

**FOREIGN TRADE UNIVERSITY  
HO CHI MINH CITY CAMPUS**

-----oo-----



**MID-TERM REPORT  
BUSINESS PROCESS ANALYSIS OF WIDE WORLD IMPORTERS**

Students	:	Phan Anh Vu	2311115150
		Nguyen Phan Quynh Anh	2312155010
		Truong Bao Khang	2312155073
		Le Lan Huong	2312155056
		Nguyen Ngoc Bich Khue	2312155080

Module	:	Data Management System
Classcode	:	ML184
Teacher	:	Mr. Dao Quoc Phuong

**HO CHI MINH CITY, 9<sup>th</sup> MARCH, 2025**

## MEMBERS

Name	Task	Complete	Signature
Phan Anh Vũ	Writer, Analyst, Power BI	100%	
Nguyễn Phan Quỳnh Anh	Writer, Analyst, Visualization	100%	
Trương Bảo Khang	Writer, Analyst, Visualization	100%	
Lê Lan Hương	Writer, Analyst, Slides	100%	
Nguyễn Ngọc Bích Khuê	Writer, Analyst, Visualization	100%	

## TABLE OF CONTENTS

<b>MEMBERS</b> .....	<b>2</b>
<b>CHAPTER I: BUSINESS PROCESS OVERVIEW</b> .....	<b>1</b>
1. Company Introduction .....	1
1.1. World Wide Importers – The Company .....	1
1.2. World Wide Importers's Business Model .....	1
1.3. Wholesale Novelty Goods Distribution .....	2
2. Operational Workflow .....	2
2.1. Purchase Order Process .....	2
2.2. Inventory Management .....	3
3. Objectives .....	5
3.1. Scope & Objectives .....	5
3.2. Tools Used .....	5
<b>CHAPTER II: DATABASE DESIGN</b> .....	<b>7</b>
1. Purchasing Module Tables .....	7
1.1. Entity relationships (ERD) .....	7
1.2. Key Database Entities .....	9
2. Sales Module Table .....	10
2.1. Entity relationships (ERD) .....	10
2.2. Key database entities .....	12
3. Warehouse Module Tables .....	13
3.1. Entity relationships (ERD) .....	13
3.2. Key database entities .....	14
<b>CHAPTER III: DATABASE ANALYSIS</b> .....	<b>16</b>
1. Industry Terms And Concepts Used .....	16
Sales and Revenue .....	16
Performance and Business Insights .....	16
Warehouse and Inventory Management .....	16
Supplier and Procurement .....	17
2. A Sales & Customer Viewpoint .....	17
2.1. Objectives .....	17

2.2.	Sales trend analysis .....	17
2.3.	Price markups .....	33
2.4.	Recommendations .....	36
3.	Decoding Sales Dynamics: Strategic Insights into Profitability, Seasonality, and Market Evolution .....	38
3.1.	Introduction .....	38
3.2.	Revenue, COGS, and Gross Profit Per Year .....	40
3.3.	Revenue, COGS, and Profit Analysis – Spotting Seasonal Patterns .....	42
3.4.	Analyzing Long-Term Profitability Trends .....	44
3.5.	Strategic Recommendations .....	46
4.	A Warehouse & Supplier Viewpoint .....	63
4.1.	Objective .....	63
4.2.	Warehousing Behaviour Analysis .....	64
<b>CHAPTER IV: COMPREHENSIVE VISUALIZATIONS .....</b>		<b>71</b>
<b>CHAPTER V: CONCLUSION &amp; RECOMMENDATIONS .....</b>		<b>76</b>
1.	Main Issues, Consequences, and Direction .....	76
1.1.	Sales Trends and Profitability .....	76
1.2.	Inventory Control and Procurement .....	76
2.	Database Improvement .....	79
2.1.	Space Utilization Problems .....	79
2.2.	Suspect Backorder Data Integrity .....	79
2.3.	Missing Supplier Delivery Data .....	79
2.4.	Stocktake Date .....	79
2.5.	Data for Predicting Importing Trends .....	80
3.	Other Factors .....	80
<b>APPENDIX .....</b>		<b>82</b>
1.	Code Optimization .....	82
2.	Research and Analytical Support .....	86

## TABLE OF FIGURES AND TABLES

<i>Figure 1 - ERD of the Purchasing Module .....</i>	9
<i>Figure 2 - ERD of the Sales Module.....</i>	12
<i>Figure 3 - ERD of the Warehouse Module .....</i>	14
<i>Figure 4 - Year-over-Year Percentage Change in Quantity Sold by year.....</i>	19
<i>Figure 5 - Quantity Sold Trends over the years by Product Category.....</i>	20
<i>Figure 6 - Year-over-year Percentage Change in Quantity Sold.....</i>	22
<i>Figure 7 - Sales Share of Newly Introduced Novelty Items in 2016.....</i>	23
<i>Figure 8 - Monthly Sales of newly introduced Novelty Items by the years.....</i>	24
<i>Figure 9 - Yearly Clothing Sales Trend - Monthly Breakdown with Overall Average .....</i>	25
<i>Figure 10 - T-Shirt YoY Sales Growth.....</i>	26
<i>Figure 11 - USB YoY Sales Growth.....</i>	27
<i>Figure 12 - Gross Profit Margin Trends of T-Shirts and USB.....</i>	28
<i>Figure 13 - Top 5 Best-selling Items Over Time.....</i>	30
<i>Figure 14 - Best-seller Sales vs. Total Monthly Sales .....</i>	31
<i>Figure 15 - Top 5 Best-Selling vs. Top 5 Profitable Contribution to Monthly Profit .....</i>	32
<i>Figure 16 - Markup Percentage by Stock Group.....</i>	33
<i>Figure 17 - Markup Percentage per Stock Item.....</i>	34
<i>Figure 18 - Correlation Heatmap: Markup % vs. Total Sales.....</i>	35
<i>Figure 19 - Quantity Sold vs. Profit Margin per Product Category .....</i>	36
<i>Figure 20 - Revenue, COGS, and Gross Profit Trends (2013-2024) .....</i>	40
<i>Figure 21 - Average Monthly Product Trend by Product Category .....</i>	44
<i>Figure 22 - Yearly Profit Trend by Product Category (2013-2024) .....</i>	45
<i>Figure 23 - Yearly Sales Growth Rate .....</i>	48
<i>Figure 24 - Total Sales Trend with Moving Average .....</i>	48
<i>Figure 25 - Profit Increase for all Novelty Items .....</i>	51
<i>Figure 26 - Quantity Increase for All Novelty Items.....</i>	52
<i>Figure 27 - Monthly Price Trends of Ride-on toys and USB food flash drivers .....</i>	54
<i>Figure 28 - The influence of Discount on Profit .....</i>	56
<i>Figure 29 - Correlation Between Price, Profit, and Quantity Sold.....</i>	57
<i>Figure 30 - Yearly Profit Trend for Halloween Zombie Masks (Light Brown) .....</i>	60
<i>Figure 31 - Supplier Contribution of Total Goods Received.....</i>	65
<i>Figure 32 - Trends in Average Unit Cost by Stock Category .....</i>	69
<i>Figure 33 - Visualization - Sales Overview.....</i>	71
<i>Figure 34 - Visualization - Sales Growth and Changes by Group.....</i>	71
<i>Figure 35 - Visualization - Sales Margins and Markups.....</i>	72
<i>Figure 36 - Visualization - Product Profitability .....</i>	72
<i>Figure 37 - Visualization - Profitability by Product Group .....</i>	73

