Project Report

Visualization Tool for EV charge and Range Analysis

1.INTRODUCTION

1.1 Project Overview

This project delivers a comprehensive visualization platform to monitor, analyse, and optimize electric vehicle (EV) charging behaviour and range efficiency. It offers real-time insights for both individual users and fleet managers to make data-driven decisions

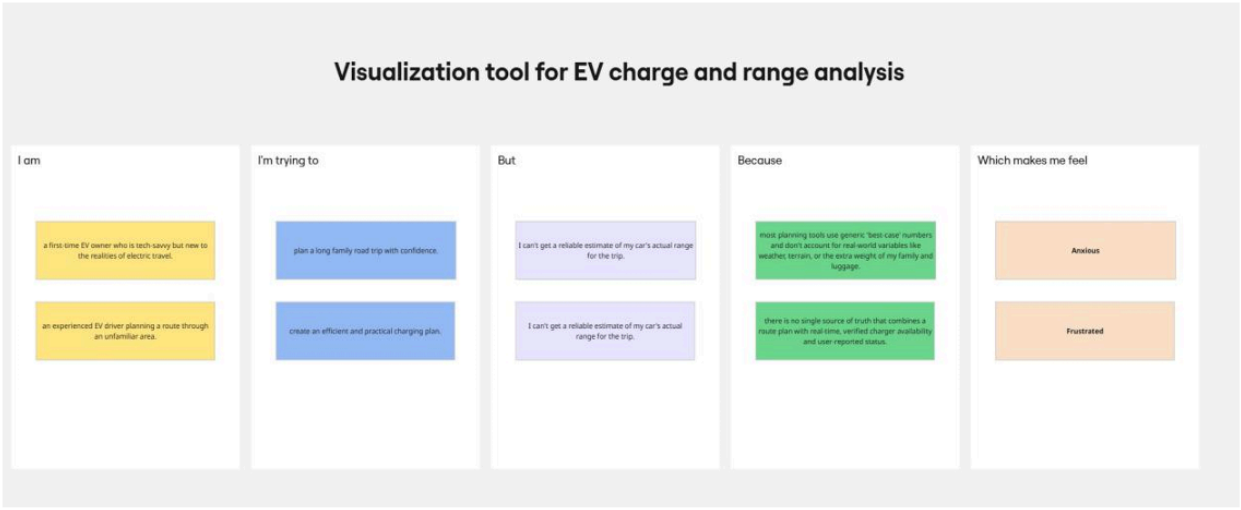
1.2 Purpose

The purpose of the EV Charge and Range Analysis Visualization Tool is to empower users with meaningful, real-time insights that improve electric vehicle usage, planning, and efficiency.

