**CRISP-DM METHODOLOGY FOR VEHICULAR RECOMMENDATION SYSTEM**

1. **Business Understanding**

Car fuel economy is the count of miles that a car can travel using a certain amount of fuel. It is measured in miles per gallon (mpg) or MPGe for electric vehicles. The higher the car’s mpg, the better the car’s fuel economy. Hence, the car can go farther on a fuel tank if it can get more miles per gallon. Sometimes car fuel economy and car fuel efficiency are used interchangeably, but they are different. Car fuel efficiency means the fuel amount used to power a car instead of indicating the distance that the fuel will take the car.

One of the tasks of the U.S. Environment Protection Agency (EPA) is to review automakers’ fuel economy test results and confirm some of the results by conducting its tests. This makes the US EPA a reliable source of fuel economy data for different vehicles in the United States of America and across the world.

Fuel economy varies by vehicle type. For instance, minivans have 22 mpg, which is lower than the mpg of a subcompact car. Therefore, checking the car’s fuel economy when acquiring a vehicle is essential. The vehicle purchaser’s impact from fuel economy is reducing the cost of driving the vehicle. When the price of fuel increases, the consumers prefer paying more for fuel economy and vice versa.

Currently, there is high inflation across global markets in the world economy. This has been caused by several factors, including the war between Ukraine and Russia, the diplomatic tensions between China and the USA, and the 2020 COVID-19 pandemic. These shocks to the global economy between 2019 and 2022 have led to an increase in global energy prices due to supply chain disruptions. Consequently, consumers are willing to pay more for car fuel economy.

Additionally, supply chain disruptions in microchip production have led to global disruptions in the manufacturing and supply of vehicles. This supply chain disruption has caused the cost of acquiring a newly manufactured European car to increase. Consequently, this has increased the demand for newly manufactured Japanese-made vehicles across the globe. In 2019, Germany exported 550,000 used cars to Africa, while Japan exported 302,467 units of used cars. The increase in demand for Japanese-made vehicles in Europe is poised to increase the cost of acquiring cheaper Japanese vehicles in Africa.

According to EPA, a passenger vehicle emits an average of 4.6 metric tons of carbon dioxide annually. This measurement assumes that the average vehicle on the road has a fuel economy of 22 mpg and drives approximately 11,500 miles annually. Therefore, every gallon of fuel burned creates about 8,887 grams of CO2. The European Union, in October 2022, reached an agreement to revise the CO2 emissions of newly manufactured passenger and light commercial vehicles to zero by 2035. This category of vehicles contributed around 63% of global transportation sector emissions in 2020, i.e., passenger vehicles - 41% and medium and heavy trucks - 22%.

The adoption of renewable energy is also a key player in the global trend to reduce emissions in the automotive sector. Manufacturers are developing new vehicles that use electric and hydrogen combustion engines. This manufacturing advancement is to move the automotive sector into the green sector hence reducing the emissions from their products. Africa has the potential to produce renewable energy from solar, wind, geothermal, and offshore sources to power vehicles. The continent also has the potential to produce green hydrogen from renewable energy. These require efforts from private industry and government stakeholders to achieve. Policy development and private industry’s willingness to address the automotive sector emissions can help Africa reduce emissions and generate revenue from green and carbon credits.

Therefore, Kenyan and other African economies should aim to import or manufacture low-emission and high-fuel-economy vehicles in their markets. This will lead to a reduction in fossil fuel demand in the African market. Consequently, the emissions from the automotive sector in Africa will reduce. The governments could take advantage by generating revenue from carbon and green credits sales to other government and private entities. Lastly, for the consumers of vehicles to save on the cost of driving and acquiring the vehicle, there is a need to develop a recommendation system that personal and industrial vehicular consumers can use to determine the most suitable vehicle.

1. **Business objectives**

* To recommend to consumers which car models to import to Kenya.
* To conduct an analysis of emissions and fuel economy for different vehicles in the market.
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