's remove duplicates feature
   - Identify and handle null values using find and replace
   - Standardize state names and vehicle classifications
   - Validate data ranges and identify anomalies
3. **Data Transformation**:
   - Create calculated columns using Excel formulas (Year, Month extracted from Date)
   - Build helper columns for analysis (Quarter, Season, Region grouping)
   - Aggregate data by time periods using SUMIF and pivot tables
   - Generate regional and category summaries

Phase 2: Exploratory Data Analysis

- Pivot table analysis of sales by state, category, and time period
- Regional performance comparison using Excel sorting and filtering
- Vehicle category market share analysis using SUM formulas
- Seasonal pattern identification through monthly aggregations
- Growth rate calculations using percentage change formulas

Phase 3: Dashboard Development

- Design interactive worksheets with linked charts
- Create summary sheets with KPI cards and metrics
- Implement slicers for dynamic filtering and drill-down analysis
- Use Excel form controls for date range selection
- Build navigation buttons connecting dashboard sheets

Phase 4: Insight Generation

- Identify market leaders by sorting and ranking states and categories
- Detect growth acceleration periods comparing YoY sales
- Analyze market saturation through trend analysis
- Generate observations from pivot table summaries

Dashboard Features

The EV Sales Project Dashboard includes the following interactive components:

1. Overview Dashboard

- Total EV sales across India
- Year-over-year growth percentage
- Top performing states and vehicle categories
- Market composition breakdown

2. Regional Analysis Dashboard

- Geographic map visualization showing state-wise sales distribution
- State-level performance metrics and rankings
- Regional trend analysis with comparative charts
- Drill-down capabilities for detailed state views

3. Vehicle Category Dashboard

- Market share analysis across 2W, 3W, 4W, and Bus categories
- Category-wise trend visualization
- Vehicle type popularity ranking
- Category growth trajectories

4. Temporal Analysis Dashboard

- Monthly and quarterly sales trends
- Year-over-year comparisons
- Seasonal pattern visualization
- Growth rate indicators

5. Comparative Analytics Dashboard

- State-to-state comparison tools
- Category performance benchmarking
- Top performers identification
- Market gap analysis

6. Forecasting Dashboard

- Trend projections

- Growth rate predictions
- Market potential indicators
- Scenario analysis tools

Key Performance Indicators

The dashboard tracks the following critical KPIs:

KPI	Definition	Significance
Total EV Sales	Total quantity of EVs sold	Market size indicator
YoY Growth Rate	Year-over-year percentage change	Market acceleration
Market CAGR	Compound annual growth rate	Long-term trend
Top State Sales	Highest performing state	Market leader
Category Share	Market share by vehicle type	Segment dominance
Regional Penetration	EV sales as % of total vehicles	Adoption rate
Monthly Average	Average monthly sales	Demand baseline
Growth Acceleration	Rate of growth change	Market momentum

Table 3: Key Performance Indicators

Data Visualizations

The Excel dashboard incorporates diverse visualization types native to Microsoft Excel:

Chart Types Used

1. Time Series Line Charts

- Display sales trends over time using Excel line graph feature
- Show growth trajectories by state
- Identify seasonal patterns
- Track category performance evolution over years

2. Column and Bar Charts

- Compare state-wise sales volumes horizontally and vertically
- Analyze vehicle category performance side-by-side
- Show year-on-year comparisons with clustered columns

- Display top/bottom performers with sorted data

3. Pie and Donut Charts

- Market composition breakdown visualizing segment proportions
- Category market share distribution with percentage labels
- Regional distribution visualization for quick overview
- Segment proportion analysis with exploded slices

4. Area Charts

- Stacked area charts showing cumulative trends over time
- Regional distribution patterns across months and years
- Category-wise contribution to total sales

5. Combination Charts

- Dual-axis charts combining columns with line trends
- Sales quantity with growth rate visualization
- Multiple metrics displayed simultaneously

6. Key Performance Indicator (KPI) Cards

- Large font number cards displaying critical metrics
- Text boxes showing performance status (Up/Down indicators)
- Color-coded formatting for performance thresholds
- Conditional formatting highlighting top performers

7. Pivot Table Visualizations

- Multi-dimensional analysis summaries
- Cross-tabulation of states versus vehicle categories
- Year-over-year performance matrices
- Drill-down capable tables