<i>Figure 38 - Visualization - Changes in Quantity Sold and Profitability .....</i>	73
<i>Figure 39 - Visualization - Changes in Product Prices .....</i>	74
<i>Figure 40 - Visualization - Received and Sold Value.....</i>	74
<i>Figure 41 - How being imported and being sold is different .....</i>	75
<i>Table 1 - Results - YoY Sales Growth in Quantity.....</i>	18
<i>Table 2 – Results – YoY Sales Growth by Stock Group .....</i>	20
<i>Table 3 – Results - Quantity Sold of USB.....</i>	29
<i>Table 4 - Results - Sales Profit by Month.....</i>	42
<i>Table 5 - Results - Sales Profit (Clothing) by Month .....</i>	43
<i>Table 6 - Results - Profit Increrase .....</i>	51
<i>Table 7 - Results - Top Profit-driving Products.....</i>	53
<i>Table 8 - Results - Total Revenue of Ride-on toys and USB food flash drive.....</i>	53
<i>Table 9 - Results - Does discounted products attract new customers? .....</i>	57
<i>Table 10 - Results - Profit margin of the Halloween masks.....</i>	61
<i>Table 11 - Results - Prices changes of the Halloween zombie masks.....</i>	62
<i>Table 12 - Results – Excess Procurement of the masks .....</i>	63
<i>Table 13 - Results - Stock Age .....</i>	64
<i>Table 14 – Results - Total Received by Suppliers .....</i>	65
<i>Table 15 – Results - Trends between Quantity Received from suppliers and Quantity Sold by category .....</i>	67
<i>Table 16 - Results - Importing Costs .....</i>	69
<i>Table 17 - Results - Imported Goods Ranking .....</i>	70

## **CHAPTER I: BUSINESS PROCESS OVERVIEW**

### **1. Company Introduction**

#### **1.1. World Wide Importers – The Company**

Wide World Importers (WWI) is a wholesale novelty goods importer and distributor operating from the San Francisco bay area. The company works as a B2B distributor, sourcing products from international suppliers and delivering them to businesses.

As a wholesaler, WWI's customers are mostly companies who resell to individuals. WWI sells to retail customers across the United States including specialty stores, supermarkets, computing stores, tourist attraction shops, and some individuals. WWI also sells to other wholesalers via a network of agents who promote the products on WWI's behalf. While all of WWI's customers are currently based in the United States, the company is intending to push for expansion into other countries/regions.

There is an extensive inventory of products, including food items, beverages, novelty goods, and industrial supplies, ensuring a diverse range of offerings for customers. For this inventory, WWI has a supply chain management system to handle high-volume orders with optimized delivery schedules. WWI also has multiple warehouses and distribution centers to minimize shipping costs and improve order times.

#### **1.2. World Wide Importers's Business Model**

The business model of WWI is based on bulk distribution, playing the role of an intermediary between manufacturers and retail businesses. The company ensures that businesses have a regular supply of goods at reasonable wholesale prices. This model helps retailers to get access to a wide range of products without the need to deal with direct supplier relationships or import logistics.

The company's transactional process is based on a very simple order management system. In turn, retailers place their bulk orders through WWI's sales platform which is integrated with inventory tracking and warehouse management systems. Orders are filled out based on availability of stock and picking, packing and shipping is done in a timely manner by fulfillment teams.

### **1.3. Wholesale Novelty Goods Distribution**

WWI has a dedicated segment for wholesale novelty goods distribution, catering to businesses looking for unique, seasonal, or promotional items. These products range from party supplies and holiday decorations to branded merchandise and limited-edition collectibles. Given the fast-paced nature of novelty goods, WWI's ability to rapidly adjust inventory levels and respond to shifting trends is crucial for maintaining market relevance.

In addition to its normal distribution, WWI also offers custom bulk purchasing packages to corporate clients and event sponsors, whereby they can purchase bulk quantities of promotion items based on their requirements. The good relationships with its suppliers and its optimized chain of logistics enable it to offer timely delivery and competitive pricing in the industry of novelty products.

## **2. Operational Workflow**

### **2.1. Purchase Order Process**

A purchase order (PO) is an official document issued by the buyer to the seller containing details about the product or service such as type, quantity, and price as discussed and agreed upon. Therefore, as a legally binding contract, it supports the transaction by giving authorization to sell while in turn assisting both inventory management and cost control.

When the buyer identifies a need in the company, the purchase order process is activated. This need triggers the procurement process. The purchase order acts as a safeguard, protecting the interests of both parties by ensuring that the buyer and the seller are on the same page regarding the transaction details, thus reducing any potential misunderstandings or litigation.

The PO cycle is a structured yet dynamic process, which involves different stages to guide the transaction from its origins to its end. Each of these life cycle phases is important for the optimization of procurement functions, accurate recording in finance, and smooth cooperations between buyers and sellers.

The cycle starts when the buyer recognizes the need for goods or services, and the need is made recognizable through the issuance of the purchase order. This order is a formal sales request to the seller along with relevant data like product description, quantities, prices as agreed, and payment terms. By issuing the PO, the buyer is putting

in place a clear contractual framework from which the procurement process will be set in motion for the purpose of providing clarity and accountability to both parties.

Upon issuance of the purchase order, the seller will conscientiously review its terms to ascertain alignment with their capabilities, pricing, and inventory availability. If the supplier accepts the conditions of the PO, they shall formally accept the order thereby asserting their bond in fulfilling the request as stated.

With the acceptance of an order, a supplier can now start to undertake downstream manufacturing, packaging, or shipment preparation activities on the ordered goods. Delivery is a vital stage in ensuring that products or services reach the buyer as scheduled according to the agreement. Thus, shipment tracking enables preparation for acceptance and verification of received goods by the buyer.

The buyer will then inspect by checking whether the procured commodity or service passes through an acceptance test to determine if it meets the standards prescribed through the purchase order. The quality assurance check ensures elimination of any defects and wrong manufacturing of the products. Otherwise, such mistakes will lead to complaints from the ultimate buyer regarding the supplier, demands for rejection or replacement, or even re-negotiation.

On successful verification of the orders, the supplier raises an invoice requesting the client to pay for the goods and services already supplied. And the buyer scrutinizes the accuracy of the invoice before making the payments as per the agreed terms—whether upfront payment, credit, or as an installment of payments.

The last stage in the lifetime of a purchase order is to formally close the purchase order after fulfilling all obligations thereof, including delivery, inspection, invoicing, and payment. These are all well documented to be able to do the audit of finances, monitor compliance, and plan in future for new procurements. By developing accurate transaction records of completed purchases, WideWorldImporters can reconsider some of their purchasing policies and become more effective in evaluating supplier performance.

