NITTE MEENAKSHI INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION, AFFILIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY,
BELGAUM, APPROVED BY AICTE & GOVT.OF KARNATAKA

KNOWLEDGE * CHARACTER * UNITY

CASE STUDY REPORT

on

ANALYSYS AND VISUALISATION OF EV DATASET

Submitted in partial fulfilment of the requirement for the award of Degree of

Bachelor of Engineering
in

Information Science and Engineering
Submitted by:

Ananya Havinal	1NT22IS015
Chaithanya M	1NT22IS039
B Swathi	1NT22IS034
Inguva Srinija	1NT22IS064

Under the Guidance of

Mr. Prashanth B S

Assistant Professors, Dept. of ISE, NMIT

NITTE
EDUCATION TRUST

Department of Information Science and Engineering

(Accredited by NBA Tier-1)

2024-2025

(AN AUTONOMOUS INSTITUTION, AFFILIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

Department of Information Science and Engineering

(Accredited by NBA Tier-1)

KNOWLEDGE * CHARACTER * UNITY

CERTIFICATE

This is to certify that the Project Report on **"Analysis and visualization of EV dataset using Power Bi"** is an authentic work carried out by **Ananya Havinal(1NT22IS015), Chaithanya M (1NT22IS039), B Swathi(1NT22IS034), Inguva Srinija(1NT22IS064)** Bonafede students of Nitte Meenakshi Institute of Technology, Bangalore in partial fulfilment for the award of the degree of Bachelor of Engineering in Information Science and Engineering of Visvesvaraya Technological University, Belagavi during the academic year 2024-2025. It is certified that all corrections and suggestions indicated during the internal assessment has been incorporated in the report.

Power Bi Faculty

_____

Mr. Prashanth B S

Assistant Professor, Dept. ISE,
NMIT Bangalore

Abstract

The rapid adoption of electric vehicles (EVs) is transforming the automotive landscape, driven by the need for sustainable mobility. This report uses Power BI to analyze EV sales data, focusing on top-performing and underperforming manufacturers, state-wise penetration rates, quarterly trends, and regional adoption patterns. Key insights include identifying market leaders, states with high EV penetration, and trends in 2-wheeler and 4-wheeler segments, along with a comparison of adoption in Delhi and Karnataka. Power BI's capabilities in data integration and visualization provide actionable insights, enabling stakeholders to make informed decisions, address challenges, and accelerate the shift toward sustainable mobility.

Acknowledgement

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of the people who made it possible, whose constant guidance and encouragement crowned our effort with success. I express my sincere gratitude to our Principal **Dr. H. C. Nagaraj**, Nitte Meenakshi Institute of Technology for providing facilities.

We wish to thank our HoD**, Dr. Mohan S. G.** for the excellent environment created to further educational growth in our college. We also thank him for the invaluable guidance provided which has helped in the creation of a better project.

I hereby like to thank our *Mr. Prashanth B S, Assistant Professor* Department of Information Science & Engineering on their periodic inspection, time to time evaluation of the project and help to bring the project to the present form.

Table of Contents

Abstract

Acknowledgement

List of Figures

References

List of Figures

Chapter-1

INTRODUCTION

The Indian electric vehicle (EV) market is experiencing diverse growth across different states and vehicle segments. This analysis delves into key aspects of this growth by examining EV sales data. We will identify top and bottom performing manufacturers for both 2-wheelers and 4-wheelers, pinpoint the states leading in EV penetration rates, analyze quarterly sales trends for major 4-wheeler manufacturers, and directly compare EV sales and penetration between Delhi and Karnataka for 2024. This comparative analysis aims to provide a comprehensive understanding of the current EV market landscape in India.

Understanding the dynamics of EV adoption requires a detailed examination of sales figures, market share, and regional variations. This project analyzes EV sales data to address several key questions: Which manufacturers are leading and lagging in sales of 2-wheelers and 4-wheelers? Which states demonstrate the highest EV penetration? What are the quarterly sales trends for major 4-wheeler manufacturers? And how do EV sales and penetration in Delhi compare to Karnataka in 2024? By exploring these questions, we aim to uncover valuable insights into the evolving EV market in India This analysis explores key trends and comparisons within the Indian EV market. Using sales data, we identify top and bottom manufacturers for 2-wheelers and 4-wheelers, pinpoint leading states in EV penetration, analyze quarterly sales trends for top 4-wheeler manufacturers, and compare EV market performance between Delhi and Karnataka for 2024. Data analysis is crucial for understanding the complexities of the rapidly evolving EV market. This project utilizes sales data to provide data-driven insights into several key areas: manufacturer performance (top and bottom performers), state-level EV penetration, quarterly sales trends for major 4-wheeler brands, and a direct comparison of EV market dynamics between Delhi and Karnataka in 2024. This analysis will shed light on the current state and future direction of EV adoption in India