2.IDEATION PHASE

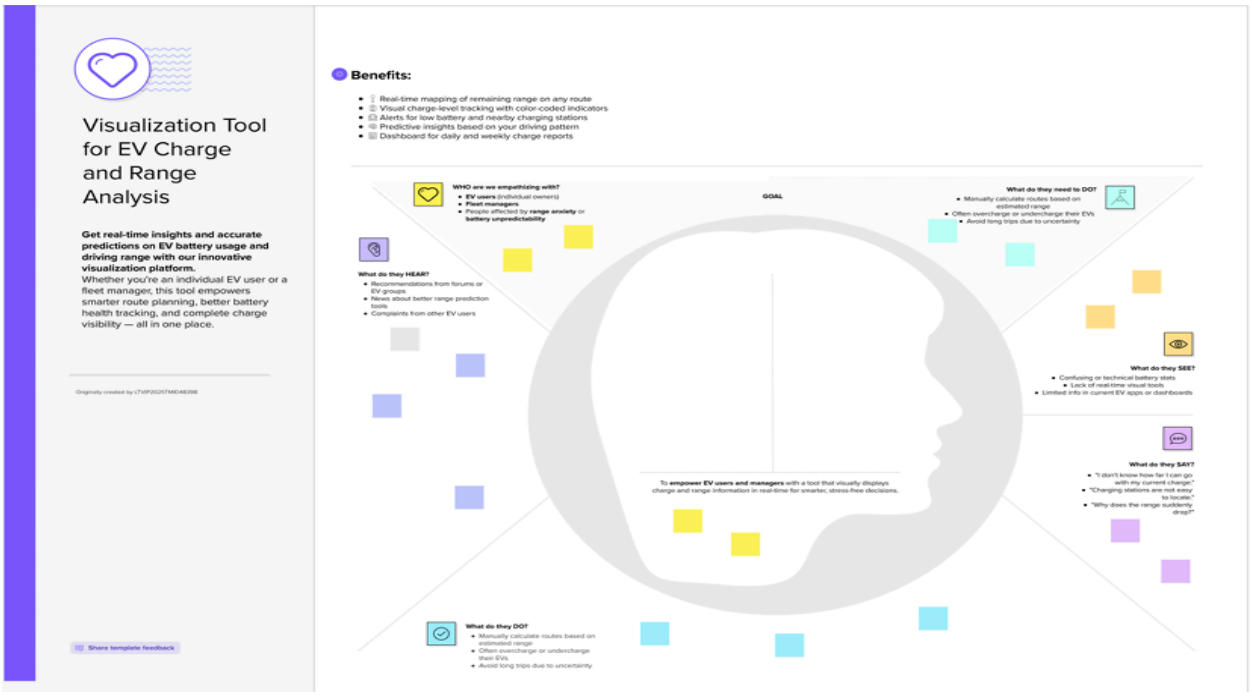
2.1 Problem Statement

Analysing different data from Multiple sources for Electric cars in India and Globally. We have 4 Different datasets that we need to analyse the data and create a Dashboard and story that can represent the data and show the Visuals for the data.



2.2 Empathy Map Canvas

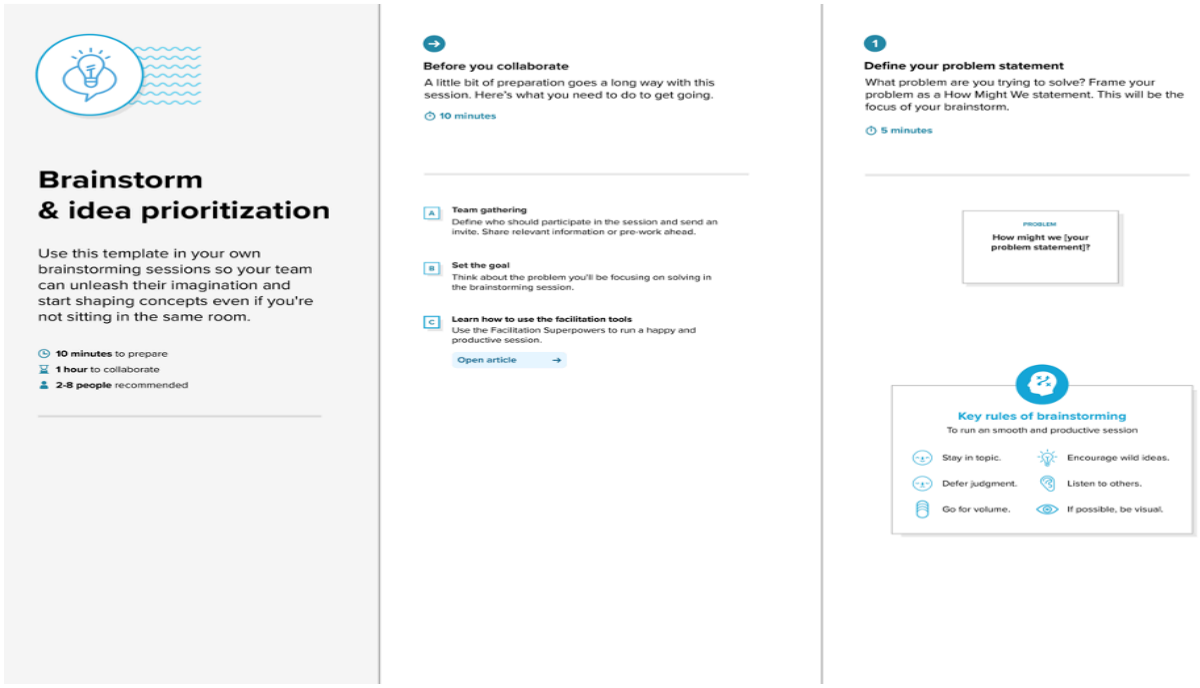
It transforms complex data from battery sensors, driving behavior, and environmental factors into clear, interactive visual dashboards. With features like charge state tracking, real-time range estimation maps, and energy consumption analytics, the tool enables EV owners and fleet operators to monitor performance, predict range, and plan efficient routes.