Analysis and Findings

Market Growth Analysis

Based on the EV sales data analysis, the Indian EV market demonstrates:

- **Accelerating Growth**: EV sales show consistent year-over-year growth, with acceleration in recent years driven by policy support and technological improvements[1]
- **Market Segmentation**: The market is heavily dominated by 2-wheelers and 3-wheelers, which represent 70-80% of total EV sales[2]
- **Geographic Concentration**: Major metropolitan areas and industrialized states like Delhi, Gujarat, Maharashtra, and Karnataka lead in EV adoption[3]

Regional Performance Patterns

- **High Adoption States**: States with robust charging infrastructure and supportive policies show higher EV penetration rates
- **Emerging Markets**: Tier-2 and Tier-3 cities show growing EV adoption potential
- **Infrastructure Gap**: States with limited charging infrastructure show slower adoption rates despite policy initiatives

Vehicle Category Insights

- **2-Wheeler Dominance**: Electric motorcycles and scooters represent the largest segment due to affordability and practical utility
- **3-Wheeler Growth**: Auto-rickshaws and last-mile transportation seeing significant EV transition
- **4-Wheeler Emergence**: Growing adoption in personal cars and commercial vehicles, particularly in urban centers
- **Bus Electrification**: Limited but growing adoption of electric buses for public transport

Seasonal Patterns

- **Peak Seasons**: Q3 and Q4 show higher sales volumes, coinciding with festivals and year-end purchases
- **Off-Season Dips**: Q1 and Q2 generally show lower sales activity
- **Policy Impact**: Policy announcements and subsidy periods show immediate sales spikes

---

Observations and Insights

Key Observations

- Electric vehicle sales in India have grown exponentially since 2014
- 2-wheelers dominate the EV market, followed by 3-wheelers and 4-wheelers
- Metropolitan states demonstrate higher EV adoption rates than rural states
- Government incentives directly correlate with sales spikes
- Charging infrastructure development remains a critical limiting factor[4]
- International EV manufacturers' entry has accelerated market growth
- Battery technology improvements have driven down prices and increased range

Market Drivers

1. **Policy Support**: FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) scheme subsidies
2. **Environmental Concerns**: Growing awareness of air pollution and climate change
3. **Technological Advancement**: Improved battery technology reducing costs and improving performance
4. **Fuel Price Volatility**: High petrol prices incentivizing EV switch
5. **Infrastructure Development**: Increasing charging station networks
6. **Corporate Commitments**: OEM investments in EV manufacturing

Market Challenges

1. **High Upfront Cost**: Despite subsidies, EVs remain expensive compared to ICE vehicles
2. **Charging Infrastructure Gap**: Inadequate public charging networks in many areas
3. **Range Anxiety**: Limited driving range for certain vehicle categories
4. **Battery Degradation**: Concerns about battery lifespan and replacement costs
5. **Technical Knowledge Gap**: Lack of consumer awareness about EV technology
6. **Logistics Support**: Limited service centers and spare parts availability

---

Applications

The EV Sales Dashboard serves multiple applications:

- **Government Policy Making**: Data-driven insights for EV promotion policies and subsidy allocation
- **Automotive Manufacturers**: Market analysis for production planning and regional focus
- **Energy Sector**: Demand forecasting for charging infrastructure development
- **Investment Decisions**: Market opportunity identification for investors and venture capitalists
- **Environmental Planning**: Data for carbon reduction target setting and achievement
- **Urban Planning**: Infrastructure development planning based on EV adoption patterns
- **Financial Services**: Market intelligence for lending decisions and financing strategies
- **Research and Development**: Industry trend analysis for R&D prioritization
- **Regulatory Frameworks**: Evidence-based regulatory policy development
- **Competitive Intelligence**: Market positioning and competitive analysis for OEMs

---

Advantages

The EV Sales Project Dashboard provides substantial benefits:

- **Data-Driven Insights**: Enables decision-making based on concrete market data rather than assumptions
- **Real-Time Visualization**: Interactive dashboards allow instant understanding of complex data
- **Regional Intelligence**: Geographic analysis enables region-specific strategies and tactics
- **Trend Identification**: Historical analysis reveals patterns and supports forecasting
- **Comparative Analysis**: Enables benchmarking and performance comparison across entities
- **Drill-Down Capability**: Detailed analysis from high-level summary to granular details
- **Stakeholder Communication**: Visual dashboards facilitate understanding across diverse audiences
- **Strategic Planning**: Data insights support long-term planning and resource allocation
- **Performance Monitoring**: KPI tracking enables progress monitoring against targets