1.1 POWER BI

Power BI is a leading tool for business intelligence that was developed to help users turn unstructured data into informative and actionable visuals. It provides strong connections with various data sources, data transformation and cleaning, and interactive dashboard and reports creation features that help in making well-informed decisions

Power BI is here and has one of its distinctive features to allow lo-tech users create great-looking visualizations. Advanced users can leverage the powerful DAX (Data Analysis Expressions) language, custom visualizations, and design complex analytics solutions. It connects with access level SQL databases, excel spreadsheets, cloud services, and APIs are among their data sources, making it versatile enough to suit all businesses, regardless of size.

The figure 1.1 shows the POWER BI
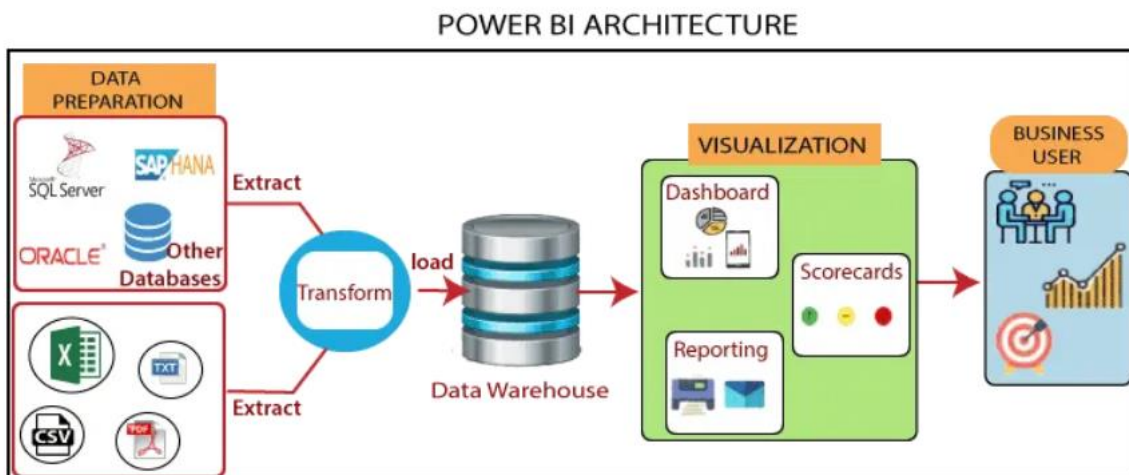
Figure 1.1 POWER BI

1.2 Model View

The Model View is a visual representation of the relationships of the tables in a dataset in Power BI. It also enables users to define relationships, generate calculated columns, and define hierarchies to aid in data analysis. Organizing logically, users build the dataset to allow efficient, accurate querying over multiple tables to form strong data models for use in insightful reports.

1.3 Report View

The Report View is where users create and design interactive reports using visualizations like charts, graphs, and slicers. It offers a drag-and-drop interface to add data fields and customize visuals, making it easy to build engaging and dynamic reports. Users can apply filters, drill-through options, and bookmarks to enhance interactivity and storytelling within reports.

1.4 Table View

The Table View in Power BI displays raw data in a tabular format, allowing users to inspect and validate the dataset. It is useful for verifying data integrity, checking relationships, and ensuring that transformations have been applied correctly. Users can also create calculated columns and measures directly in the Table View to enrich their datasets.

1.5 Data

Data is the foundation of Power BI, sourced from various platforms such as Excel, SQL databases, cloud services, and APIs. Power BI allows seamless data integration, transformation, and modelling to create a unified dataset for analysis. Through Power Query, users can clean, shape, and merge raw data into a structured format suitable for visualizations and insights.

Summary: This chapter introduces the project and the Power BI technological stack, outlining its core components and features. It details Power BI's data integration, visualization, and interactive reporting capabilities**.**

Chapter-2

OBJECTIVES

2.1 Identify Market Leaders and Laggards

Analyze EV sales data to determine the top-performing and bottom-performing manufacturers in the 2-wheeler and 4-wheeler segments. This helps to understand competitive dynamics and market share distribution.