## **2.2. Inventory Management**

Inventory management provides a logical approach to purchasing, storing, and distributing inventory, which includes raw materials, parts, and finished products. It is mainly concerned with achieving an optimal balance between available stocks, incoming supplies, and outgoing orders to avoid both surplus and shortages. With proper

inventory management, operations will flow seamlessly with enough stock on-hand, with little waste and maximum efficiency.

Efficient inventory management is a must for any business that deals with physical goods. It directly affects profitability and operational efficiency. The right kind of stock management assures the satisfaction of customers by providing enough supplies of in-demand products, which build repeat purchases and continued revenue.

By managing proper inventory levels, optimization enables releasing capital investment tied up with inventory and minimizes the holding costs. Unnecessary costs arise due to overstocking, whereas stock shortfalls result in loss of customer goodwill, and hence, customer loyalty in the marketplace. In addition, in real-time inventory management, companies can align themselves with changing customer tastes and thereby enjoy a competitive edge.

An efficient inventory management system depends on the flawless integration of four key components: inventory tracking, demand forecasting, stock optimization, and reporting and analytics. These elements work in harmony to facilitate good operational flow and efficient stock management.

Inventory tracking refers to the real-time monitoring of stock levels while these are moving through the supply chain. Keeping an eye on stock levels helps organizations pinpoint possible shortages early, thus taking preventive action to eliminate disruption.

Demand forecasting is used to set demand within future timeframes based on past sales data. By discerning trends and consumer behavior, a business can synchronize stock levels with anticipated demand in such a way as to be able to avoid stockouts on one end and excess inventory on the other.

Stock optimization aims at striking a balance between maintaining sufficient quantities of stock to meet demand and minimizing storage costs and the risk of obsolescence. Categorizing items as fast-moving and slow-moving enables businesses to replenish high-demand products more promptly.

Reporting and analytics analyze sales patterns, stock performance, and supply chain efficiency and provide actionable conclusions. Therefore, the identified weak areas can be improved through data-based decision-making programs to further augment operational efficacy.

Inventory management is certainly a very important and complicated part of any business that has a direct bearing on profit-making and customer satisfaction. By comprehending its key elements, difficulties, and current and future trends, businesses can devise strategies to enhance inventory.

### **3. Objectives**

#### **3.1. Scope & Objectives**

This research seeks to assess sales performance and warehouse efficiency of WideWorldImporters (WWI) by a structured approach based on data. This aims at important financial metrics summarizing revenue, cost of goods sold (COGS), and gross profit in a wise understanding of the company's performance in profitability. It also tries to assess volume of sales, fluctuations in demand due to seasonality, and inventory turnover rates, as a basis for formulating stock management practices and procurement strategies.

A critical aspect of this analysis investigates the connections of sales trends with levels of inventory and external market data. The relationships that emerge from this study will assist WWI in refining pricing models, improving store resilience, and enhancing the accuracy of demand forecasting. The company will use this in understanding how various factors like customer preferences and economic shifts influence patterns and sales, which result in more informed decisions on inventory control, promotional campaigns, and supplier management.

This research also assesses potential risks for efficient business performance beyond sales and inventory appraisal. Issues such as supplier dependence, obsolete stocks, and excess inventories can erode profits if not handled appropriately. The early identification of these risks enables WWI to take proactive measures to mitigate disruption and keep the business viable. The overarching goal of the project is to improve operational efficiency by leveraging data insights into important strategic decision-making processes to increase profitability and overall performance.

#### **3.2. Tools Used**

To conduct this study effectively, various tools and technologies will be employed throughout the analysis process. SQL Server Management Studio (SSMS) was predominantly used to query and manage databases, retrieve, and run processing on relevant sales and inventory data. Python, on the other hand, is a tool that would harness visualization of key trends and patterns to help comprehend complex datasets and justify

data-led recommendations. Optimization techniques driven by AI would further enhance the efficiency of the database query systems and smoothen the entire data processing pipeline. This would complement the capacity for an accurate forecast and trend analysis so that the insights are reliable and actionable. In addition, PowerBI is used to create interactive dashboards from the WWI database and our SQL queries. These dashboards allow for more in-depth and specialised analysis, as seen in our use of Python to calculate and draw insights. Real-world business scenarios will also be simulated using data generation means in order to provide for an extensive consideration of diverse market situations and operational challenges.

By utilizing these advanced tools and methodologies, this study aims to deliver a thorough and precise assessment of WWI's sales and warehouse performance. The integration of data analysis and business intelligence will support more effective decision-making, ultimately helping the company achieve sustainable growth and operational excellence.

## **CHAPTER II: DATABASE DESIGN**

### **1. Purchasing Module Tables**

Purchasing module is the soul of Wide World Importers supply chain. It has been used for everything concerning ordering stock, establishing relationships with suppliers, and payments. The purchasing module ensures the right products are available at all times by tracking purchase orders and monitoring supplier transactions while maintaining levels of inventory.

This module organizes and maintains a database about suppliers, storing significant aspects about suppliers, their categories, and key contacts. It keeps a comprehensive record of purchase orders when an item was ordered, from which supplier, when it is due to arrive and how it will be delivered. Each and every financial transaction with every supplier, which includes payment, refund, and adjustment, makes its entry in supplier transactions.

All procurement has to be organized and streamlined in order for WWI to avoid stock shortages while keeping finances organized and business operations running smoothly. It connects directly to warehouse and sales functions, ensuring everything runs in sync from ordering to delivering.

#### **1.1. Entity relationships (ERD)**

The entity relationships within this module illustrate how suppliers, purchase orders, and inventory interact with one another.

<b>Table</b>	<b>Description</b>
Purchasing.SupplierTransactions	Stores transaction details between suppliers and the company, including transaction amounts, invoice numbers, and dates.
Purchasing.PurchaseOrders	Represents purchase orders placed with suppliers, containing information about suppliers, order dates, and expected delivery dates.
Purchasing.PurchaseOrderLines	Contains individual line items within a purchase order, specifying ordered stock items, quantities, and packaging details.
Purchasing.Suppliers	Maintains records of suppliers, including their names, categories, and primary contact persons.
Purchasing.SupplierCategories	Classifies suppliers into different categories based on their business type or relationship with the company.
Application.PaymentMethods	Defines different payment methods used in supplier transactions, such as bank transfers or credit card payments.
Application.DeliveryMethods	Lists various delivery methods available for transporting purchased goods from suppliers to warehouses.
Warehouse.StockItems	Stores details of inventory items, including item names, supplier associations, packaging types, and color variations.
Warehouse.PackageTypes	Defines different types of packaging used for stock items, such as boxes, pallets, or individual units.

