Final Report

1. INTRODUCTION

1.1 Project Overview

The project titled **" Visualization Tool for Electric Vehicle Charge and Range Analysis"** is a comprehensive data visualization initiative aimed at analyzing and presenting key metrics in the electric vehicle (EV) domain. The project leverages SQL for efficient data preprocessing and Tableau for designing intuitive, interactive dashboards. By combining these technologies, the project transforms raw, unstructured datasets into coherent insights that illustrate EV trends, regional charging station availability, and adoption rates.

1.2 Purpose

The primary objective of this project is to create a user-centric tool for various stakeholders such as policymakers, researchers, and EV manufacturers. The tool empowers them to:

- Explore EV market dynamics visually
- Understand charging infrastructure distribution
- Assess brand performance
- Make informed decisions based on clean, actionable data

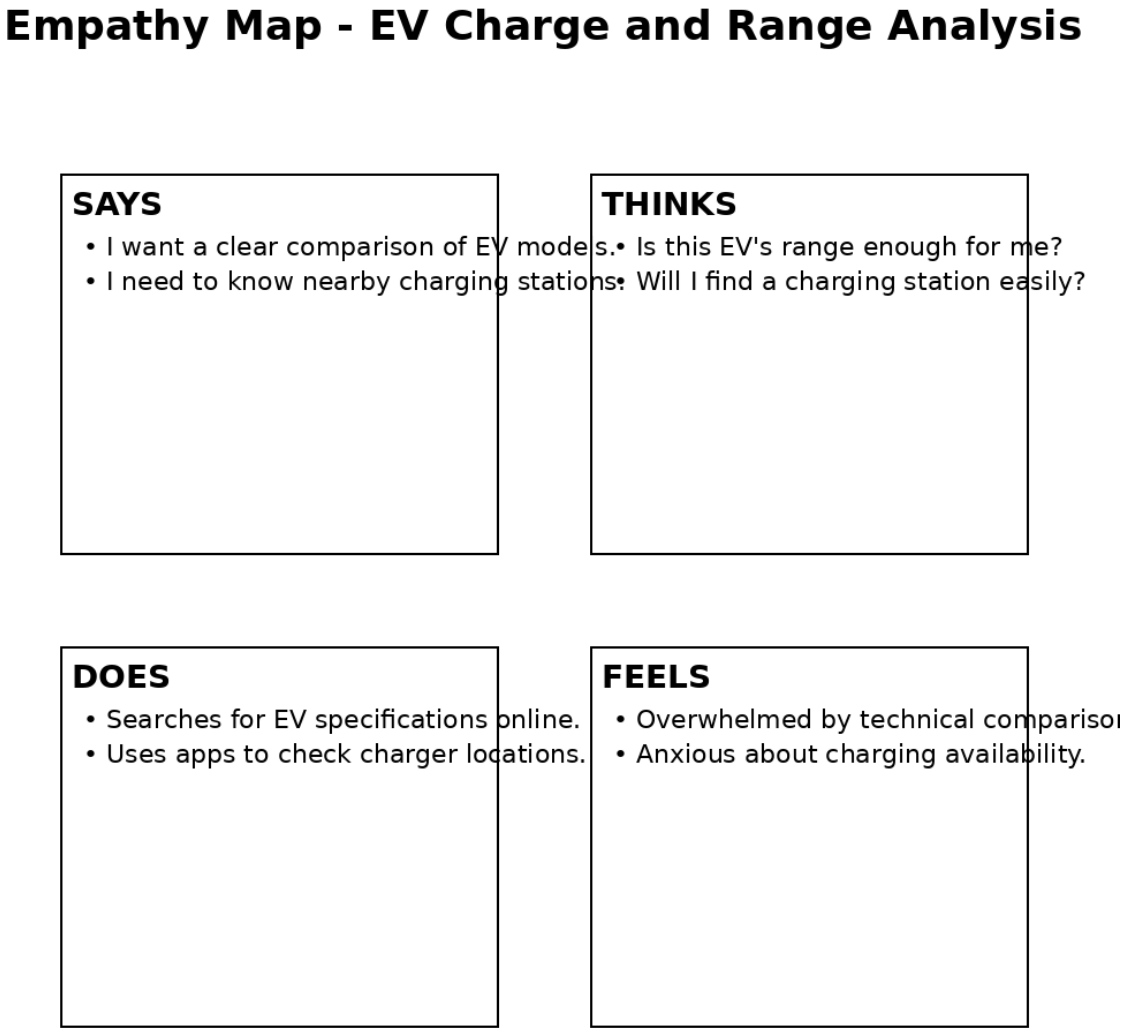
2. IDEATION PHASE

2.1 Problem Statement

Although electric vehicle data is increasingly available, it often remains unorganized, inconsistent, or siloed across various sources. This lack of structure makes it challenging to derive meaningful insights. Stakeholders are in need of a consolidated, user-friendly platform that visualizes:

- Regional distribution of EVs
- Charging station densities
- Efficiency and cost trends

2.2 Empathy Map Canvas



- **Says:**
  - "I want a clear comparison of EV models."
  - "I need to know nearby charging stations."
- **Thinks:**
  - "Is this EV's range enough for my needs?"
  - "Will I easily find charging points on long trips?"

- **Does:**
    - Searches specifications, maps, and forums
    - Uses multiple platforms to compare EVs
- **Feels:**
    - Confused by technical data and scattered sources
    - Anxious about infrastructure and maintenance
    -

2.3 Brainstorming

During brainstorming sessions, multiple tools were evaluated. Tableau was selected for its powerful data visualization features, especially geospatial mapping and interactivity. SQL was chosen for its robustness in cleaning, transforming, and joining data across various tables.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey map

(Attach Image: Customer Journey Map - EV Buyer Experience)

The typical journey of an EV buyer includes research, comparison, dealership visit, test drive, purchase decision, and post-purchase charging behavior. Our dashboard aligns with the research and decision stages by providing:

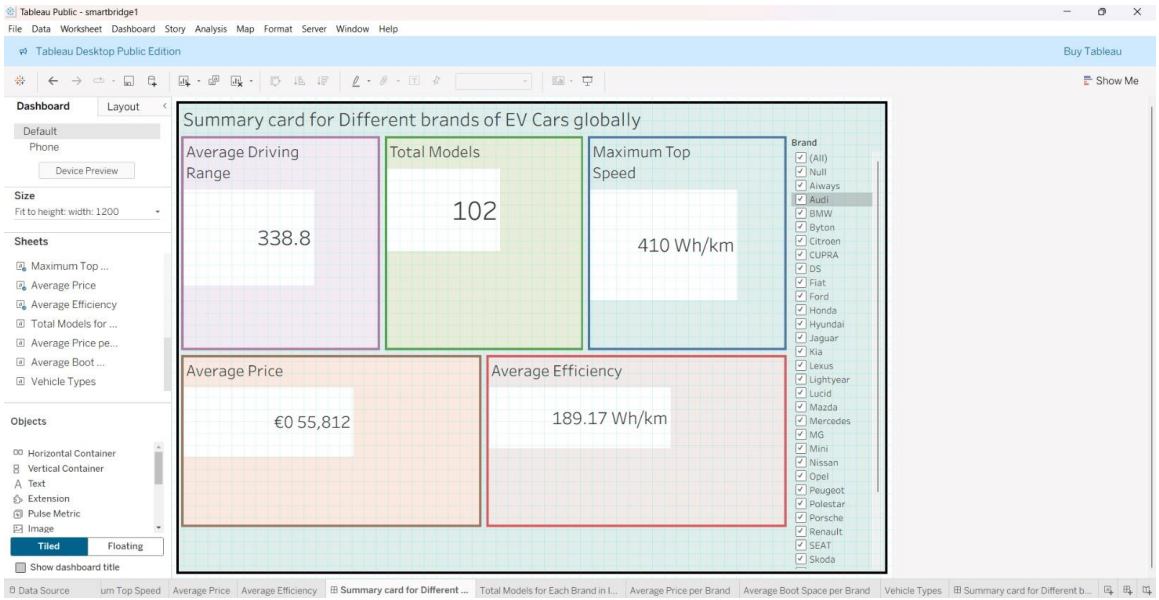
- Model comparison tools
- Charging network insights
- Price-range filters

