Visualization Tool for Electric Vehicle Charge and Range Analysis

Project Based Experiential Learning Program

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Visualization tool for electric vehicle charge and range analysis :

Abstract:

This project develops a data visualization dashboard to analyze electric vehicle (EV) charging behavior, range efficiency, and market trends. The tool addresses critical challenges in EV adoption, such as charging infrastructure gaps and performance variability. Insights are derived from stakeholder consultations, design-thinking methodologies, and comparative analysis of 40+ EV models. The report concludes with future scalability recommendations for policymakers and manufacturers.

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1. Introduction

1.1 Overview

India is a country with the third largest road network in the world. Electrification of passenger vehicles is ever more certain following the launch of many more EV offerings from vehicle manufacturers, legislation to curb Internal Combustion Engine (ICE) powered vehicles and municipal concerns over air quality. Policy makers, technologists, energy regulators, vehicle and EV infrastructure industries are increasingly concerning themselves with enhancing enablers and removing barriers to EV adoption. This recognition and call to action is playing out to differing degrees worldwide and, by being proactive, the UK has the potential to build on its position as the third largest vehicle producer in Europe and expand its vehicles offering and supporting arrangements.
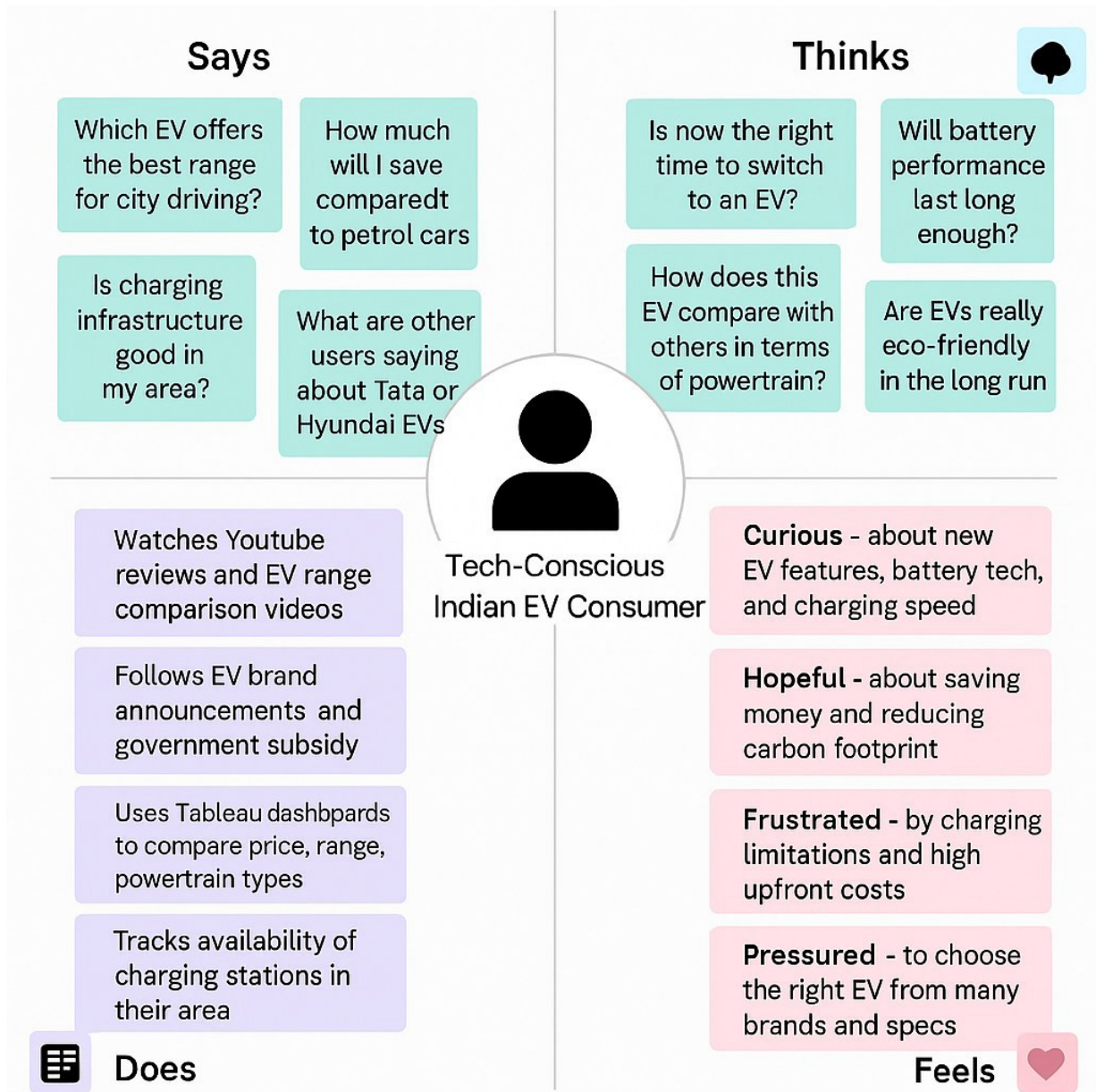
1.2 Purpose

Against this background, in January 2018, a cross Catapult working group drawn from Future Cities, Transport Systems, High Value Manufacturing and Energy Systems Catapult consulted with a broad range of stakeholders that were affected directly by, or could seize opportunities presented by, the mass adoption of EVs.

