**Case Study - Alcoholic Beverage Sector**

**Business Understanding**

The wine industry is dynamic and diverse, with players ranging from small family-owned vineyards to large multinational corporations. It's influenced by factors such as regional climate, consumer preferences, government regulations, and global market trends. Additionally, it's a sector where tradition and innovation often intersect, as winemakers seek to balance time-honored practices with modern techniques and technologies.

The quality of wine is important for several reasons, both for producers and consumers:

1. **Consumer Satisfaction:** High-quality wine provides a better overall experience for consumers. It offers more enjoyable aromas, flavors, and textures, which can lead to greater satisfaction and enjoyment.
2. **Reputation and Branding:** Consistently producing high-quality wine builds a positive reputation for wineries. This reputation can lead to brand loyalty, higher demand, and potentially higher prices for their products.
3. **Competitive Advantage:** In a crowded market, having a reputation for quality sets a winery apart from its competitors. It can attract more attention from distributors, retailers, and consumers.
4. **Wine Aging Potential:** High-quality wines typically have the structure and balance needed to age gracefully. They can develop more complex and nuanced flavors over time, increasing their value.
5. **Economic Value:** Collectors and investors often seek out high-quality wines for their potential to appreciate in value over time. Some rare or highly-rated wines can command very high prices in the market.
6. **Critical Acclaim:** High-quality wines are more likely to receive positive reviews and high scores from wine critics, which can significantly boost their visibility and demand.

The chemical composition and sensory characteristics of wine play a significant role in determining its price.

The chemical composition and sensory characteristics of wine are two distinct aspects that provide valuable information about the nature and quality of a wine.

1. **Chemical Composition:**The chemical composition of wine refers to the various compounds and elements present in the liquid. These include:
   * **Fixed Acidity:** The total concentration of acids in the wine, which primarily includes tartaric acid, malic acid, and citric acid. It contributes to the wine's overall acidity level.
   * **Volatile Acidity:** The presence of volatile acids, primarily acetic acid, which can give a wine a vinegary or sharp taste if too high.
   * **Citric Acid:** An organic acid naturally found in citrus fruits. It can add freshness and acidity to a wine.
   * **Residual Sugar:** The amount of sugar that remains in the wine after fermentation. It influences the wine's sweetness level.
   * **Chlorides:** The concentration of salts, particularly sodium chloride, which can affect the wine's taste and mouthfeel.
   * **Free and Total Sulfur Dioxide:** Sulfur dioxide is used in winemaking as a preservative and antioxidant. It can also affect the wine's aroma and flavor.
   * **Density:** The mass per unit volume of the wine, which can indicate the concentration of solids (like sugar) in the liquid.
   * **pH:** A measure of the wine's acidity or alkalinity. Lower pH values indicate higher acidity.
   * **Sulphates:** Compounds that can act as antioxidants and antimicrobial agents in wine.
   * **Alcohol:** The percentage of alcohol by volume in the wine, which affects the body, texture, and overall flavor profile.
   * **Color (red/white):** This can be influenced by the grape variety used, as well as the winemaking process.
2. **Sensory Characteristics:**  
   Sensory characteristics refer to the aspects of wine that can be perceived by our senses, primarily taste and smell. These include:
   * **Aroma:** The scents and fragrance perceived when smelling the wine. This can include fruity, floral, herbal, and other complex aromas.
   * **Flavor:** The combination of tastes experienced on the palate. This includes sweet, sour, bitter, salty, and umami, as well as various specific flavor notes.
   * **Texture or Mouthfeel:** This includes factors like the wine's body (light, medium, full), tannin level (which affects astringency), and acidity (which affects freshness).
   * **Finish:** The taste and sensation that lingers in the mouth after swallowing. It can be described as short, medium, or long.
   * **Overall Quality:** The subjective assessment of how all these elements come together to create a pleasing or unpleasing experience for the taster.

Understanding both the chemical composition and sensory characteristics helps in evaluating and appreciating the wine, as well as in the production process for winemakers. It's worth noting that the balance and interaction between these elements contribute to the complexity and uniqueness of each wine.

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**Wine Quality Dataset**

**Domain: Alcoholic Beverage Sector**

**Dataset:** [**Click here**](https://drive.google.com/file/d/1yUqz3uZcS0448zyPSeFdThaAXjlBj39R/view?usp=sharing)to download the dataset.

**Dataset description:**

The dataset contains 6498 rows and 14 columns

Input variables (based on physicochemical tests):

* 1 - fixed acidity
* 2 - volatile acidity
* 3 - citric acid
* 4 - residual sugar
* 5 - chlorides
* 6 - free sulfur dioxide
* 7 - total sulfur dioxide
* 8 - density
* 9 - pH
* 10 - sulphates
* 11 - alcohol
* 13- good(1/0)
* 14-Color(red/white)

Output variable (based on sensory data):

* 12 - quality (score between 0 and 10)

**SPRINT 1 - Exploratory Data Analysis**

**Task -** This is an open ended question. Kindly apply all your knowledge to perform an exploratory data analysis on the given dataset. It is known that the target variable is **Wine Quality**.

However, you are mandatorily supposed to solve the below mentioned EDA Task for your presentation:

1. Which variables are most significant with respect to the target variable?
2. Explore the data distribution of each column. Identify some important patterns.
3. Insights and Recommendations (i.e. Data Driven Business Decision)

Write proper conclusions and provide recommendations to the bank based on the insights.