2.2 Assess State-wise EV Penetration Rates

Evaluate EV penetration rates across states to identify regions with high adoption levels. This information can guide policymakers and stakeholders in optimizing resources and strategies.

2.3 Explore Quarterly Sales Trends

Analyze quarterly EV sales trends from 2022 to 2024 for top manufacturers. This helps to identify seasonal patterns, growth trajectories, and potential market fluctuations.

2.4 Compare Regional EV Adoption

Perform a comparative analysis of EV sales and penetration rates between Delhi and Karnataka for 2024. This objective highlights regional disparities and provides insights into factors influencing adoption.

2.5 Visualize Data for Actionable Insights

Utilize Power BI's interactive dashboards to transform raw data into meaningful visualizations. These insights support decision-making for manufacturers, policymakers, and other stakeholders.

Summary: This chapter outlines the key objectives of the report, focusing on understanding market dynamics, regional trends, and actionable insights using Power BI

Chapter-3

PROBLEM STATEMENT

This analysis, using Power BI, aims to provide insights into electric vehicle sales and penetration by identifying the top and bottom 3 makers of 2-wheelers and 4-wheelers. It will also highlight the top 5 states with the highest penetration rates for 2-wheeler and 4-wheeler EV sales. The study will track quarterly sales trends for the top 5 4-wheeler EV makers from 2022 to 2024 and compare EV sales and penetration rates between Delhi and Karnataka in 2024, offering valuable insights into regional adoption patterns

Chapter-4

DESIGN

1. Top/Bottom 3 Makers (2-Wheelers & 4-Wheelers)

- Visualization: Two separate horizontal bar charts (one for 2-wheelers, one for 4-wheelers).

- X-axis: Number of vehicles sold.

- Y-axis: Manufacturer name.

- Data: Sort manufacturers by sales volume in descending order. Highlight the top 3 with one color and the bottom 3 with another distinct color. The remaining manufacturers can be a neutral color.

- Title: "Top & Bottom 3 EV Makers by Sales Volume" (Separate titles for 2-wheelers and 4-wheelers).

- Additional Considerations: Include data labels to show exact sales figures.

2. Top 5 States by Penetration Rate (2-Wheelers & 4-Wheelers)

- Visualization: Two separate maps (choropleth maps) of India.

- Map 1: 2-wheeler penetration rate by state.

- Map 2: 4-wheeler penetration rate by state.

- Color Scale: Use a diverging color scale. For example, darker shades of green for higher penetration and lighter shades for lower penetration.

- Tooltips: On hover, display the state name and the exact penetration rate.

- Title: "EV Penetration Rate by State" (Separate titles for 2-wheelers and 4-wheelers).

- Additional Considerations: A small table next to each map showing the top 5 states and their penetration rates could further enhance the visualization.

3. Quarterly Trends for Top 5 EV Makers (4-Wheelers)

- Visualization: Line chart.

- X-axis: Quarter (e.g., Q1 2022, Q2 2022, ..., Q4 2024).

- Y-axis: Sales volume.

- Lines: One line for each of the top 5 EV makers. Use distinct colors for each line.

- Legend: Clearly label each line with the manufacturer's name.

- Title: "Quarterly Sales Trends for Top 5 EV Makers (4-Wheelers) (2022-2024)".

- Additional Considerations: Add data labels for key points or use tooltips to display exact sales numbers on hover.

4. EV Sales and Penetration Comparison (Delhi vs. Karnataka) for 2024

- Visualization: A combination chart or two separate bar charts.

  - Option 1 (Combination Chart):

    - X-axis: Delhi and Karnataka.

    - Y-axis (Left): Sales volume (bar chart).

    - Y-axis (Right): Penetration rate (line chart or a second set of bars).

  - Option 2 (Two Bar Charts):

    - One bar chart for sales volume comparing Delhi and Karnataka.

    - Another bar chart for penetration rate comparing Delhi and Karnataka.

- Colors: Use distinct colors for Delhi and Karnataka.

- Title: "EV Sales and Penetration Comparison: Delhi vs. Karnataka (2024)".

Chapter-5

IMPLEMENTATION

Implementation in the context of Power BI refers to the process of putting a Power BI solution into action by developing, deploying, and integrating dashboards or reports to address specific business needs.

1. Top 3 and Bottom 3 Makers in Terms of 2-Wheelers and 4-Wheelers Sold

Objective: Identify the top and bottom manufacturers based on sales volume for both 2-wheelers and 4-wheelers EVs.