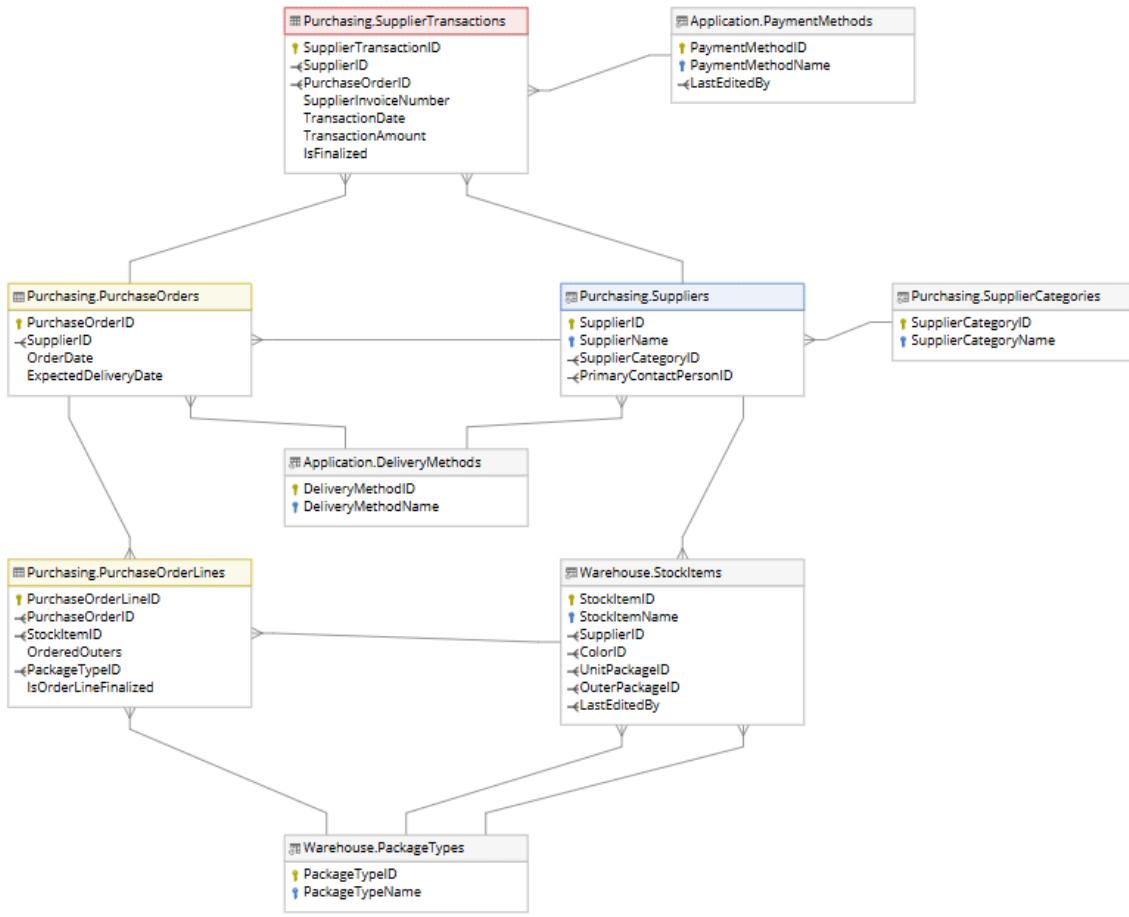


Figure 1 - ERD of the Purchasing Module

## 1.2. Key Database Entities

The key entities include:

- Purchasing.SupplierTransactions – Identified by SupplierTransactionID.
- Purchasing.PurchaseOrders – Identified by PurchaseOrderID.
- Purchasing.PurchaseOrderLines – Identified by PurchaseOrderLineID.
- Purchasing.Suppliers – Identified by SupplierID.
- Purchasing.SupplierCategories – Identified by SupplierCategoryID.
- Application.PaymentMethods – Identified by PaymentMethodID.

- Application.DeliveryMethods – Identified by DeliveryMethodID.
- Warehouse.StockItems – Identified by StockItemID.
- Warehouse.PackageTypes – Identified by PackageTypeID.

These entities serve as the foundation of the purchasing system, defining key records and their relationships in the database.

## **2. Sales Module Table**

The Sales Module is a crucial component of Wide World Importers' business operations. Every activity, from the time a customer comes for a sales transaction until invoicing, is supervised in this module. It is thus defined and perfected into managing sales operations through recording all customer transactions and processing orders under special deals.

This captures and maintains complete records regarding sales that are perceived and captured against specific customers through complete information (customer details, order history, and invoice). It creates identifications among customers into groups, tracks all their transactions, and archives historical data for analysis. It enables an order to be executed and kept in line with order lines, special deals, and invoices for seamless financial transactions.

By organizing and streamlining the sales process, this module would help WWI improve customer service and keep track of its revenues as well as optimize its order-processing capacity. It has been integrated into others such as Purchasing and Warehouse to ensure a balanced synchronization of supply chain management and smooth operation of the business.

### **2.1. Entity relationships (ERD)**

These entities form the core structure of the sales and inventory management system, ensuring smooth transaction processing, order tracking, and customer management.

<b>Table</b>	<b>Description</b>
Sales.CustomerTransactions	Stores details of customer transactions, including transaction type, payment method, and tax details.
Sales.Invoices	Contains records of invoices issued to customers, including order details and assigned personnel.
Sales.InvoiceLines	Represents individual line items within an invoice, specifying stock items, quantities, and prices
Sales.Orders	Tracks customer orders, including salesperson assignment, order dates, and contact details.
Sales.OrderLines	Stores individual items within an order, detailing stock items, packaging, quantities, and unit prices.
Sales.Customers	Maintains records of customers, including names, billing details, contact persons, and assigned buying groups.
Sales.CustomerCategories	Classifies customers into different categories based on their purchasing behavior or business type.
Sales.SpecialDeals	Manages special pricing deals, including discount amounts, applicable customers, and validity periods.
Warehouse.StockItems	Stores inventory details, including stock names, suppliers, color variations, and packaging types.
Sales.BuyingGroups	Defines groups of customers that share common purchasing preferences or agreements.

