Université de Tunis

Tunis Business School

Project Report
IT 300 - Business Intelligence

TITLE

Business Intelligence Mini-Project Inventory Analysis for Wish Platform

BY
Ahmed Mnaouer
Mayssam Hassen

PRESENTED TO
Dr. Ameni Azzouz

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1. Introduction

This business intelligence project focuses on inventory analysis for the **Wish platform**, leveraging a data warehouse to analyze summer product data from August 2020. The dataset includes details on products sold, merchant performance, and shipping options.

The project aims to analyze product performance, merchant contributions, and shipping efficiency, while uncovering patterns in inventory dynamics and sales trends. Key objectives include identifying top-performing products, evaluating inventory turnover, and understanding the impact of shipping options and merchant practices on sales.

Through this analysis, we aim to deliver actionable insights for optimizing stock levels, refining merchant strategies, and enhancing shipping operations, providing stakeholders with a comprehensive understanding of inventory and sales dynamics to drive profitability and efficiency.

2. Data Preparation and ETL Process

2.1 Data Gathering :

The dataset used in this project was sourced from the website "Kaggle" in the form of 2 CSV files. The data includes details about products, merchants, shipping options, and inventory levels. This is the link to the dataset.

2.2 Data Extraction :

The first step in the ETL Process was Data Extraction. Using Python and the library "Pandas", we did extract our data from the following CSV files: "[summer-products-with-rating-and-performance_2020-08.csv](link)" and "[Computed insight - Success of active sellers.csv](link)".

2.3 Data Transformation :

We then used Python to prepare the data for the data warehouse by manipulating and structuring it. To enhance the manageability and flexibility of the data, we restructured it accordingly. In order to ensure our data aligns with the specifications of our defined data warehouse server, we used the Numpy library to perform the necessary transformations, including data cleaning, (handling duplicates and missing values), column renaming, consistency checking of data types, deriving new columns from existing ones, dropping unneeded columns, adding new insightful columns, and data aggregation. The final result consisted in 2 cleaned datasets. All the transformations are provided in the [products_dataset.ipynb](link) and [computed_insights_dataset.ipnyb](link) files.

2.4 Data Loading :

2.4.1 Data Storage and Schema :

In the next step, we created a separate cleaned CSV file for each of our dimension and fact tables so that we could load our data on PostgreSQL and create our Snowflake Schema. The code for the tables' creation is provided in the following file : tables_creation.ipnyb.

Here's the corresponding snowflake schema for our inventory analysis :

Snowflake Schema
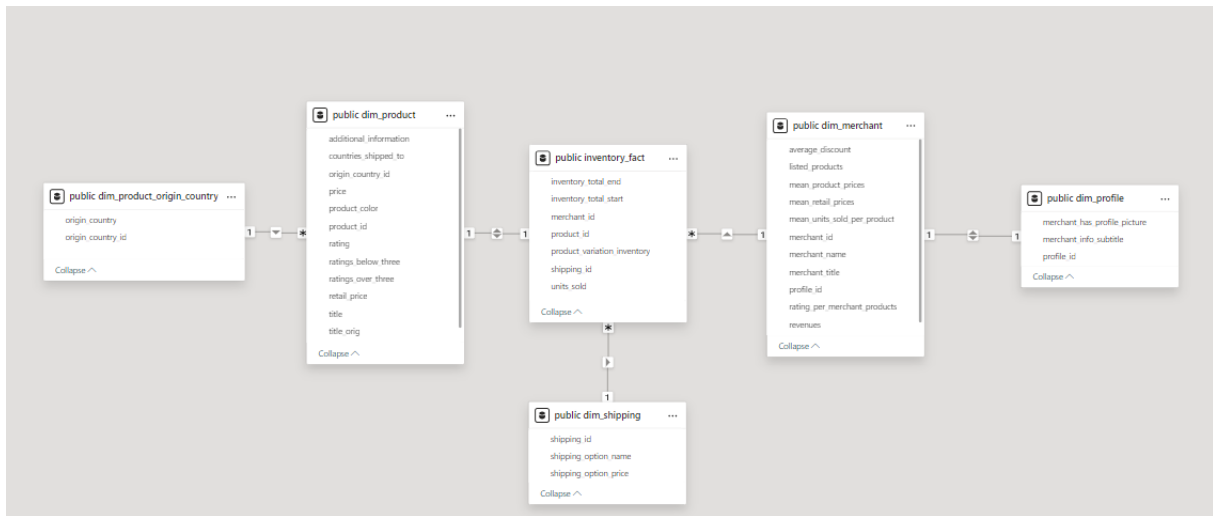
- **Inventory Fact** : the fact table of this schema represents the inventory of the Wish Platform. In the inventory, we track products alongside their associated merchants and shipping types, each of which is modeled as an independent dimension. It stores quantitative data such as units sold and inventory levels.