Several years ago, the number of highway-capable EV options was limited, but the variety of makes and models on the market is now quickly increasing. There are currently in excess of 40 highway-capable fully-EV models on the market and many more due for release in the coming year. In addition to passenger cars, Hackney Carriages2, vans and buses are now on the market too and in operation in several cities. Electric heavy goods vehicles are towards the latter stages of development and are starting to be offered for commercial release. By 2025 it is expected that most types of ICE vehicle will have an EV equivalent available.

2. Problem definitions and design thinking

2.1 Empathy map

Says

Which EV offers the best range for city driving?

How much will I save comparedt to petrol cars

Is charging infrastructure good in my area?

What are other users saying about Tata or Hyundai EVs

Thinks

Is now the right time to switch to an EV?

Will battery performance last long enough?

How does this EV compare with others in terms of powertrain?

Are EVs really eco-friendly in the long run

Tech-Conscious Indian EV Consumer

Does

Watches Youtube reviews and EV range comparison videos

Follows EV brand announcements and government subsidy

Uses Tableau dashbpards to compare price, range, powertrain types

Tracks availability of charging stations in their area

Feels

Curious - about new EV features, battery tech, and charging speed

Hopeful - about saving money and reducing carbon footprint

Frustrated - by charging limitations and high upfront costs

Pressured - to choose the right EV from many brands and specs

2.2 Brainstorming map

2 Brainstrom

Write down any ideas that come to mind that address your problem statement.

🕑 10 minutes

💡 You can select a sticky note and then select imas to icons

Pradeep	Deekshita	Murali	Irfan
Visualize EV adoption across Indian states using Tableuo to identify high growth regions	Analyze the efficiency vs price of EV brands to understand value for money using dashboards	Track growth in EV charging stations and range performance over recent years	Compare public perception on EVs before and after subsidy or pricing policies

3 Group ideas
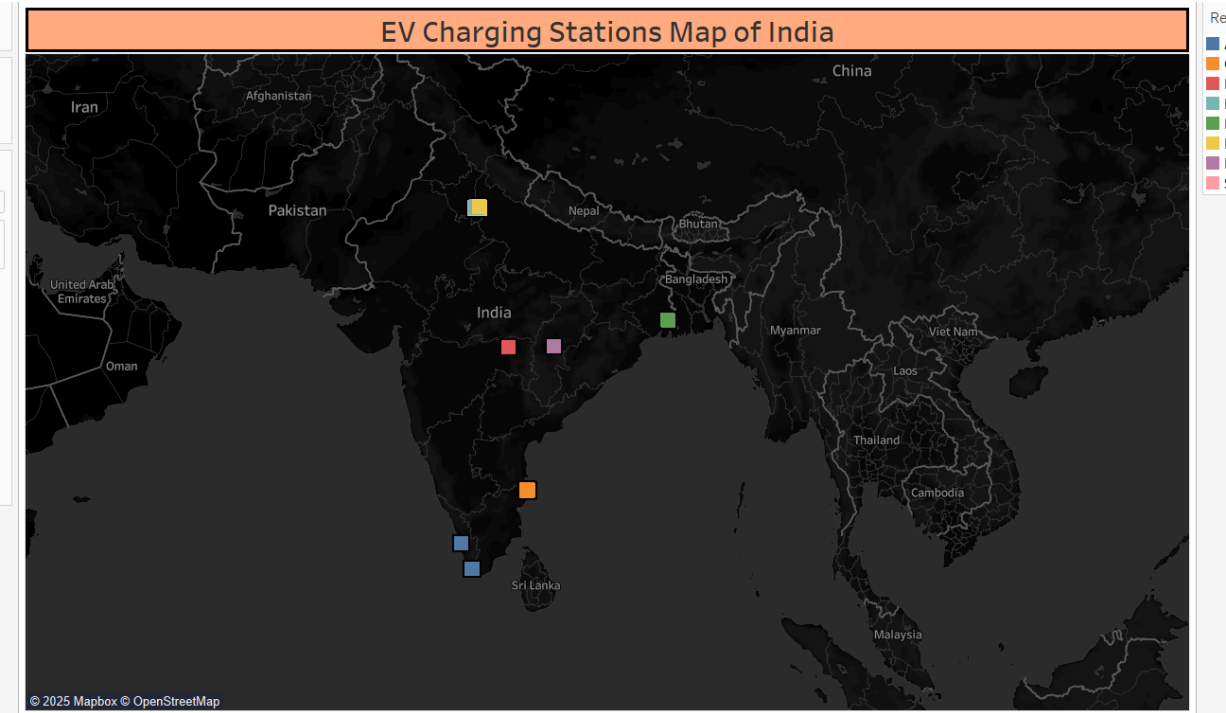
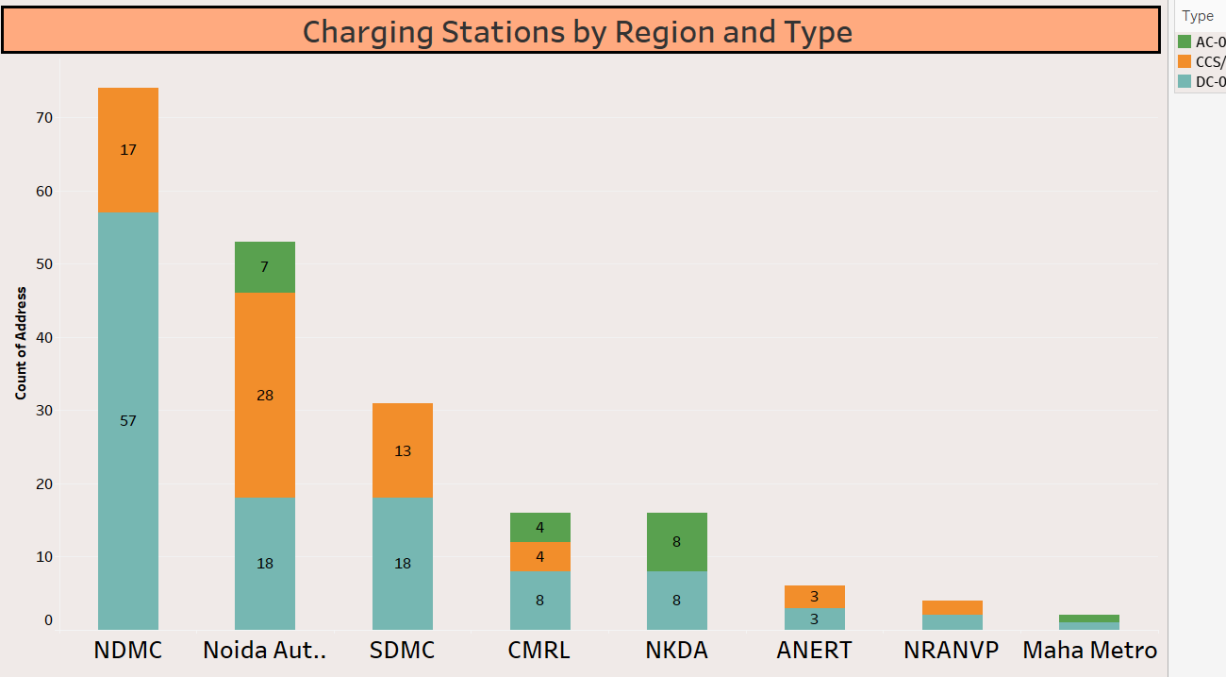**Cluster 1; Understanding EV Penetration & Regional Trends**