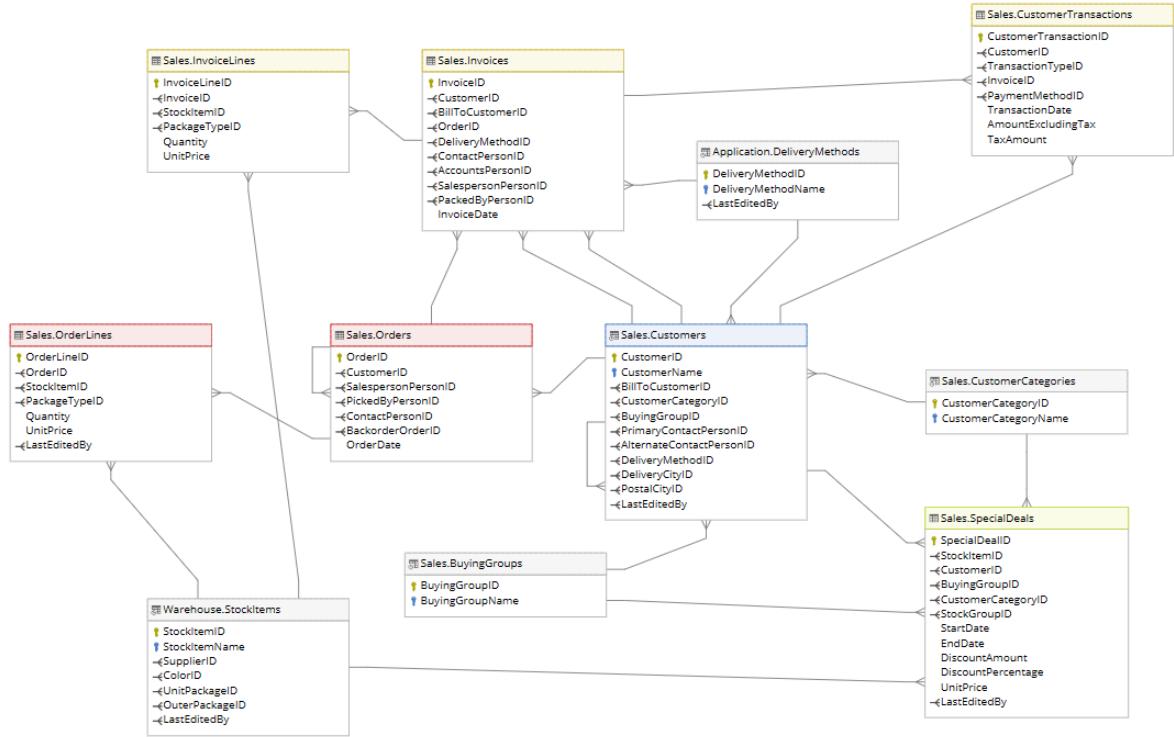


Figure 2 - ERD of the Sales Module

## 2.2. Key database entities

The key entities include:

- Sales.CustomerTransactions – Identified by CustomerTransactionID.
- Sales.Invoices – Identified by InvoiceID.
- Sales.InvoiceLines – Identified by InvoiceLineID.
- Sales.Orders – Identified by OrderID.
- Sales.OrderLines – Identified by OrderLineID.
- Sales.Customers – Identified by CustomerID.
- Sales.CustomerCategories – Identified by CustomerCategoryID.
- Sales.SpecialDeals – Identified by SpecialDealID.
- Warehouse.StockItems – Identified by StockItemID.

- Sales.BuyingGroups – Identified by BuyingGroupID.

### 3. Warehouse Module Tables

The Warehouse Module is what keeps Wide World Importers (WWI) running smoothly. This module keeps track of the current stock of items, where they are, and when they come in or empty. In this way, customer orders are packed and shipped in time while keeping stock organized.

Every item is kept completely track-ready in terms of packaging, suppliers, and count. The movement of stock goes into this single log so that each sale, purchase, or adjustment is recorded for all time. For perishable items, it even monitors temperatures in cold rooms and delivery trucks so that the freshness of products is maintained at all points.

Accurately and efficiently, the Warehouse Module saves the day for WWI as regards delays, wastage, and having the correct stuff ready. It's all done in the context of sales and purchasing, making the whole internal supply chain fit well with each other.

#### 3.1. Entity relationships (ERD)

Table	Description
Sales.Customers	Stores customer details, including their billing and delivery information, category, and contacts.
Warehouse.StockItems	Contains information about stock items, including name, supplier, color, package details, brand, size, barcode, and unit price.
Warehouse.StockItemTransactions	Tracks transactions related to stock items, such as movements in and out of inventory.
Warehouse.StockItemHoldings	Maintains the quantity on hand, bin location, and last cost price of stock items.
Warehouse.Colors	Stores different colors available for stock items.

Warehouse.StockGroups	Contains stock grouping details, categorizing items into different stock groups.
Warehouse.StockItemStockGroups	Links stock items to stock groups, establishing a many-to-many relationship.
Purchasing.Suppliers	Stores supplier details, including supplier category, contact persons, and delivery information.
Warehouse.PackageTypes	Defines different types of packaging available for stock items.
Application.TransactionTypes	Maintains different types of stock item transactions.

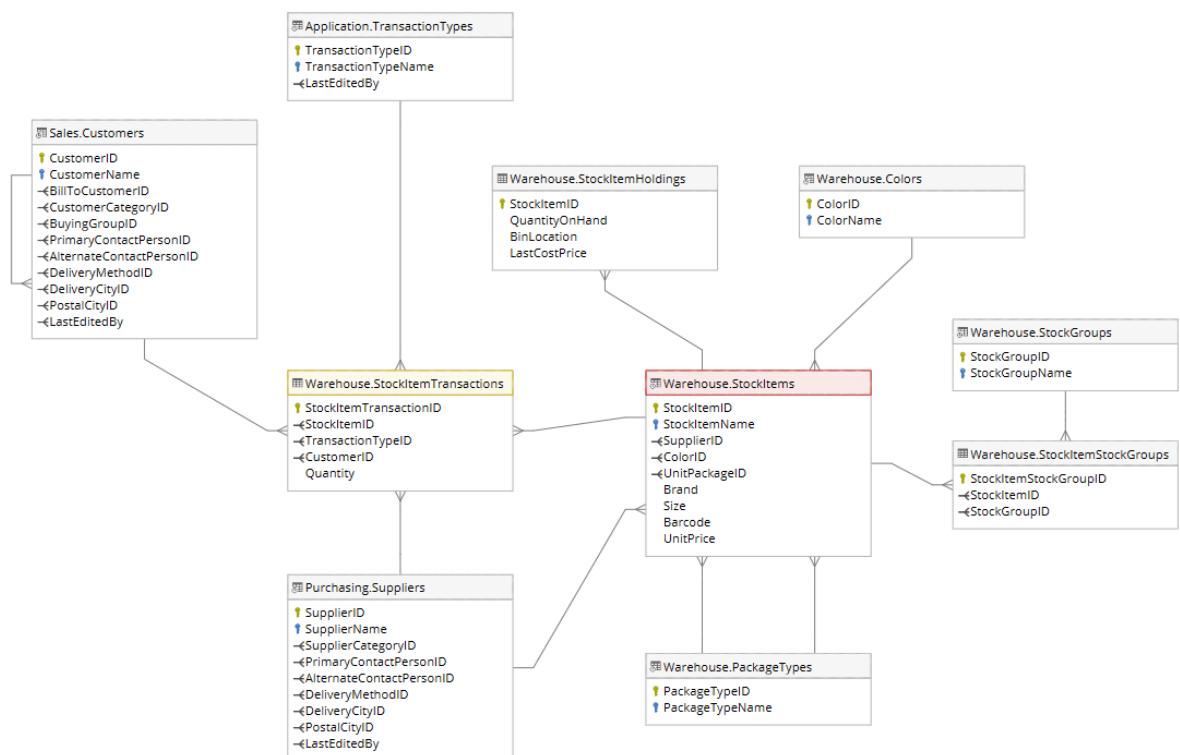


Figure 3 - ERD of the Warehouse Module

### 3.2. Key database entities

- Sales.Customers – Identified by CustomerID.
- Warehouse.StockItems – Identified by StockItemID.