- **Product Dimension** : represents an overall overview about the different products available on Wish platform and the details of each product such as its name, number of countries it can be shipped to, price, rating etc.

- **Merchant Dimension** : represents the list of merchants that are working with the Wish platform, and different information about them such as ratings given to them (based on the products they offered during the month), along with additional information related to their products such as the mean of each merchant's products price, number of listed products of each merchant, revenues of each merchant etc.

- **Shipping Dimension** : represents the shipping option name and price that the Wish platform relies on to deliver its products, where each product has a specific shipping option type set by the platform.

- **Origin Country Subdimension** : represents the origin country of each product and its ID.

- **Merchant Profile Subdimension** : provides details about the merchant's profile such as whether he has a profile picture, and the percentage of positive feedback the merchant has gotten. These details are about how the merchant is presented on the platform.

> **Remark :** We opted for a Snowflake Schema as the data contains valuable information about merchants and products that we couldn't involve within the same dimension. We worked on subgrouping those columns in a way that guaranteed us keeping the maximum data for better analysis.

2.4.2 Fact table :

The fact of this dataset "Inventory_Fact" is the inventory of the Wish platform. In addition to the foreign keys (which together constitute the primary key of the fact table) coming from the dimension tables, it includes the following measures :

- inventory_total_start
- inventory_total_end
- product_variation_inventory
- units_sold

2.4.3 Dimension tables :

The dimensions we included in our Snowflake Schema are the followings :

- Product : Provides detailed information about products.

Primary key : product_id.

Attributes : price, retail_price, rating, title, title_orig, product_color, countries_shipped_to, additional_information, ratings_over_three, ratings_below_three.

Dimension derived from the Product dimension : Origin Country.

- o **Primary key** : origin_country_id.
- o **Attributes** : origin_country.

- Merchant : Describes merchants and their overall performance.

Primary key : merchant_id.

Attributes : merchant_title, merchant_name, revenues, rating_per_merchant_products, listed_products, mean_product_prices, mean_retail_prices, mean_units_sold_per_product, average_discount.

Dimension derived from the Merchant dimension : Profile Subdimension.

- o **Primary key** : profile_id.
- o **Attributes** : merchant_has_profile_picture, merchant_info_subtitle.

- Shipping : Stores details about shipping options.

Primary key : shipping_id.

Attributes : shipping_option_name, shipping_option_price.

2.5 SQL Queries and Data Visualization :

In this project, we implemented a ROLAP solution by using PostgreSQL as the relational database to store and query our data. We first executed SQL queries on PostgreSQL to dynamically consolidate our data.

Determining the top 5 merchants with the highest sales levels based on revenues :

SELECT merchant_name, revenues, average_discount, mean_units_sold_per_product

FROM dim_merchant

ORDER BY revenues DESC

LIMIT 5;

Determining the shipping option with the highest price:

SELECT shipping_option_name, shipping_option_price

FROM dim_shipping

ORDER BY shipping_option_price DESC

LIMIT 1;

Second, we visualized our data in a dashboard after connecting to Power BI in order to extract the following insights and draw conclusions.