Visualize EV adoption ac cross. Indian states using Tableau to identify high-growth regions
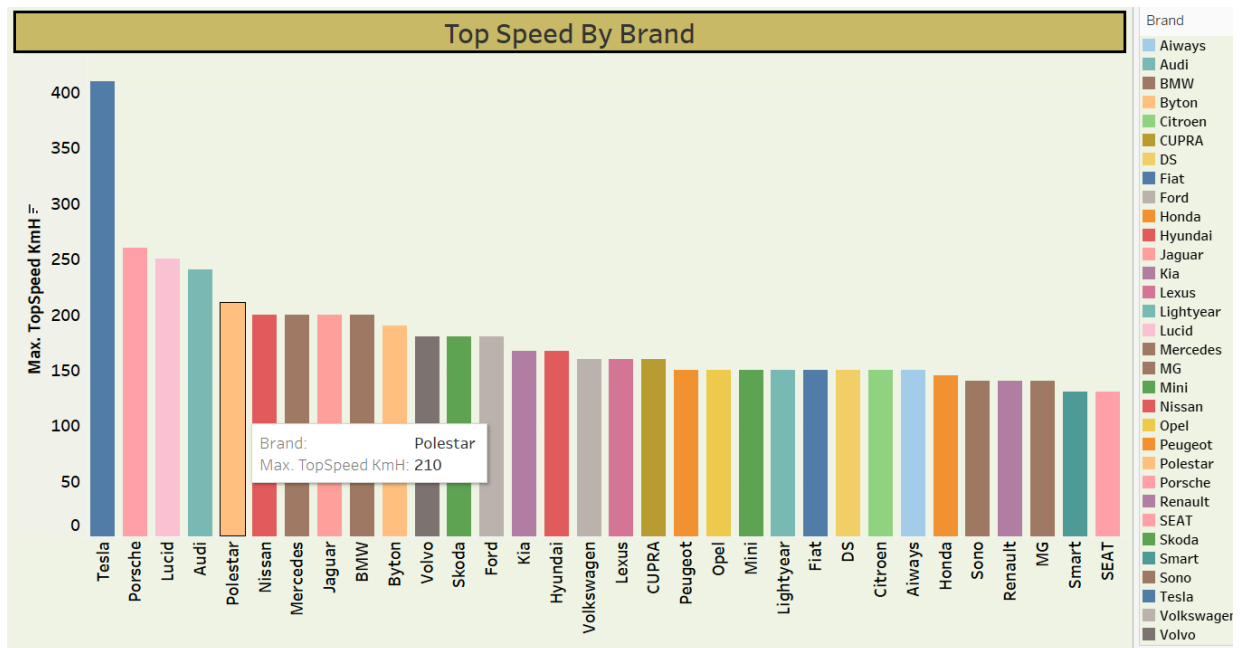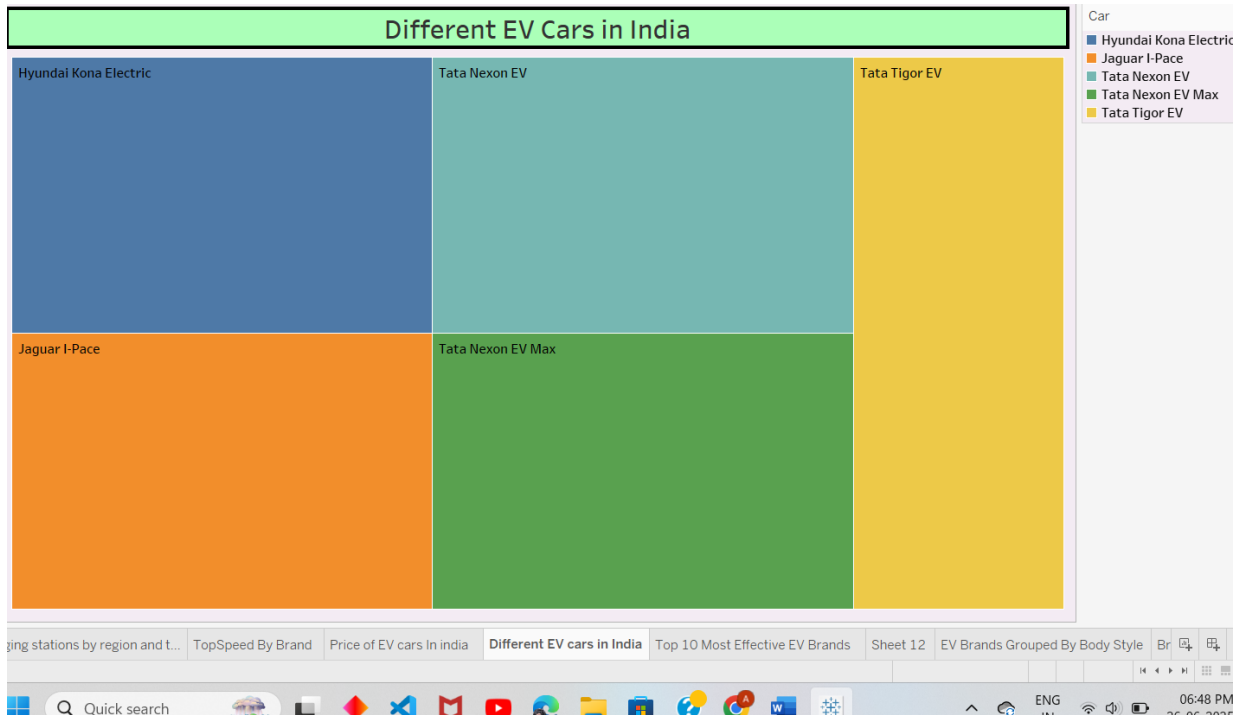
Cluster 2; Analyzing Impact of External Influences on EV Sales