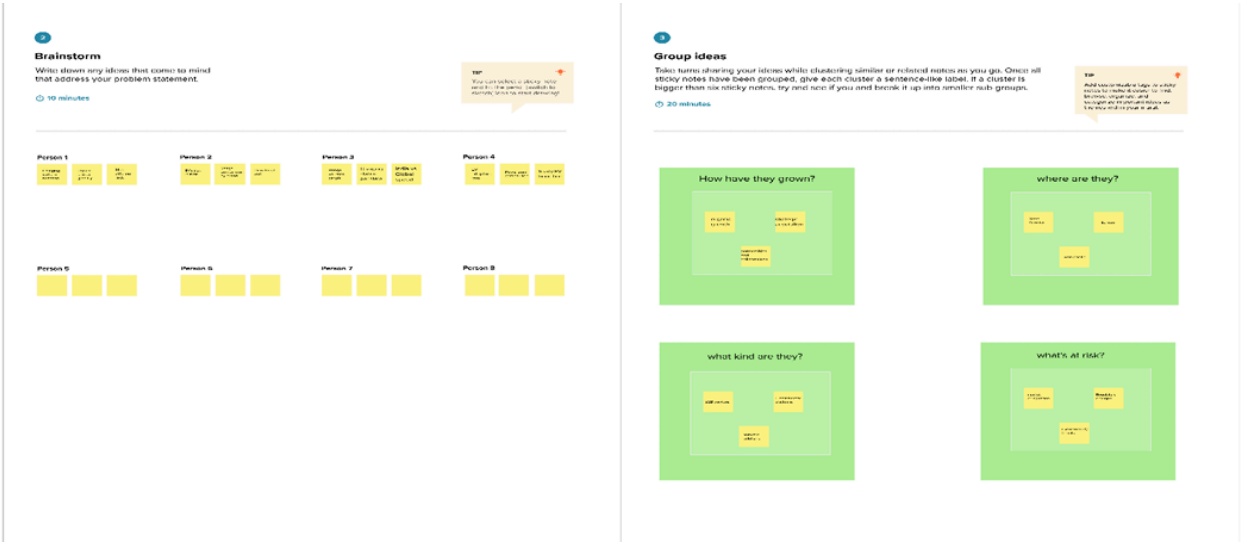
2.3 Brainstroming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