Graphs' Interpretation :

1- **Merchants related insights:**

- "Primsale colimited" is the merchant with the highest sales level with total units sold equal to 120K. "Leiston" is in the second place with total units sold of 107K. "Shenzheniong", "Bigcompany", "Fashionstore04", and "Shanghailalang International Trade Coltd" come next with each having 100K units sold.

- "Primsale colimited" is the merchant that has the highest level of sales with total revenues equal to 1.08M€. "Guangzhouchanny Trade Coltd", "Pandolah Apparel Coltd", "Leiston", and "Hotdress" are also among the top merchants who contributed to the total revenues of the Wish platform with total revenues between 0.82M€ and 1M€.

- "F40051ab1zhong9" is the merchant with the highest average product variation inventory of 49 among merchants having the highest numbers of product varieties offered, followed by "Witkey bl", "Sangboo store" and "Cenic beauty" with respective averages of 43, 37 and 34.

2- Products related insights:

- The top 5 products with the highest sales levels are "2018 New Fashion Women's Tops Sexy Strappy Sleeveless Lace Crop Tops", "2018 Summer Fashion Women Tank Tops Sexy Women Sleeveless Crop Tops Casual Style Women Cotton Print Lace Stitching Irregular Blouse Tops (5-5XL)", "Summer Crop Top Women Tank Tops Halter Vest Casual Camisole Croped Shirt Women Tops", "Summer Fashion Trousers Women Leggings Ripped Pants Slim Pants Army Green Tights Pants" and "2019 Summer Women's' Fashion Lace Up Tie Pants Plus Size Casual High Waist Short Pants(5-5XL)" with sales ranging from 100K to 20K units sold.

- Products available on the Wish platform during the August 2020 month have an average of 34 different items in size, color, features etc.

- Almost all products that are left as end-inventory are the products that are delivered with Standard Shipping.

- Most of the products originating from Singapore and China are sold at the end of the month giving the highest two levels of inventory turnover rate (0.91 for Singapore and 0.84 for China), whereas way less than half of the products coming from Venezuela and Austria is sold. Therefore, products coming from the first two countries are most likely to satisfy customers' needs and ensure the lowest inventory-end level.

- The most expensive prices come from products originating from Venezuela, whereas the cheapest prices come from products originating from Singapore.

3. Conclusion :

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KPIs Choice:

1. <u>Inventory turnover ratio :</u>
- **Efficiency Check**: Indicates how effectively the inventory is contributing to revenue generation.
- **Performance Indicator**: A higher ratio suggests better inventory management, as more revenue is being generated per unit of inventory.

2. <u>Stock keeping profitability :</u>
- **Formula**: SK Profitability = (Average Retail Price - Average Price)*Units Sold
- **Purpose**: Indicates the overall profitability of product pricing set by the platform.

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Stock keeping profitability KPI indicates a positive profit that exceeds 95M€ per month. Inventory turnover is also indicating a relatively acceptable rate of 84%. Those results are a proof that the current inventory management style is leading to covering the different costs and making a real profit. However, to ensure continuous progress in making profit, and reducing the inventory level at

the end of the month, we recommend the Wish platform to follow those tips based on the previous insights :

- It's recommended to focus on improving its standard shipping services as most of the products that are left behind are those who are delivered in this way.

- In terms of better resource allocation, the Wish platform has to focus on extending its activity with the following merchants : "Primsale colimited", "Guangzhouchanny Trade Coltd", "Pandolah Apparel Coltd", "Leiston" and "Hotdress" as those are the ones generating the biggest part of revenues for the Wish platform.

- To ensure a high inventory turnover and reduce the inventory end, the Wish platform has to extend its activity particularly in Singapore as well as in China and reduce its activity in Venezuela and Austria.

- For better inventory efficiency management, it's recommended to focus and invest in products that are shipped with the Express shipping type as this can increase the likelihood of selling all products by the end of each month.