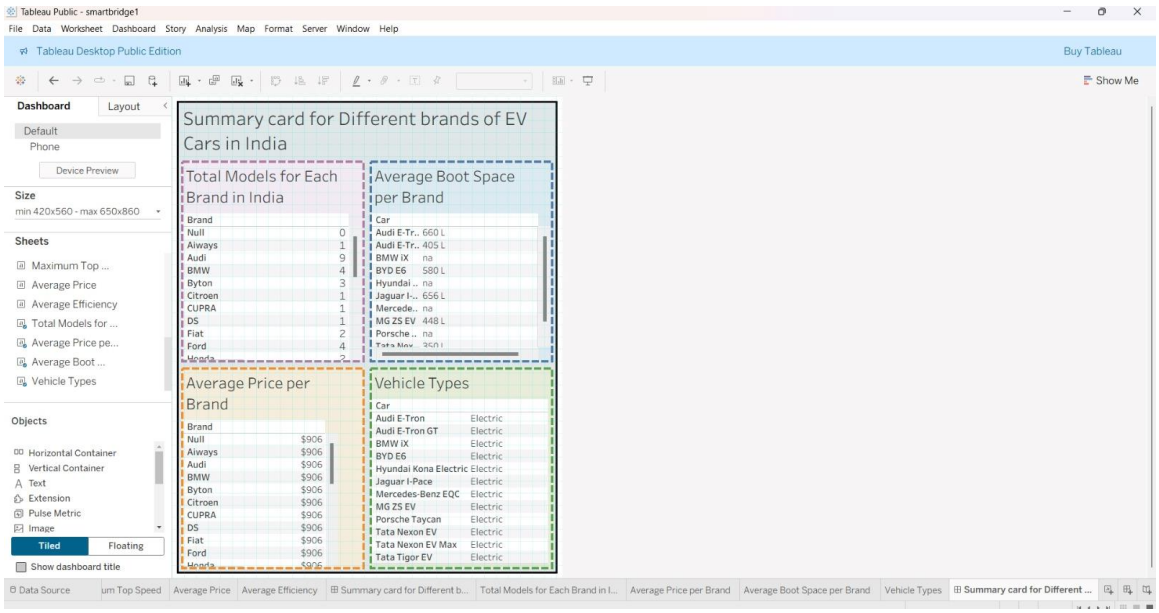
3.2 Solution Requirement

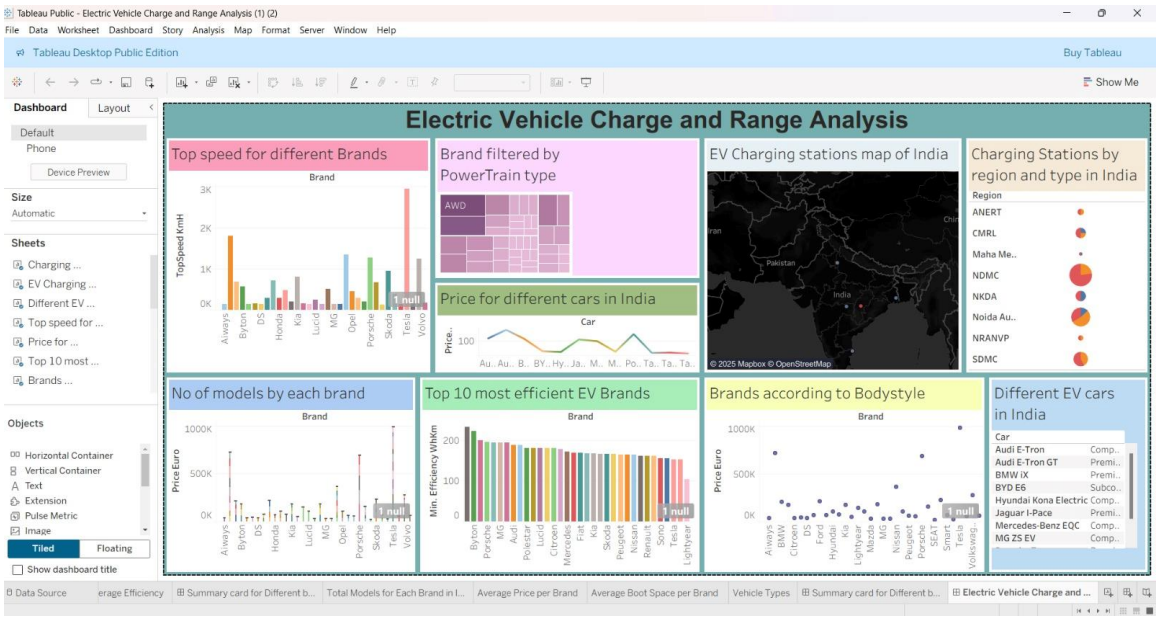
- Clean and structured dataset from CSV files
- SQL queries for:
    - Data filtering
    - Joins and transformations
    - Outlier removal
- Tableau for visual dashboards with:

- Filter controls (Price, Brand, Range)
- Geographic heat maps
- Time series trend lines

3.3 Data Flow Diagram







3.4 Technology Stack

- **SQL:** Data cleaning, merging, and query handling
- **Excel:** Initial data inspection and corrections
- **Tableau Public:** Dashboard creation and sharing

4. PROJECT DESIGN

4.1 Problem Solution Fit

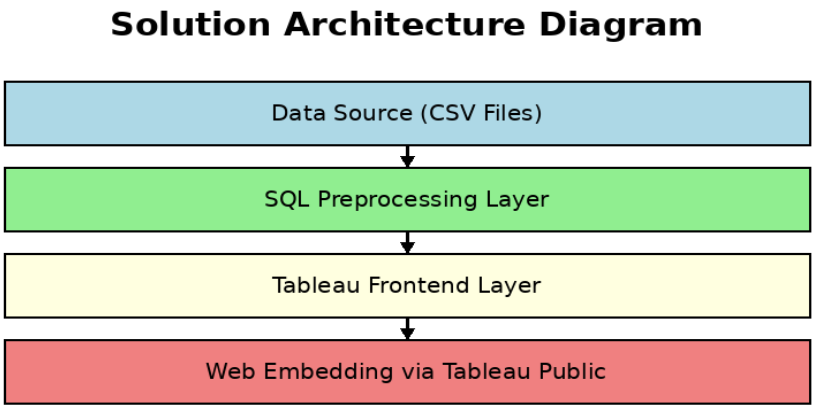
The dashboard addresses the primary pain point: complex and scattered EV data. With filters, visual elements, and aggregated views, it simplifies understanding and facilitates decision-making.

4.2 Proposed Solution

We created an interactive, web-embeddable dashboard that offers:

- KPI displays
- Visual filters by brand, range, price, and region
- Charging station heat maps
- EV performance comparison (e.g., efficiency vs. top speed)

4.3 Solution Architecture



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

We used an Agile-based sprint methodology with the following phases:

- **Sprint 1:** Dataset collection and requirement gathering
- **Sprint 2:** Data cleaning using SQL
- **Sprint 3:** Visualization design using Tableau
- **Sprint 4:** Dashboard review, publishing, and integration into a web app