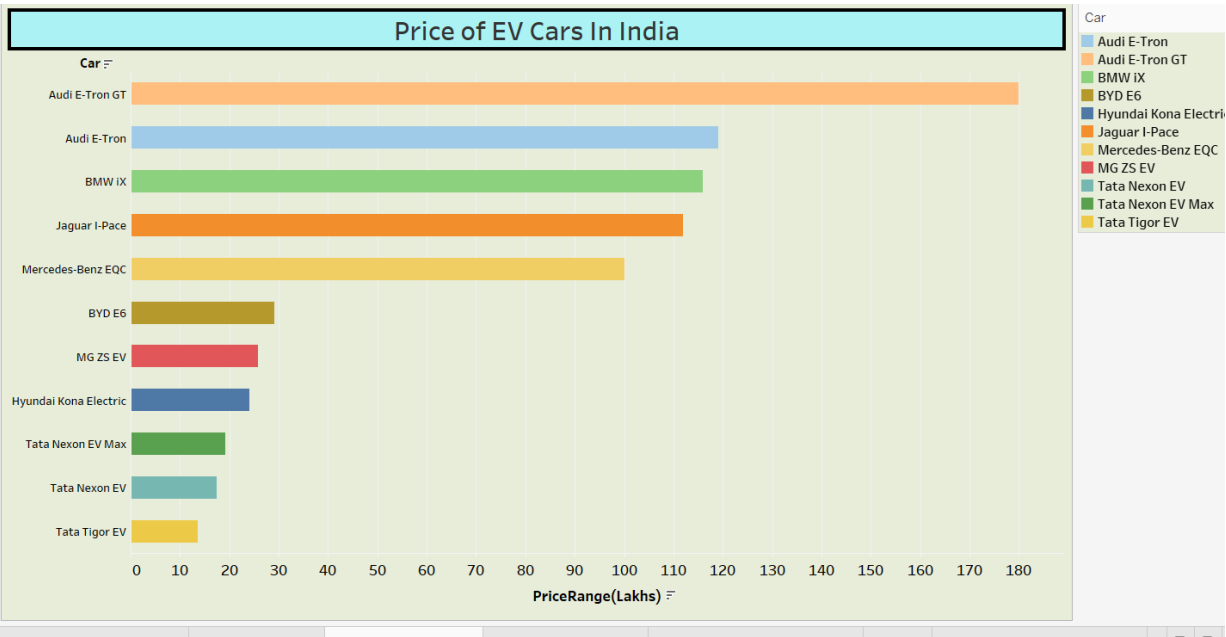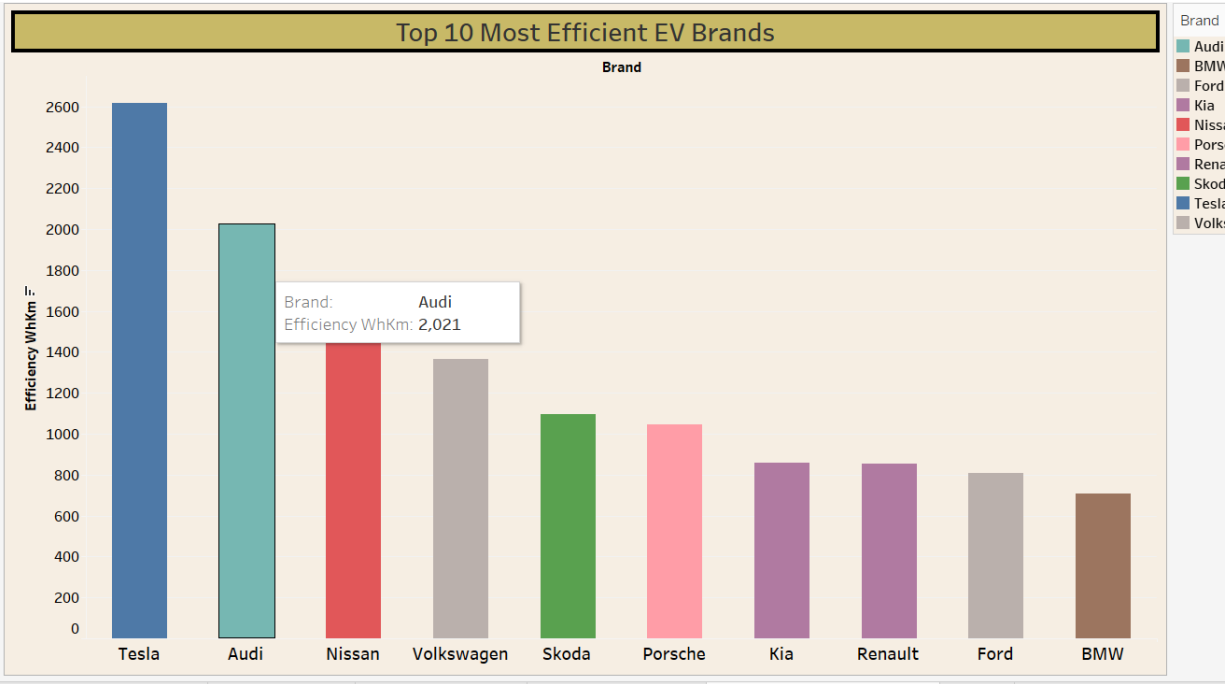
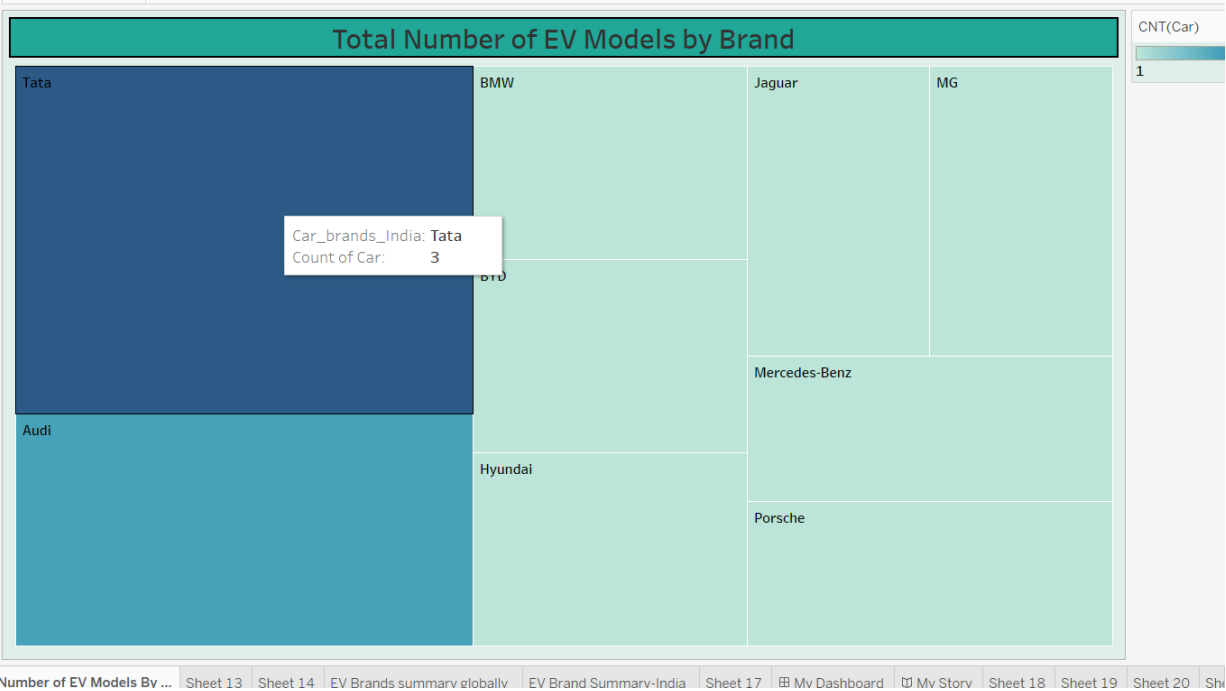Visualize how pricing, government policies, or fuel cost changes impact EV adoptoption