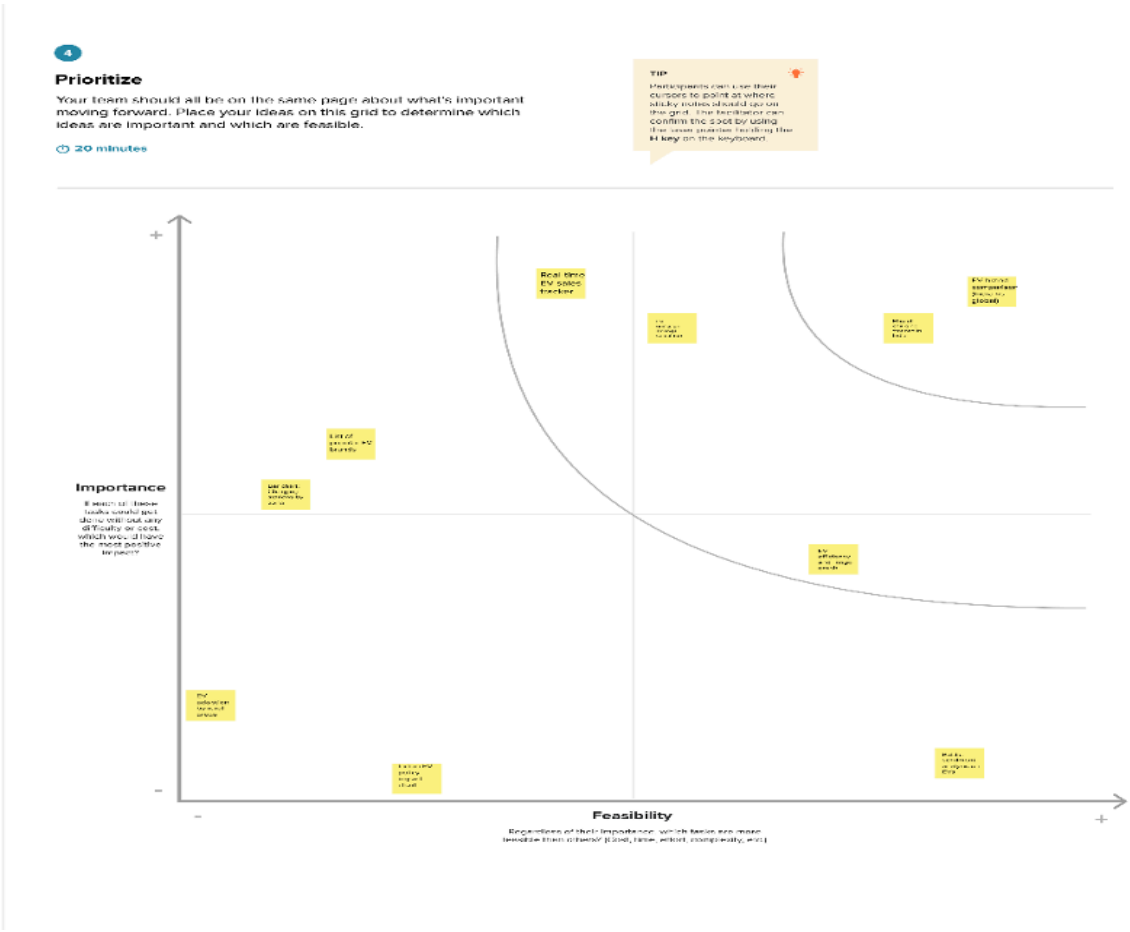
Explored various datasets



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3.REQUIREMENT ANALYSIS

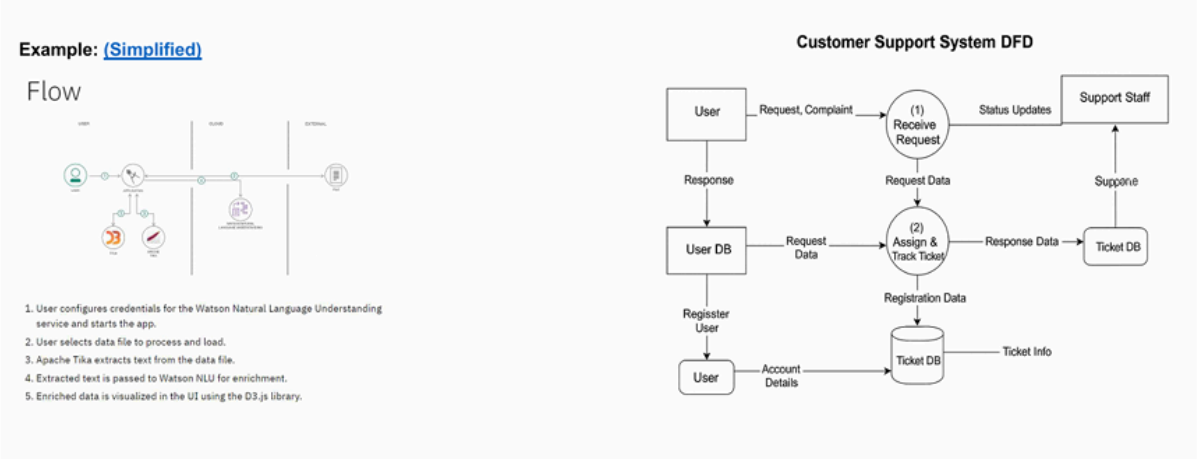
Scenario:EV Data Visualization and Insight Exploration	Entice How does someone become aware of this service?	Enter What do people experience as they begin the process?	Engage In the core moments in the process, what happens?	Exit What do people typically experience as the process finishes
Experience steps What does the person (or people) at the center of this scenario typically experience in each step?	User sees ad or article on EV insights User sees targeted ads or LinkedIn posts about EV data insights User stumbles upon the tool via Google Search or a blog about electric vehicle trends	Visits the dashboard login page	Interacts with charts, filters data views Uses comparison tools to analyze EV metrics by region or manufacturer Downloads specific datasets or exports charts as PDF/CSV	Logs out or completes exploration
Interactions What interactions do they have at each step along the way? ▪ **People:** Who do they see or talk to? ▪ **Places:** Where are they? ▪	Google search, social media, blogs LinkedIn, Twitter, EV forums Smartphone, social media apps	Signup form, email confirmation	Self-service via UI Dashboard UI, map visualization, filters Dashboard, data view page	Logout, survey, save/share option
Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	"Help me learn more about EV trends." "Help me find a reliable tool to analyze EV data effortlessly." "Help me understand how EVs are performing in my region compared to global benchmarks"	"Help me sign up and get started easily."	"Help me explore meaningful EV insights." "Help me identify EV performance trends quickly" "Help me compare datasets to make data-driven recommendations"	"Let me finish and save/share my findings."
Positive moments What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?	Discovering useful content via trusted source Landing page clearly communicates the value of the tool Sample dashboard previewes spark interest	Smooth signup and visually appealing UI	Interactive filters, smooth performance, insightful data Charts respond smoothly to filter selections Tooltips and legends clarify complex visuals	Able to save report or share findings
Negative moments What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?	Misleading content or spam-like ads No clear call-to-action (e.g., "Try Demo" or "Explore Dashboard") Confusing or cluttered landing page	Complicated signup or failed verification	Slow loading, too many options, data overload Visual clutter or overlapping chart elements Lag or delay in loading large datasets	Confusion on how to save/share findings
Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested?	Collaborate with EV influencers and blogs for credible promotion Add compelling use cases on homepage (e.g., "Compare EV charging efficiency across states") Include testimonials or success stories from early users	Add Google/Gmail/ LinkedIn one-click login	Add tutorial or guided tour, enable user-specific dashboards Introduce guided insights or summary highlights Optimize performance for large dataset handling	Auto-save session, ask for feedback gently

