"End-to-End Data Analysis: From Entity-Relationship Modeling to Profitability Dashboards – Salteñas Factory"

1. Introduction

This report details the development and results of a data analysis project applied to a *salteñas* factory—a traditional Bolivian product similar to a meat-filled empanada. The factory distributes its *salteñas* to stores in the cities of Cochabamba, Oruro, Sacaba, Quillacollo, and Tiquipaya. With operations organized in early morning and morning shifts and a well-managed inventory system, the main objective of the project is to improve operational efficiency and increase profitability. To achieve this, a combination of data modeling, storage and querying in PostgreSQL, and data visualization with Tableau was utilized.

2. Objectives

1. **Maximize Sales**: Identify sales patterns in different regions and times to adjust distribution and promotion strategies.
2. **Optimize Labor**: Analyze shift allocation and resource use to increase operational efficiency in the factory.
3. **Maximize Profit**: Reduce costs by optimizing the use of inputs and improving profit margins through an informed sales strategy.

3. Development

The project was developed in several key stages:

1. **Entity-Relationship Diagram (ERD) Modeling**: An ERD was created to map all relevant business entities, such as stores, sales, inputs, employees, and work shifts. This diagram served as the basis for creating the data structure in PostgreSQL.
2. **Data Structure Design in PostgreSQL**: Based on the ERD, a PostgreSQL database was created to store information on sales, production, inventory, and work shifts. The database enables complex queries to explore data and extract key insights.
3. **Data Loading and Manipulation**: Historical data on sales, production, and costs were loaded into the database. Exploratory analysis was conducted using SQL queries to identify relevant patterns and trends.
4. **Exploratory Data Analysis**: Through advanced SQL queries, various business aspects were analyzed, such as sales by location, performance by work shift, and efficiency in input use. This analysis helped uncover optimization opportunities and areas for improvement.

5. **Data Visualization and Presentation in Tableau**: An interactive dashboard was developed in Tableau to present key visualizations on sales, production, costs, and profitability. This dashboard allows managers and decision-makers to evaluate business performance quickly and intuitively.

4. Conclusions

The project provided a comprehensive approach to data analysis for the *salteñas* factory. The results indicate significant potential to improve profitability by optimizing labor and efficiently managing inputs.

Cost Analysis Insights: The premium line generates the highest profit margins. Overall, beef salteñas are the best-selling product, but premium chicken salteñas offer the highest unit profit margin. Therefore, it is advisable to launch targeted promotional campaigns to boost sales of the latter.

Based on the analysis, the following can be inferred:

- **Product Optimization Opportunity**: While fried cheese empanadas are not the brand's specialty, they are highly popular during brunch hours. It would be optimal to conduct an A/B test to explore the potential inclusion of new fried empanada variants, such as shredded beef (gigote) or cheese and ham.

- **Branch Performance Analysis**: Although Cochabamba has the most sales branches and the highest volume of salteñas sold, the branch that generates the most profit is "Sacaba Hyper" in the city of Sacaba.

- **Expansion Feasibility:** The positive response in the cities of Oruro and Sacaba suggests the viability of opening new sales branches. However, additional market research is needed to determine the most strategic locations.

- **Inventory and Ingredient Management:** Based on the analysis of ingredient quantities and inventory, it is recommended to forecast a monthly requirement of at least 3 tons of flour as a key production input.

- **Production and Staffing Efficiency:** From the analysis of production performance and staffing, it is recommended to hire an additional kitchen assistant for the morning shift, as the workload is significantly higher compared to the early shift.

So, after all, the Tableau visualizations enable managers to monitor key metrics in real-time and make data-driven decisions. Moving forward, it is recommended to continue monitoring and adjusting distribution and production strategies to maximize profit and operational efficiency.