3. Results

3.1 Dashboard results

Different EV Cars in India

Car
- Hyundai Kona Electric
- Jaguar I-Pace
- Tata Nexon EV
- Tata Nexon EV Max
- Tata Tigor EV

| Hyundai Kona Electric | Tata Nexon EV | Tata Tigor EV |
| Jaguar I-Pace | Tata Nexon EV Max | |

ging stations by region and t... | TopSpeed By Brand | Price of EV cars In india | **Different EV cars in India** | Top 10 Most Effective EV Brands | Sheet 12 | EV Brands Grouped By Body Style

Top Speed By Brand

Brand
- Aiways
- Audi
- BMW
- Byton
- Citroen
- CUPRA
- DS
- Fiat
- Ford
- Honda
- Hyundai
- Jaguar
- Kia
- Lexus
- Lightyear
- Lucid
- Mercedes
- MG
- Mini
- Nissan
- Opel
- Peugeot
- Polestar
- Porsche
- Renault
- SEAT
- Skoda
- Smart
- Sono
- Tesla
- Volkswagen
- Volvo

Brand: Polestar
Max. TopSpeed KmH: 210

Top 10 Most Efficient EV Brands

Brand

Brand: Audi
Efficiency WhKm: 2,021

Brand legend: Audi, BMW, Ford, Kia, Nissa, Pors, Rena, Skod, Tesla, Volks

Efficiency WhKm (y-axis): 0, 200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600

Brands (x-axis): Tesla, Audi, Nissan, Volkswagen, Skoda, Porsche, Kia, Renault, Ford, BMW

Price of EV Cars In India

Car

Audi E-Tron GT
Audi E-Tron
BMW iX
Jaguar I-Pace
Mercedes-Benz EQC
BYD E6
MG ZS EV
Hyundai Kona Electric
Tata Nexon EV Max
Tata Nexon EV
Tata Tigor EV

PriceRange(Lakhs): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180

Car legend: Audi E-Tron, Audi E-Tron GT, BMW iX, BYD E6, Hyundai Kona Electric, Jaguar I-Pace, Mercedes-Benz EQC, MG ZS EV, Tata Nexon EV, Tata Nexon EV Max, Tata Tigor EV

EV Brands Grouped by Body Style

Total Number of EV Models by Brand

CNT(Car)