3.2 Solution Requirement

Functional: Data filtering, dashboards, stories, maps, charts

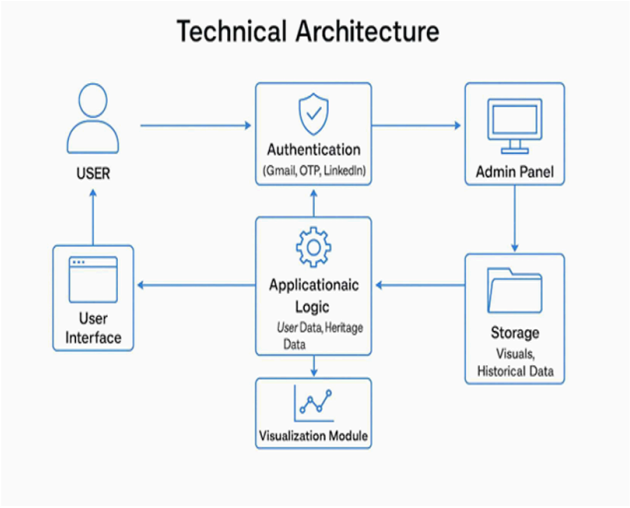
Non-functional: Performance, usability, responsiveness, accessibility

3.3 Data Flow Diagram



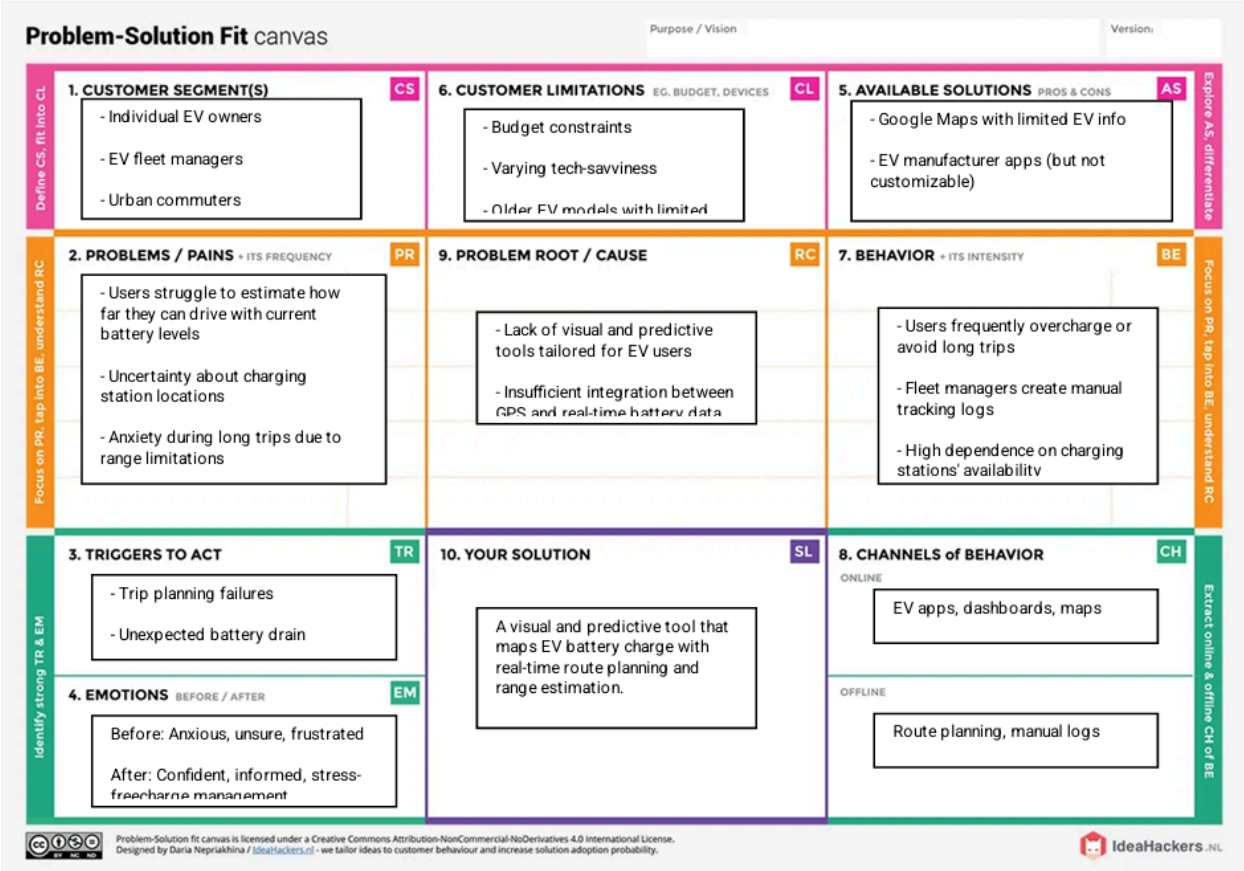
3.4 Technology Stack

- **Tableau Public** for visualization and publishing
- **Kaggle** dataset (CSV)
- Optional: Flask for web integration (if used)