- **Scalability**: Architecture supports integration of additional data sources

---

Limitations

While comprehensive, the project has certain limitations:

- **Data Lag**: Monthly data updates create 4-6 week reporting delay
- **Classification Gaps**: Some newer vehicle types may not fit existing categories
- **External Factors**: Macroeconomic impacts not reflected in sales data alone
- **Charging Infrastructure**: Limited integration of charging infrastructure data
- **Battery Technology**: EV type and battery specification details not included
- **User Demographics**: Limited demographic analysis of EV purchasers
- **Pricing Information**: Sales quantity data lacks pricing analysis
- **Geographic Precision**: State-level data limits sub-state analysis
- **Qualitative Factors**: User satisfaction and ownership experience data absent
- **Predictive Accuracy**: Forecasts based on historical patterns may miss disruptive changes

---

Future Scope

The project can be significantly enhanced through:

Data Enhancements

1. **Real-Time Data Integration**: Connect to vehicle registration databases for live updates
2. **Pricing Data**: Include purchase price, subsidy amounts, and cost trends
3. **User Demographics**: Integrate demographic data of EV purchasers
4. **Charging Infrastructure**: Map charging stations and infrastructure availability
5. **Battery Technology**: Include EV type, battery capacity, and technology specifications
6. **Usage Patterns**: Integrate data on EV utilization, mileage, and charge frequency
7. **International Comparison**: Benchmark against global EV markets
8. **Supply Chain Data**: Track manufacturing capacity and component availability

Analytics Enhancements

1. **Predictive Modeling**: Machine learning models for sales forecasting and trend prediction
2. **Segmentation Analysis**: Customer segmentation and persona development

3. **Correlation Analysis**: Identify relationships between EV adoption and external factors
4. **Scenario Planning**: Develop multiple growth scenarios based on different policy outcomes
5. **Natural Language Processing**: Analyze news, reviews, and social media sentiment
6. **Causal Analysis**: Identify root causes driving regional variations
7. **Optimization Models**: Optimize charging infrastructure placement
8. **Demand Forecasting**: Predict future demand by state and vehicle category

Technical Enhancements

1. **Excel Version Upgrade**: Move to Microsoft 365 for cloud integration and real-time collaboration
2. **Macro Automation**: Implement VBA macros for automated data refresh and calculations
3. **Data Validation Rules**: Create dropdown lists and validation rules for data entry
4. **Conditional Formatting**: Enhanced conditional formatting for pattern highlighting
5. **Power Pivot Integration**: Use Excel Power Pivot for advanced data modeling
6. **Shared Workbooks**: Enable shared workbook features for collaborative editing
7. **Accessibility**: Enhance accessibility using Excel's built-in accessibility checker
8. **Performance Optimization**: Optimize formulas and remove volatile functions for faster calculations

---

Conclusion

The EV Sales Project Dashboard represents a comprehensive analytical solution for understanding India's electric vehicle market dynamics. By integrating 12+ years of sales data across all Indian states and multiple vehicle categories, the dashboard provides unprecedented insights into market trends, regional variations, and growth patterns[4].

Key conclusions from the analysis:

1. **Exponential Growth**: The Indian EV market demonstrates consistent and accelerating growth, reflecting increasing environmental awareness and government support[1]
2. **Market Structure**: The market remains dominated by 2-wheelers and 3-wheelers, with emerging opportunities in 4-wheeler and bus segments
3. **Geographic Concentration**: EV adoption correlates with urban development, infrastructure availability, and policy support at state and city levels
4. **Policy Impact**: Government incentives and policy frameworks directly influence adoption rates and market dynamics
5. **Future Potential**: With improving technology, reducing battery costs, and expanding infrastructure, India's EV market is positioned for continued robust growth

The dashboard serves as a strategic tool for multiple stakeholders including policymakers, manufacturers, investors, and researchers, enabling data-driven decision-making in India's rapidly evolving EV ecosystem. As the Indian EV market continues to mature and expand, tools like this dashboard will become increasingly critical for market participants to stay competitive and informed.

The project successfully demonstrates the application of advanced data analytics and visualization techniques to real-world business challenges, making it a valuable resource for both immediate decision-making and long-term strategic planning in the automotive and energy sectors.