Approach:

- **For 2-wheelers**: Analyze sales data for leading EV 2-wheeler brands (such as Hero Electric, Ather Energy, Ola Electric, TVS, etc.) and compare their volume.
- **For 4-wheelers**: Look at the sales of top EV car manufacturers (like Tata Motors, Mahindra Electric, MG Motors, etc.) and determine which companies are leading and lagging in sales.

2. Top 5 States with the Highest Penetration Rate in 2-Wheeler and 4-Wheeler EV Sales

Objective: Identify the states with the highest penetration of EVs in both 2-wheeler and 4-wheeler categories.

Approach:

- **Penetration Rate**: Defined as the percentage of EV sales in relation to total vehicle sales in each state.
- **For 2-wheelers and 4-wheelers**: You would typically look for state-level data from the Ministry of Heavy Industries or specific EV-related reports that show regional splits in the market. States like Delhi, Maharashtra, Uttar Pradesh, Tamil Nadu, and Karnataka have been significant players in EV adoption in India.

3. Quarterly Trends Based on Sales Volume for the Top 5 EV Makers (4-Wheelers) from 2022 to 2024

- **Objective**: Identify how the quarterly sales trends have changed over time for the leading 4-wheeler EV makers.
- **Approach**:
- Track data for the key EV manufacturers (like Tata Motors, Mahindra Electric,

Hyundai, etc.) for the years 2022 to 2024. This will include quarterly sales volumes.

- You can derive this from quarterly reports by manufacturers or aggregate market research reports that track EV sales performance over time.

4. **EV Sales and Penetration Rates in Delhi vs. Karnataka for 2024**

Objective: Compare the EV sales and penetration rates for Delhi and Karnataka in 2024.

Approach:

- **Sales Comparison**: Identify total EV sales in both Delhi and Karnataka for 2024. This can be compared either in raw numbers or as a percentage of total vehicle sales.
- **Penetration Rate**: Compare the percentage of EVs (both 2-wheelers and 4-wheelers) in relation to total vehicle sales in both Delhi and Karnataka

Chapter-6

RESULTS AND SNAPHOTS

Snapshot 1: The following figure 6.1 shows our Electric vehicle Overview with donut and globe chart.

Figure 6.1 Electric Vechile Overview

Snapshot 2: The following figure 6.2 shows the relationship between the tables based on primary key using model view
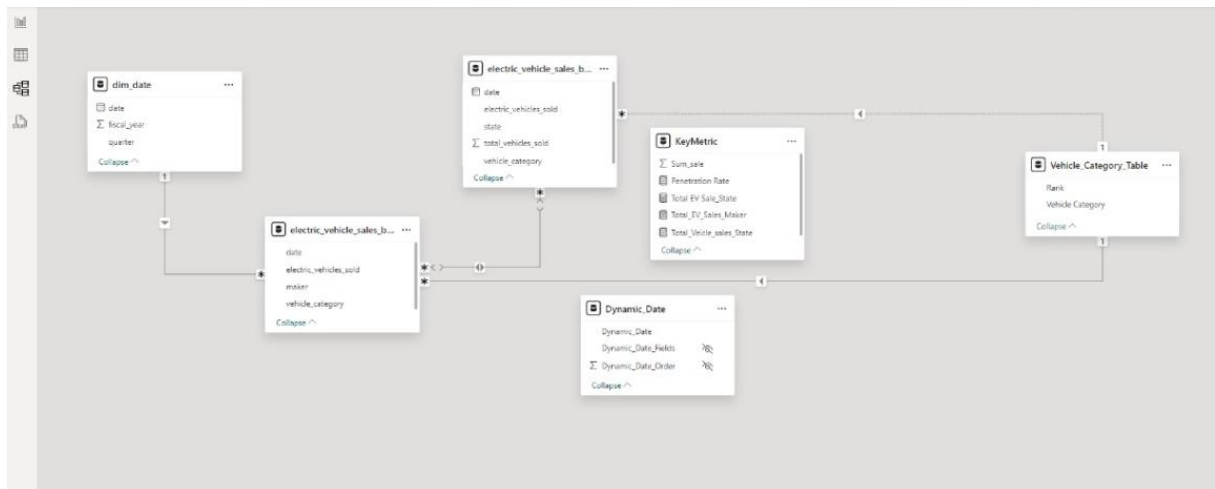