4. PROJECT DESIGN

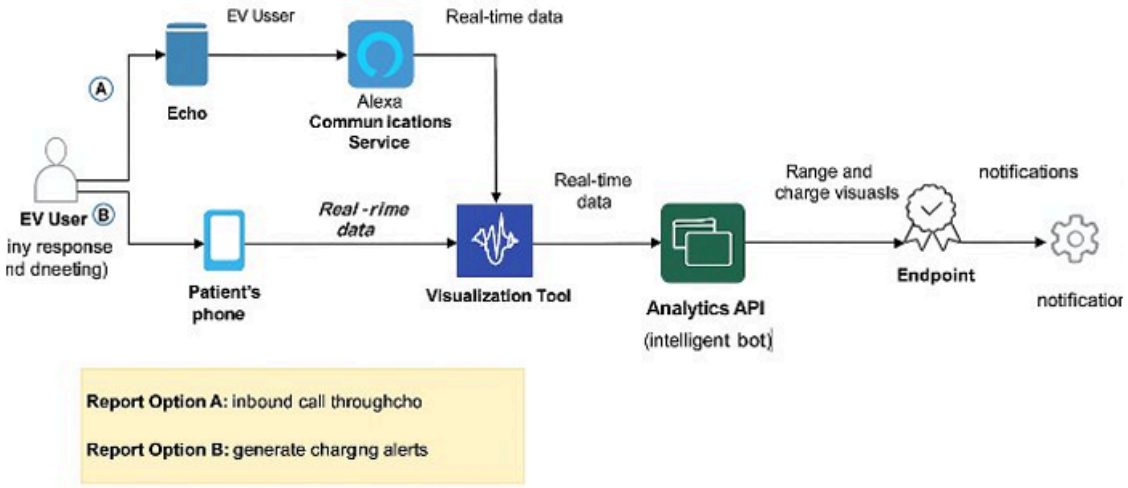
4.1 Problem-Solution Fit



4.2 Proposed Solution : Two dashboards and a Tableau story showcasing endangered sites, global distribution, and trend forecasting.

S.No.	Parameter	Description
	Problem Statement (Problem to be solved)	EV users lack clear, real-time visibility into charging patterns, range predictions, and optimal usage routes based on charge data.
	Idea / Solution description	A web-based visualization tool that processes EV data to display charge levels, consumption trends, and estimated range using interactive dashboards.
	Novelty / Uniqueness	Combines real-time charge analytics with predictive range estimation and route insights tailored to different EV models and driving behaviors.
	Social Impact / Customer Satisfaction	Enhances user confidence in EVs, reduces range anxiety, and promotes smarter, energy-efficient travel decisions.
	Business Model (Revenue Model)	Freemium model for users, with premium features for OEMs, fleet operators, and integration partners via licensing or subscription.
	Scalability of the Solution	Highly scalable to accommodate various EV brands, geographies, and fleet sizes through cloud-based data integration and modular analytics.

4.3 Solution Architecture



5. PROJECT PLANNING & SCHEDULING

Activity	Duration
Dataset Download	0.5 Hrs
Data Preparation	0.5 Hrs
Visualizations	1.0 Hrs
Filters and Interactions	1.0 Hrs
Dashboard Design	1.0 Hrs
Story Creation	1.0 Hrs
Publishing & Web Integration	1.0 Hrs

6. FUNCTIONAL AND PERFORMANCE TESTING

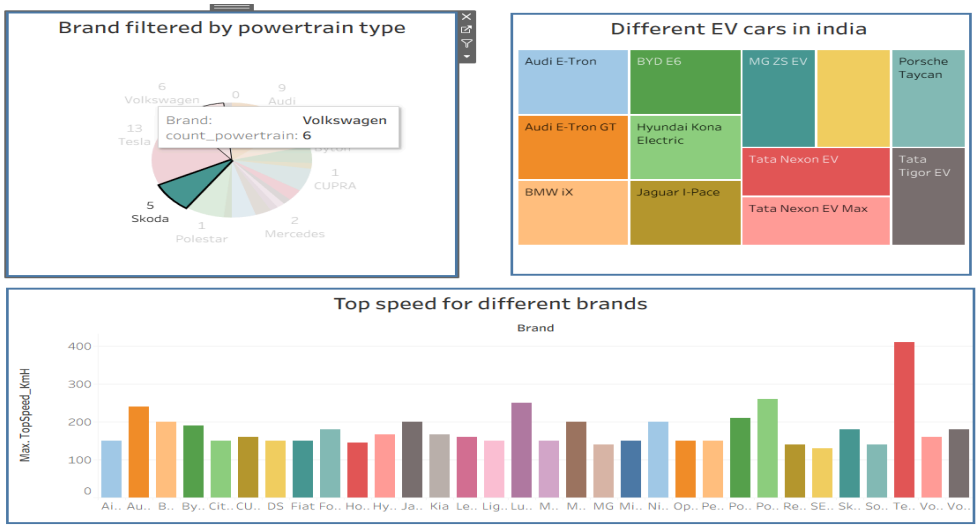
6.1 Performance Testing

Processed and visualized 1100+ records without lag. Filters and dashboards loaded instantly.