- Warehouse.StockItemTransactions – Identified by StockItemTransactionID.
- Warehouse.StockItemHoldings – Identified by StockItemID.
- Warehouse.Colors – Identified by ColorID.
- Warehouse.StockGroups – Identified by StockGroupID.
- Warehouse.StockItemStockGroups – Identified by StockItemStockGroupID.
- Purchasing.Suppliers – Identified by SupplierID.
- Warehouse.PackageTypes – Identified by PackageTypeID.
- Application.TransactionTypes – Identified by TransactionTypeID.

## **CHAPTER III: DATABASE ANALYSIS**

### **1. Industry Terms And Concepts Used**

This section defines key terms and concepts relevant to sales analysis and warehouse management, providing clarity on the methodology used in evaluating profits and inventory performance, supplier dependency, and procurement trends.

#### **Sales and Revenue**

- Revenue (Extended Price): The total sales before deductions, the gross revenue obtained from selling goods. It is calculated by multiplying the unit price of a product by the amount sold.
- Cost of Goods Sold (COGS): Direct costs involved in producing or purchasing the merchandise a company sells. COGS for purposes of this discussion is computed as Extended Price minus Line Profit, with tax included for ease.
- Gross Profit (Line Profit): The financial profit obtained after deducting the cost of goods sold (COGS) from revenue. It is an indicator of the profitability of each sale before accounting for any other operating expenses.
- Quantity Sold: The units sold of every stock item. This is the foundation of sales performance measurement, which helps analyze demand patterns, pricing strategy, and product life cycle stages (growth, stagnation, or declining).

#### **Performance and Business Insights**

- Seasonal Demand Trends: The fluctuation in product sales based on seasonal changes, holidays, or other periodic factors that influence consumer purchasing behavior
- Correlative Sales Analysis: An advanced analysis technique that links sales data with internal (inventory levels, pricing adjustments) and external factors (market conditions, economic shifts) to derive actionable business insights

#### **Warehouse and Inventory Management**

- Stock Age: The time between the date a product was first stocked and the most recent transaction. Stock age analysis is used to determine slow-moving stock and risks of obsolescence.

- Inventory Turnover: How many times inventory is sold and replaced within an interval. Low turnover indicates too much inventory, and high turnover indicates good inventory management.
- Excess Inventory: Inventory that remains unsold for a very long time, with substantial holding costs and risk of obsolescence. Products with stock age more than 4,000 days could indicate aged or outdated products or poor demand planning

## **Supplier and Procurement**

- Supplier Dependency: The extent to which a company relies on few suppliers for its inventory. Over-reliance on key suppliers may lead to significant threats to operations in the event of disruptions.
- Supply Chain Interruptions: Breaks in the continuity of supplies from suppliers resulting from logistics issues, production delays, geopolitical concerns, or supplier defaults.
- Procurement Strategy: The procurement strategy employed to purchase inventory from suppliers, e.g., diversity in networks of suppliers and demand-based ordering.

## **2. A Sales & Customer Viewpoint**

### **2.1. Objectives**

In this section, the main approach is to give an exhaustive analysis of WideWorldImporters' sales data in order to generate actionable insight. The analysis will identify some key sales trends and assess the impact of market conditions on sales. All of this will ultimately help in making better decisions for product development, inventory management, and pricing strategies. Thus, starting with high-level trend identification, we progressively narrowing down into specific categories for more in-depth investigation.

### **2.2. Sales trend analysis**

#### **2.2.1. Quantity sold trends over the years**

Firstly, our intention was to get sales data across all product types from 2013-2024, aggregating them by year. This was done to see how product sales evolved over time and whether there were certain stock items that were continuously on a growth, stagnating or declining path. Therefore, the following SQL query was established:

```

WITH YearlySales AS (
    SELECT
        YEAR(I.InvoiceDate) AS Year,
        SUM(IL.Quantity) AS TotalQuantitySold
    FROM Sales.Invoices I
    JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
    WHERE YEAR(I.InvoiceDate) BETWEEN 2013 AND 2024
    GROUP BY YEAR(I.InvoiceDate)
)
SELECT
    YS.Year,
    YS.TotalQuantitySold,
    LAG(YS.TotalQuantitySold) OVER (ORDER BY YS.Year) AS PreviousYearSales,
    CASE
        WHEN LAG(YS.TotalQuantitySold) OVER (ORDER BY YS.Year) IS NOT NULL
        THEN
            CAST(YS.TotalQuantitySold - LAG(YS.TotalQuantitySold) OVER (ORDER BY YS.Year))
        AS FLOAT)
        / NULLIF(LAG(YS.TotalQuantitySold) OVER (ORDER BY YS.Year), 0) * 100
        ELSE NULL
    END AS YoYChangePercentage
FROM YearlySales YS
ORDER BY YS.Year;

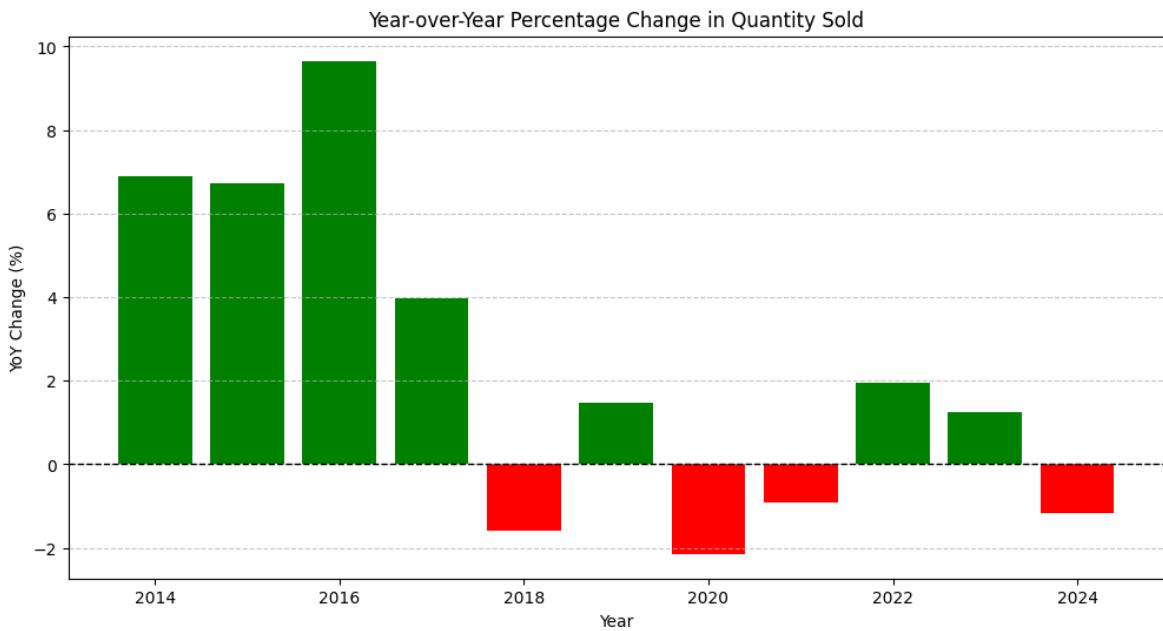
```

We get:

	Year	TotalQuantitySold	PreviousYearSales	YoYChangePercentage
1	2013	2401657	NULL	NULL
2	2014	2567401	2401657	6.90123527214752
3	2015	2740266	2567401	6.73307364139844
4	2016	3004862	2740266	9.65585092834053
5	2017	3124460	3004862	3.98014950436992
6	2018	3074366	3124460	-1.60328504765624
7	2019	3119336	3074366	1.46274061058443
8	2020	3052438	3119336	-2.14462308645173
9	2021	3024180	3052438	-0.925751808881949
10	2022	3083539	3024180	1.96281306006918
11	2023	3121911	3083539	1.24441429150077
12	2024	3085775	3121911	-1.15749616180602

Table 1 - Results - YoY Sales Growth in Quantity

Using the results from this query, we can partly form the dashboard SALES GROWTH AND CHANGES BY GROUP. Moreover, using Python to further analyse these yearly growths let us easily visualize the situation.