6. FUNCTIONAL AND PERFORMANCE TESTING

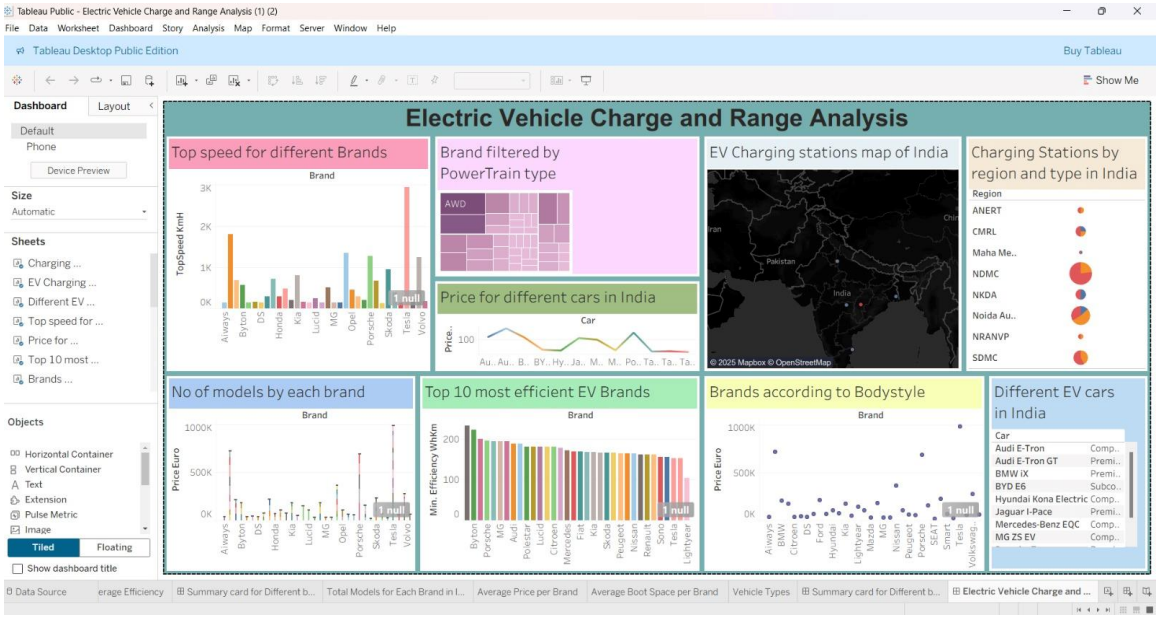
6.1 Performance Testing

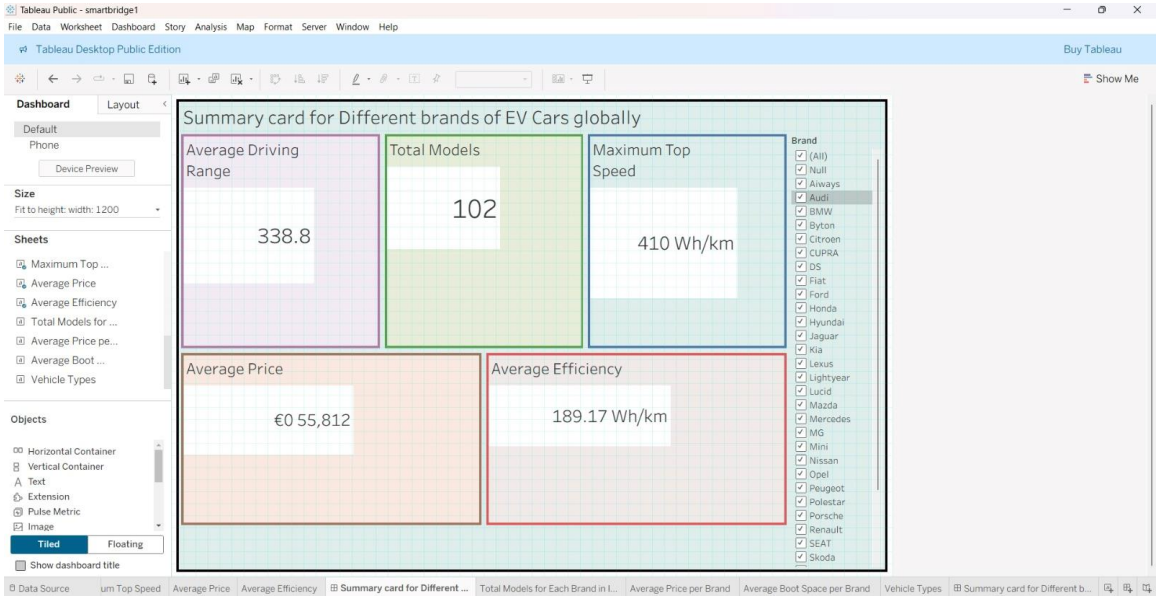
Performance was assessed based on:

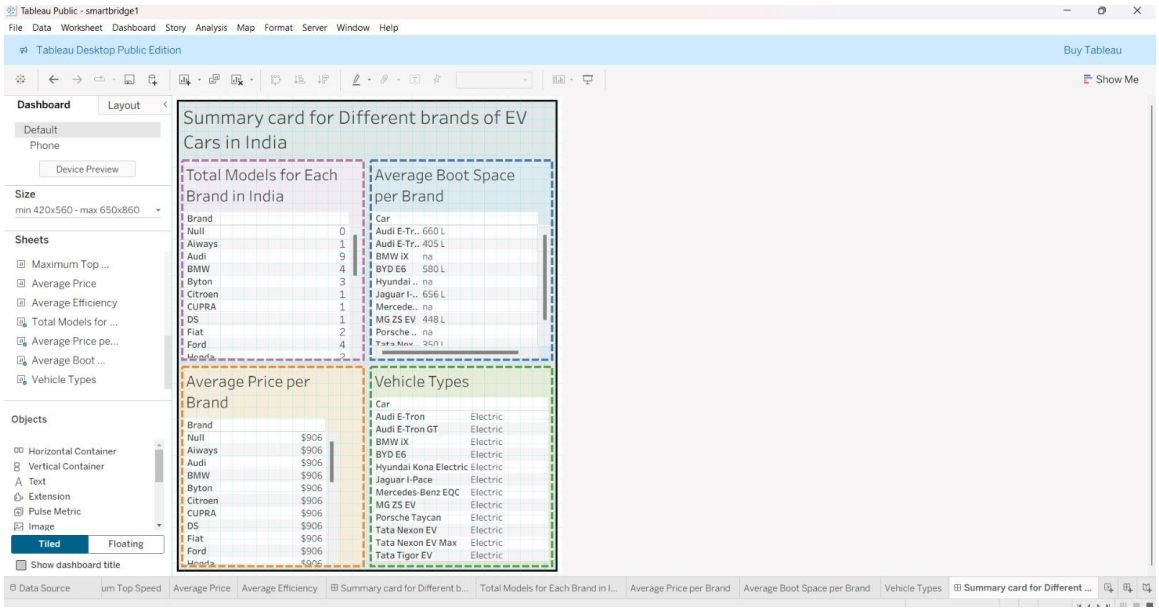
- Filter response time in Tableau
- Rendering speed of visuals on Tableau Public
- Cross-filter accuracy (e.g., when selecting multiple filters

7. RESULTS

7.1 Output Screenshots







8. ADVANTAGES & DISADVANTAGES

Advantages

- Easy to understand and navigate
- Real-time filtering and drill-down capabilities
- Strong data storytelling

Disadvantages

- Depends on Tableau Public for hosting
- Limited to Tableau's visual feature set

9. CONCLUSION

The EV Dashboard project successfully transforms scattered electric vehicle data into an insightful, interactive experience. By bridging raw datasets with structured visualization, it empowers better decision-making for manufacturers, analysts, and policymakers.

10. FUTURE SCOPE

- Integration of real-time data streams (e.g., EV sales APIs, charging activity)
- Predictive analytics using machine learning (e.g., demand forecasting)
- Emission savings calculator
- Inclusion of EV battery health and lifecycle insights

11. APPENDIX

Project Demo link : https://youtu.be/JwgVLea-GE8