1

Tata

BMW

Jaguar

MG

Car_brands_India: Tata
Count of Car: 3

Audi

Hyundai

Mercedes-Benz

Porsche
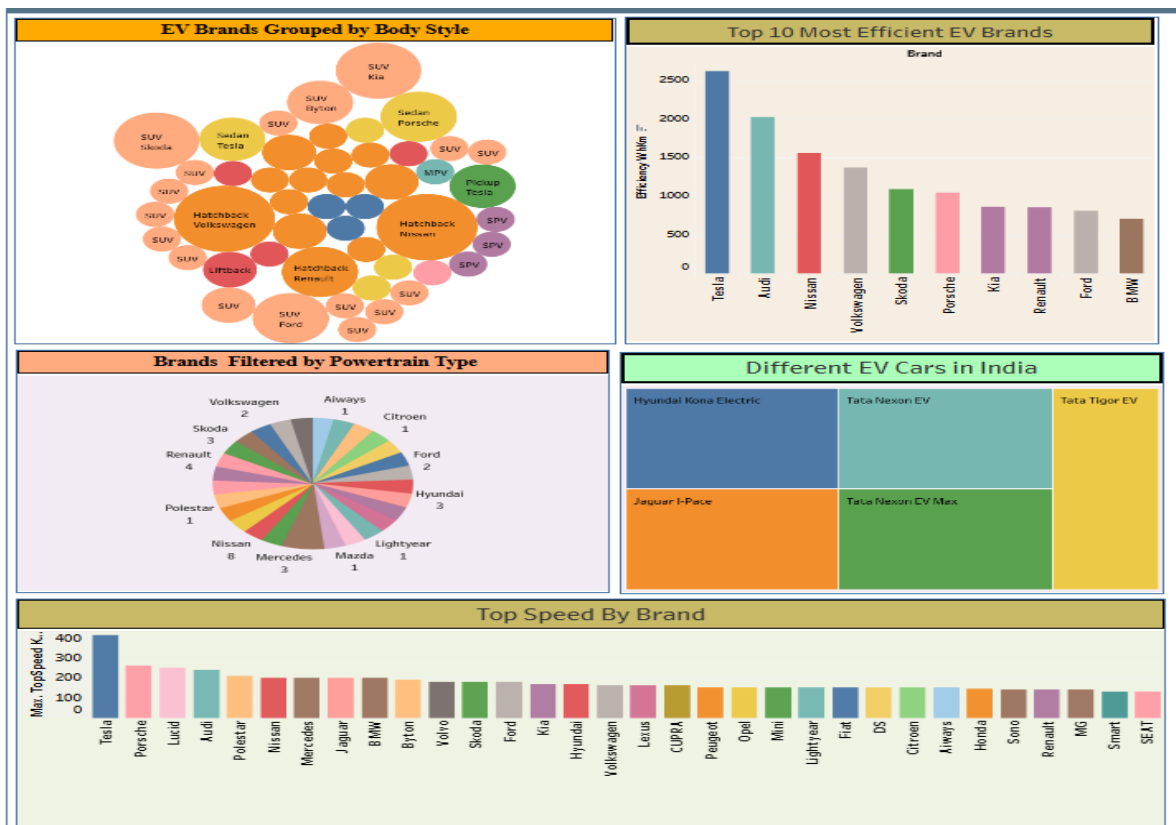