*Figure 4 - Year-over-Year Percentage Change in Quantity Sold by year*

The outcome of the analysis proved that some products enjoyed consistent demand, while others may be affected by a set of variables such as seasonality, competition, or changing market conditions. The first query ran with individual stock item trends that appeared too cluttered to enable meaningful insights. For that reason, the query was refined further using product groups, thereby enhancing the interpretation of sales patterns.

- 2016 had the highest year-over-year growth at 9.66%, mainly contributed by a substantial increase in Novelty Items (+92.49%).
- 2019-2020 experienced a downturn (-2.14%), probably due to supply chain disruptions and shifts in customer behavior.
- 2024 showed a moderate decline (-1.6%), a sign of possible market saturation or intensifying competition.

Having visualized these trends, the overall pattern appeared clear, while movements of individual products were cluttered. Therefore, we continue to refine the analysis by grouping products into categories.

### **2.2.2. Trends by product categories**

The next step involved grouping products by stock category:

```

SELECT YEAR(I.InvoiceDate) AS Year, SG.StockGroupName AS ProductCategory,
SUM(IL.Quantity) AS TotalQuantitySold
FROM Sales.Invoices I
JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
WHERE YEAR(I.InvoiceDate) BETWEEN 2013 AND 2024
GROUP BY YEAR(I.InvoiceDate), SG.StockGroupName
ORDER BY Year, TotalQuantitySold DESC;

```

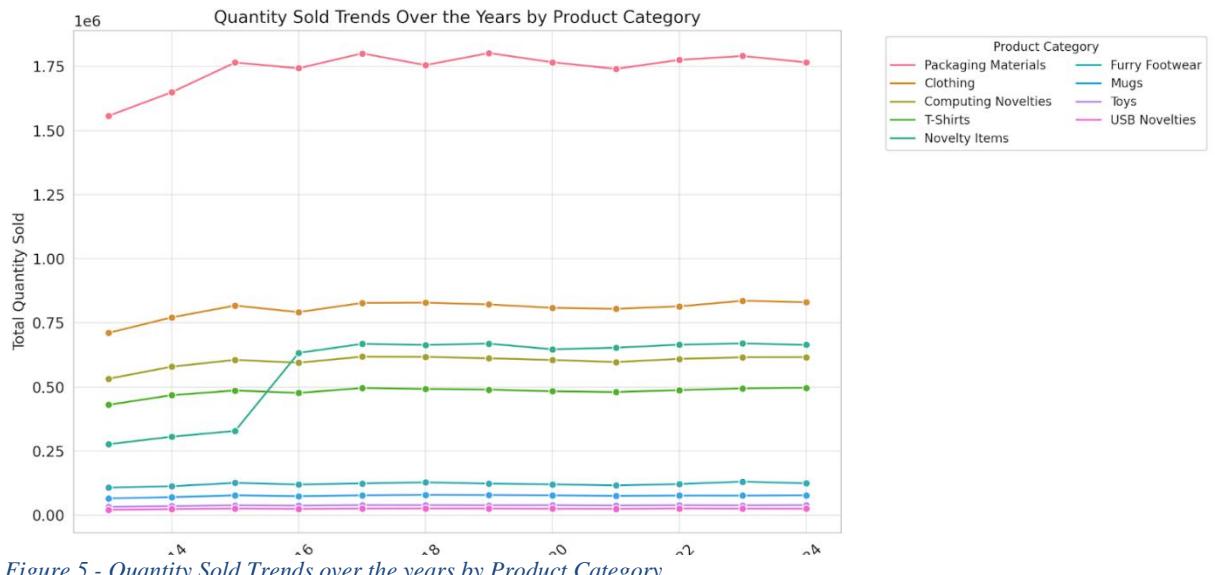


Figure 5 - Quantity Sold Trends over the years by Product Category

Using the results from this query, we can continue with our dashboard SALES GROWTH AND CHANGES BY GROUP having drawn this.

	Year	Category	Sales2016	Sales2015	YoY_Change_Percentage
1	2016	Novelty Items	632675	328677	92.491412541796
2	2015	Furry Footwear	125924	112845	11.590234392308
3	2014	USB Novelties	23685	21328	11.051200300075
4	2014	Novelty Items	306077	276609	10.653304845467
5	2015	USB Novelties	26048	23685	9.976778551826
6	2015	Mugs	77268	70384	9.780631961809
7	2014	Toys	35403	32266	9.722308312155

Table 2 – Results – YoY Sales Growth by Stock Group

Among the product categories, Packaging Materials was the top contributor to total sales volume. Afterward, the category showed a stabilized rate of growth from 2018 to 2019, a potential indication of a saturated market.

On the contrary, Clothing had an unstable trend despite being one of the best-selling categories. The category had its highest annual growth in 2014 (~8.8%), but after 2017, it became stagnant with slight declines from 2018-2021 (~-1%). Small decreases

could signify various demand influencers, which we will go into in category-based analysis.

USB Novelties and T-shirt both had strong initial growth, but their sales growth stagnated in the following years, indicating market obsolescence. Despite a temporary recovery in 2017-2018, sales continuously declined from 2020 onwards. These are stunted growth categories that we will inquire into in category-level analysis.