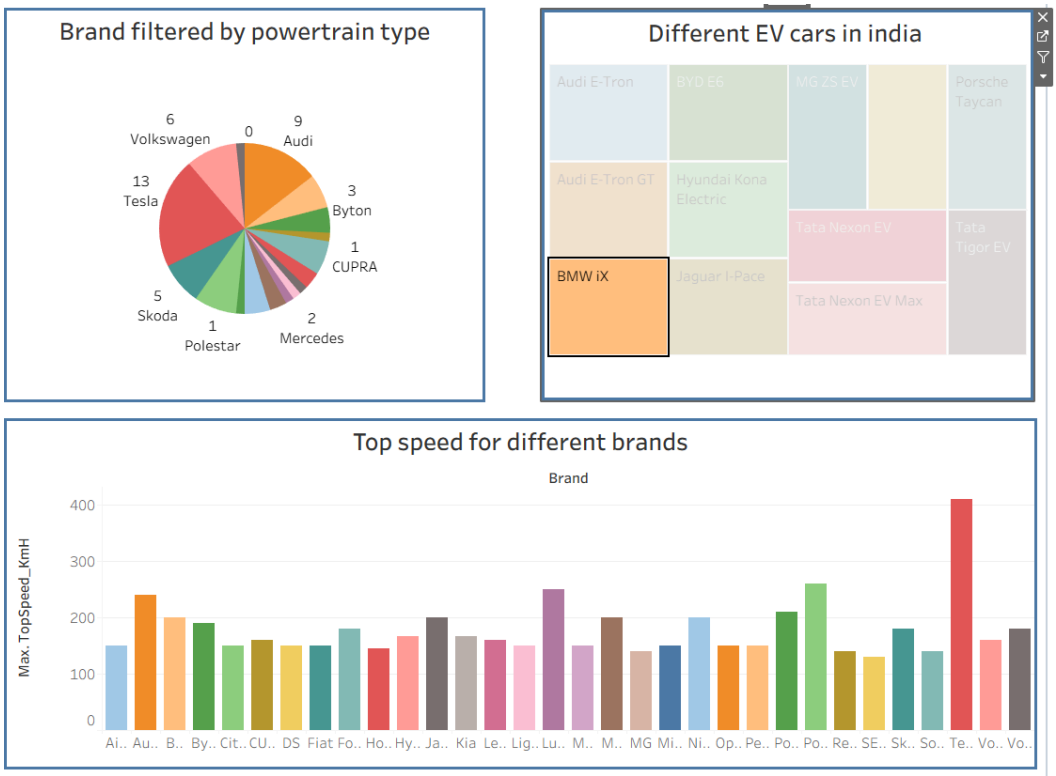
Conclusion: The performance across visualizations, dashboards, and filters was consistently smooth, ensuring usability and responsiveness for end users.

6.2 Utilization of Data Filters

- Activity 2.1: Filtered "Tesla"



● Activity 2.2: Filtered "BMW iX"



6.3 Web Integration and Publishing

- Connected to Tableau Public
- Published dashboards using share option
- Required Tableau Public login for upload

Steps:

1. Open dashboard/story > Click Share
2. Enter Tableau Public credentials
3. Click Connect and publish the selected sheet/dashboard

7. RESULTS

7.1 Output Screenshots

● Dashboard 1: Electric Car Dashboard and Overview

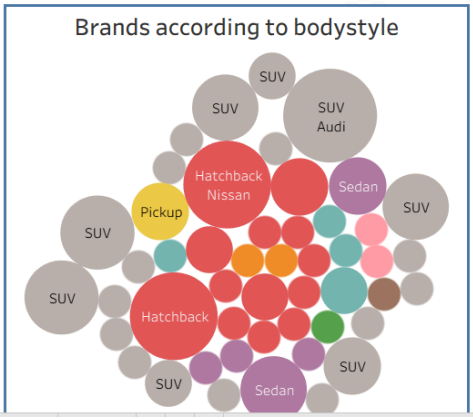
Electric Car Dashboard

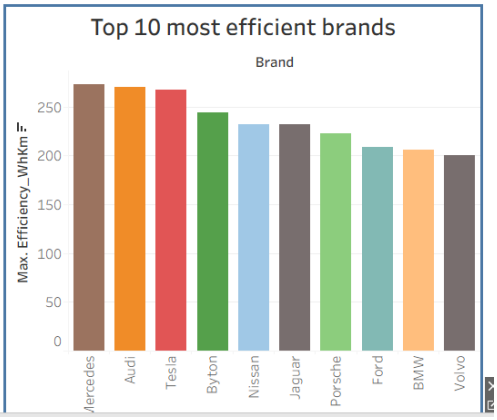
Different types of electric cars globally