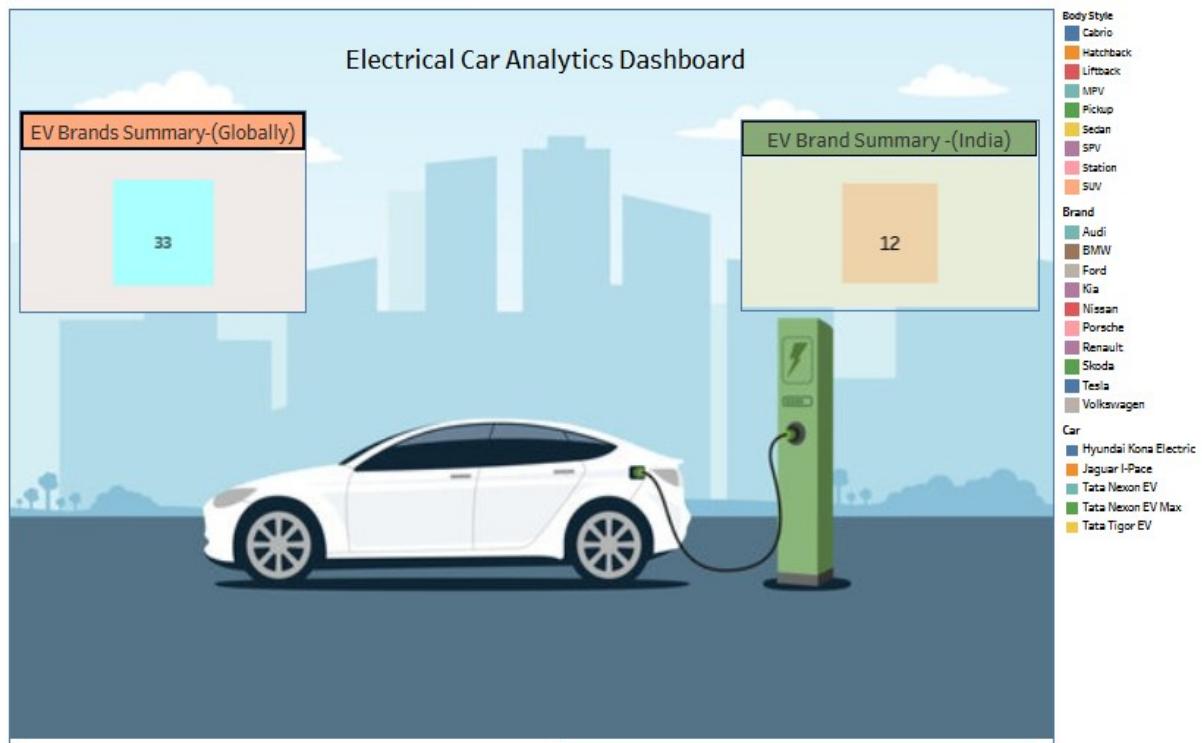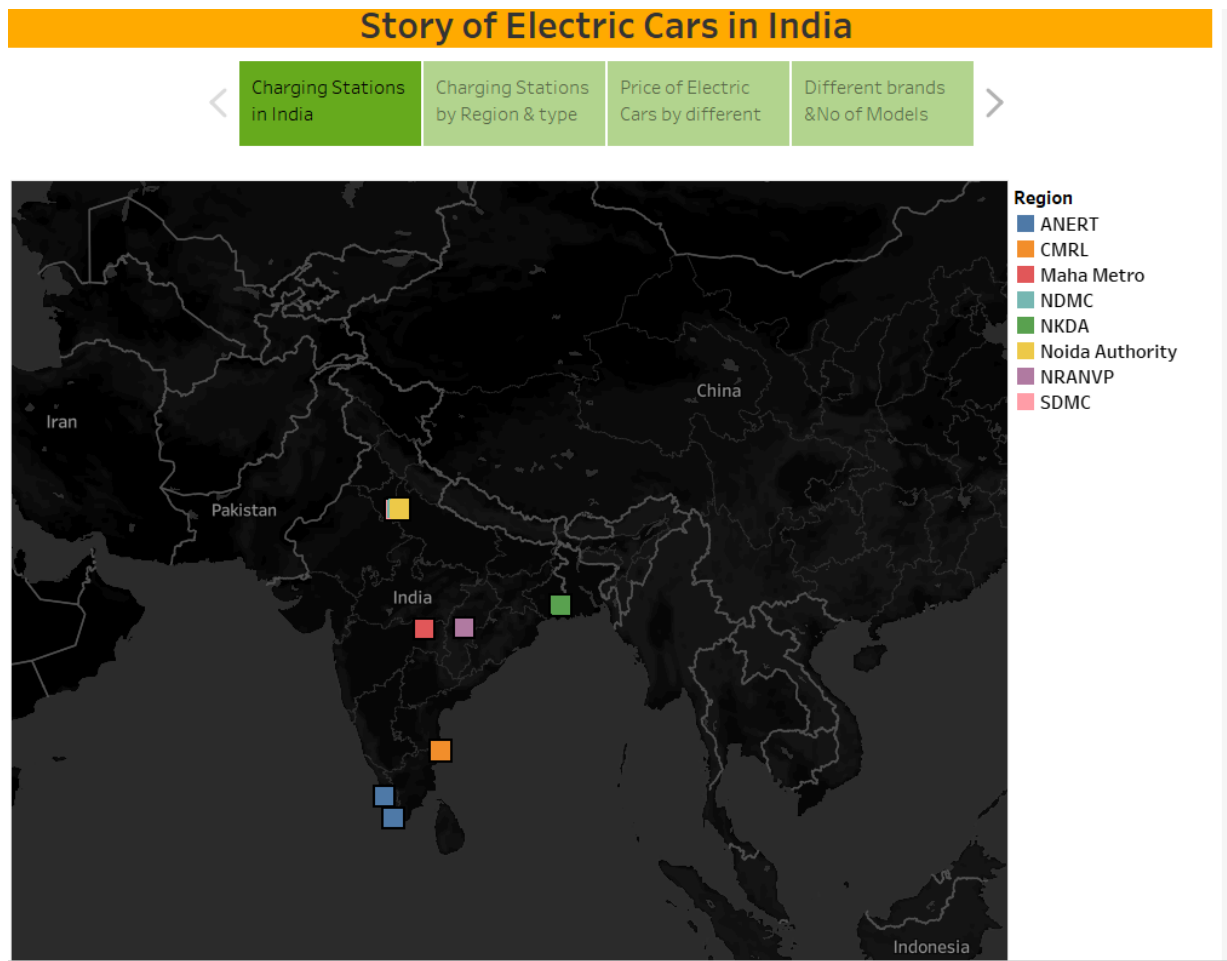
Electrical Car Analytics Dashboard