Figure 6.2 Relationship between Tables

Snapshot 3: The following figure 6.3 shows 4 wheeler electric vehicle penetration rate, top 3 makers and bottom 3 makers.
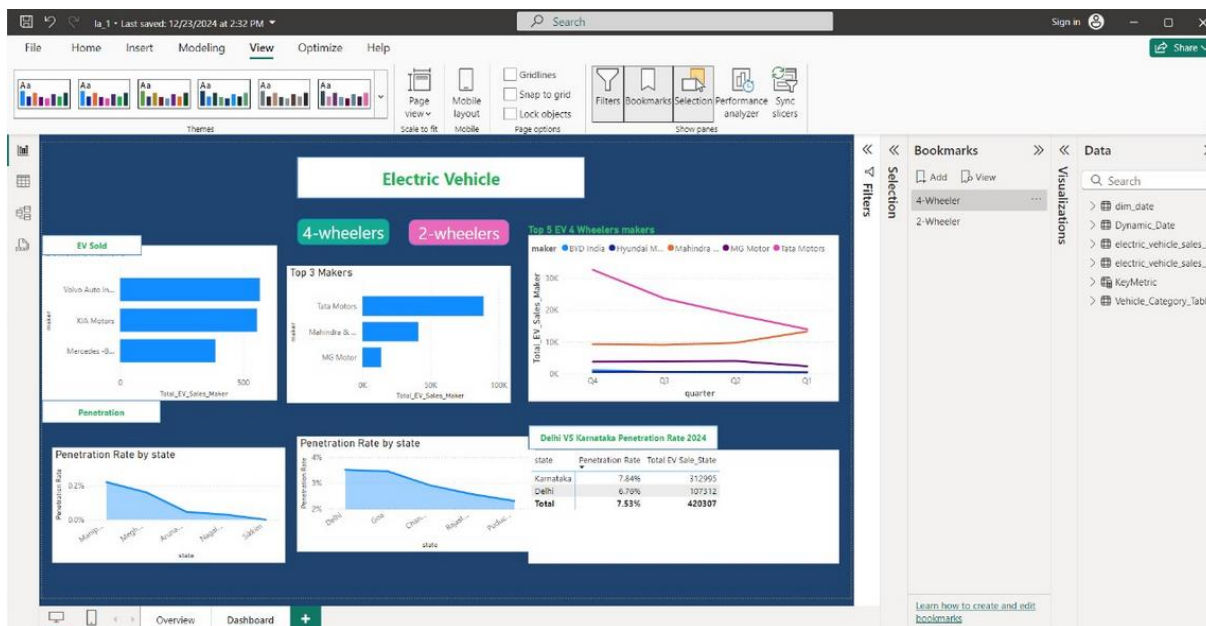

Figure 6.3 4 wheeler electric vehicle dashboard

Snapshot 4: The following figure 6.4 shows 2 wheeler electric vehicle penetration rated,top 3 makers and bottom 3 makers.

Figure 6.4 2 wheeler electric vehicle dashboard

11

Chapter-7

CONCLUSION

This project demonstrates how Power BI can be effectively used to analyze electric vehicle sales data, providing valuable insights into market trends, regional variations, and growth patterns. Through Power BI's robust data visualization capabilities, we were able to track sales trends, identify leading makers in both the 2-wheeler and 4-wheeler segments, and explore regional penetration rates. The findings highlight that Ola Electronics leads the 2-wheeler EV market, while Tata Motors dominates the 4-wheeler segment. Additionally, Power BI allowed us to observe the strong growth in 4-wheeler EV sales, particularly in Q4 2023, and to compare the higher EV penetration rates in Karnataka versus Delhi in 2024. Future work could involve integrating predictive analytics to forecast sales trends and penetration rates, as well as expanding the analysis with more granular data, such as customer preferences and regional policies

REFERENCES

1) **parth-sharma1/ELECTRIC-VEHICLE-ANALYSIS-DASHBOARD:**

   https://github.com/parth-sharma1/ELECTRIC-VEHICLE-ANALYSIS-DASHBOARD

2) **MithilKothari/Electric-Vehicle-Dashboard_Power-BI :**

   https://github.com/MithilKothari/Electric-Vehicle-Dashboard_Power-BI

3) **jasmeetsingh-028/EV_data_analysis:**

   https://github.com/jasmeetsingh-028/EV_data_analysis

4) **datasqlsantosh/Electric_Vechicle_Data_anlaysis:**

   https://github.com/datasqlsantosh/Electric_Vechicle_Data_anlaysis