98

Different electric brands in india

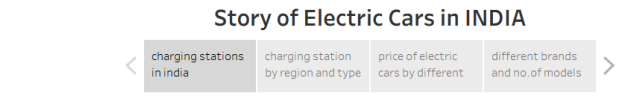
9

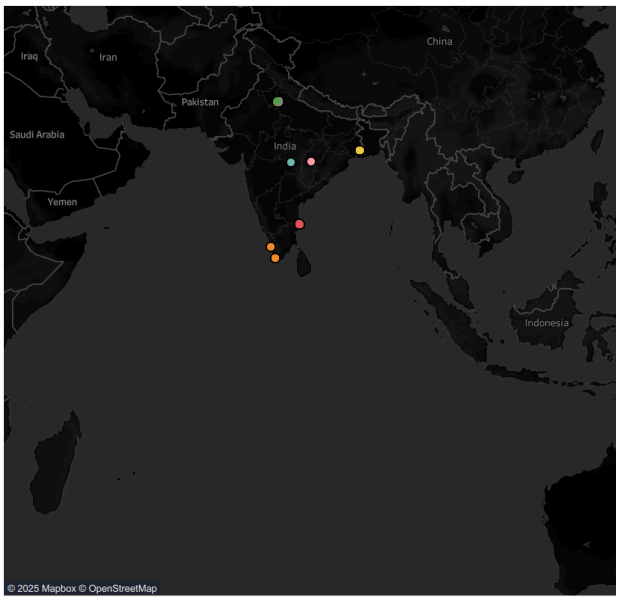




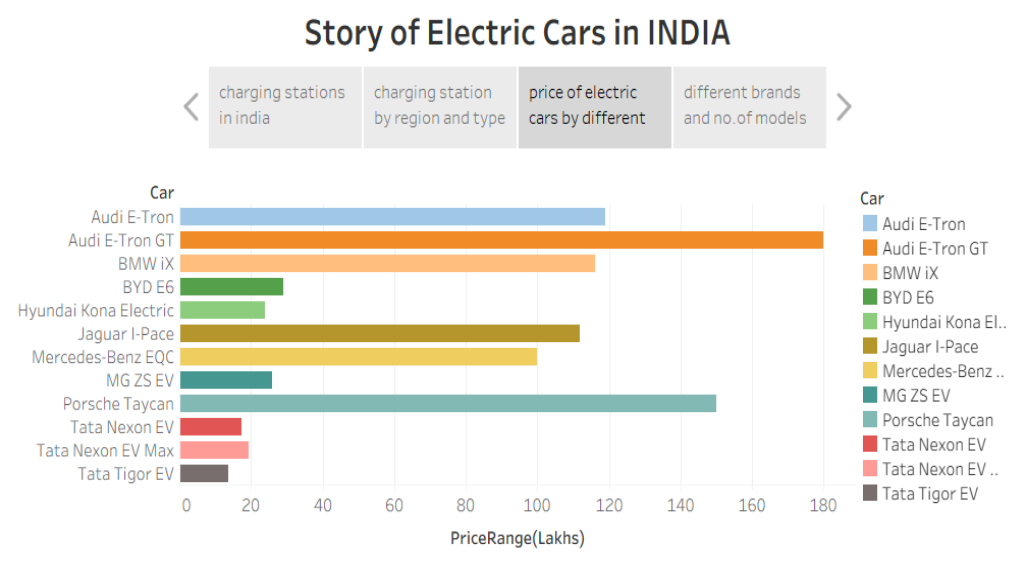
- Story Scenes with interactive flow

story1





Story 1



8. ADVANTAGES & DISADVANTAGES

Advantages

- Real-time filtering
- Clear visual storytelling
- Easy publishing on Tableau Public

Disadvantages

- Static dataset (2019 only)
- Public version lacks backend connectivity

9. CONCLUSION

The EV Charge and Range Analysis Visualization Tool successfully bridges the gap between raw EV data and meaningful decision-making. By offering an intuitive, interactive platform, it empowers users to monitor charge levels, predict vehicle range, and optimize energy consumption with ease and clarity.

10. FUTURE SCOPE

- 🔗 Integration with real-time charging station networks
- 🌦️ Range prediction improvements using live weather and traffic feeds
- 🚗 Multi-vehicle and fleet comparison dashboards
- 📱 Mobile app with location-based charge alerts and range estimation
- 📊 AI-driven energy optimization suggestions for drivers
- 🌍 Cross-region route planning with smart charging stops

11. APPENDIX

● DatasetLink:https://drive.google.com/drive/folders/1Rkzdks6Us1Uq2SRB4nxMAb83jN5bpHll

●GitHubLink:
https://github.com/Reshma-Narayanasetty/-EV-charge-and-Range-Analysis

●TableauPublicLink:
https://public.tableau.com/app/profile/narayanasetty.reshma/vizzes

●VideoDemoLink:
https://drive.google.com/file/d/1V1zsqIJrmPO7Ipvq3x4mOOZNqXzJyzaY/view?usp=sharing