3.2 Story of electric vehicles

4. Advantages and disadvantages
4.1 Advantages of electric vehicle

Eco-friendly: Because electric vehicles do not utilize fuel for combustion, there are no emissions or gas exhaust. Vehicles that run on fossil fuels contribute significantly to hazardous gas accumulation in the environment, thus driving an electric car can help contribute to a cleaner environment.

Renewable energy source: Electric vehicles run on renewable power, whereas conventional automobiles function on the combustion of fossil fuels, which reduces the world's fossil-fuel stocks.

Less noise and smoother motion: Driving an electric car is significantly smoother. Because they lack fast-moving elements, they are quieter and produce less noise.

Cost-effective: Electricity is far less expensive than fuels such as gasoline and diesel, which are subject to regular price increases. When solar electricity is utilized at home, battery recharging is cost-effective.

Low maintenance: Because electric cars have fewer moving components, wear and tear is reduced when compared to traditional auto parts. Repairs are also simpler and less expensive than combustion engines.

Government support: Governments throughout the world have granted tax breaks to encourage people to drive electric vehicles as part of a green program

4.2 Disadvantages of Electric Vehicles

High initial cost: Electric vehicles continue to be quite expensive, and many buyers believe they are not as inexpensive as traditional automobiles.

Charging station limitations: People who need to travel long distances are concerned about finding adequate charging stations in the middle of their journey, which are not always accessible.

Recharging takes time: Unlike conventional automobiles, which require only a few minutes to replenish their gas tanks, charging an electric vehicle takes many hours.

Limited options: Currently, there aren't many electric car models to pick from in terms of appearance, style, or customized variations.

Less driving range: When compared to conventional automobiles, electric vehicles have a shorter driving range. Electric cars can be convenient for short-distance travel but are inconvenient for longdistance travel.

5. Applications

With so much data being acquired through data analysis in today's corporate environment, we need a means to visualise that data so we can understand it.

By placing data in a visual context, such as maps or graphs, data visualisation helps us understand what it means. This makes the data more natural to understand for the human mind, making it simpler to see trends, patterns, and outliers in huge data sets.

It provides insights on one or more pages or screens to assist you keep track of events or activities at a glance. Unlike an infographic, which displays a static graphical representation, a dashboard displays real-time data by extracting complicated data points from massive data sets.

By visualization of electric vehicles, the peoples are come to know about the entire details of electric vehicles for example visualization of top speed for different brands gave a perfect result which gives top speed in different brands in this the customers or the people who want to buy a electric car will get a true information.

6. Conclusion :

Electric vehicles are made for the future and will be a big innovation. They are good for the environment, and they do not emit any greenhouse gases.

There are, however, many challenges associated with electric vehicles. They have a limited range. Charging the vehicle takes time and can be a hassle sometimes. The availability of charging stations is also a big issue. Incompatibility of charging stations can also be a problem. Despite many challenges and issues, switching to electric vehicles is good for the environment and is more economically viable in the long term. Many have predicted that, by 2040, most of the vehicles will be electric. Rising fossil fuel costs and high maintenance costs of petrol and diesel vehicles coupled with environmental concerns are the main reasons. Many developed countries have given incentives for purchasing electric vehicles. Automobile manufacturers are already manufacturing some impressive electric vehicles.

7. Future scope

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