Novelty Items and Computing Novelties experienced consistent growth. More than that, Novelty Items accounted for 21.06% of total sales in 2016. This prompts further investigation into what drove this growth. Here, we choose to investigate deeper into the business' activities in 2016 - the year with highest YoY growth, specifically to view the impact of newly introduced Novelty Items:

```
WITH CategorySales AS (
    SELECT YEAR(I.InvoiceDate) AS Year, G.StockGroupName AS Category,
        SUM(IL.Quantity) AS TotalQuantitySold
    FROM Sales.Invoices I
    JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
    JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
    JOIN Warehouse.StockItemStockGroups SG ON SI.StockItemID = SG.StockItemID
    JOIN Warehouse.StockGroups G ON SG.StockGroupID = G.StockGroupID
    GROUP BY YEAR(I.InvoiceDate), G.StockGroupName
),
CategoryChanges AS (
    SELECT
        Y1.Year,
        Y1.Category,
        Y1.TotalQuantitySold AS Sales2016,
        Y2.TotalQuantitySold AS Sales2015,
        (CAST(Y1.TotalQuantitySold - Y2.TotalQuantitySold AS FLOAT) /
        NULLIF(CAST(Y2.TotalQuantitySold AS FLOAT), 0)) * 100 AS YoY_Change_Percentage
    FROM CategorySales Y1
    LEFT JOIN CategorySales Y2
        ON Y1.Year = Y2.Year + 1
        AND Y1.Category = Y2.Category
    WHERE Y1.Year = 2016
)
SELECT * FROM CategoryChanges
ORDER BY YoY_Change_Percentage DESC;
```

2016 was a breakout year (as shown in the image below) with the highest YoY growth (~9.6%), mainly due to a surge in Novelty Items's sales volume (92.49%). Despite an overall positive trend, other categories in 2016 experienced year-over-year decline. This suggests a possible shift in consumer demand toward Novelty Items, potentially due to seasonal trends.

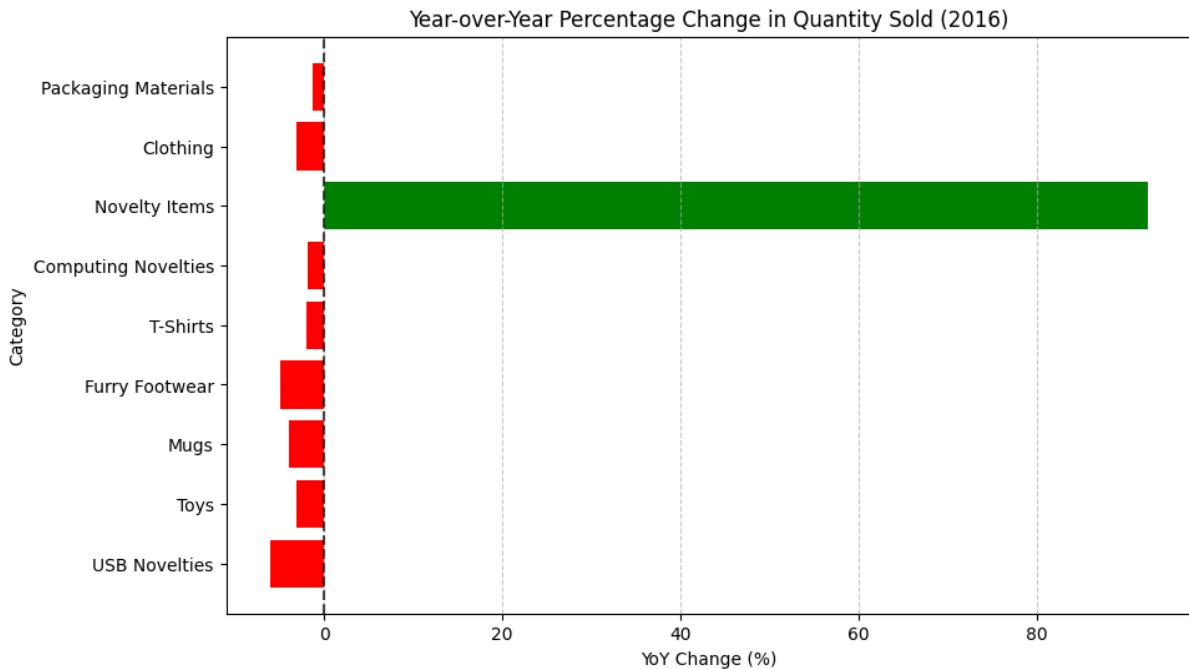


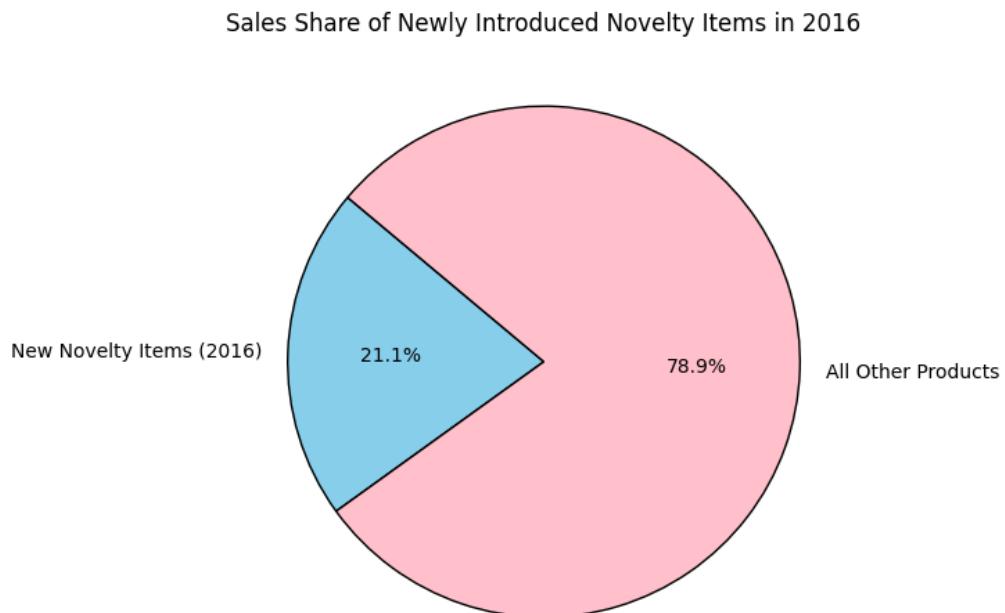
Figure 6 - Year-over-year Percentage Change in Quantity Sold

The quantity sold in Novelty Items nearly doubled compared to 2015, which we hypothesized was influenced by the introduction of new product releases. To investigate the hypothesis, we ran a query to show sales share of newly introduced Novelty Items in 2016:

```

WITH NewNoveltySales AS (
    SELECT SI.StockItemID, SI.StockItemName, SUM(IL.Quantity) AS TotalQuantitySold
    FROM Sales.InvoiceLines IL
    JOIN Sales.Invoices I ON IL.InvoiceID = I.InvoiceID
    JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
    JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
    JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
    WHERE YEAR(I.InvoiceDate) = 2016 AND SG.StockGroupName = 'Novelty Items'
        AND YEAR(SI.ValidFrom) = 2016
    GROUP BY SI.StockItemID, SI.StockItemName),
TotalNoveltySales2016 AS (
    SELECT SUM(TotalQuantitySold) AS NoveltyTotalSales FROM NewNoveltySales),
TotalSales2016 AS (
    SELECT SUM(IL.Quantity) AS Total2016Sales FROM Sales.InvoiceLines IL
    JOIN Sales.Invoices I ON IL.InvoiceID = I.InvoiceID
    WHERE YEAR(I.InvoiceDate) = 2016)
SELECT 'Newly Introduced Novelty Items' AS Category, NNS.NoveltyTotalSales AS
TotalQuantitySold, (NNS.NoveltyTotalSales * 100.0 / TS.Total2016Sales) AS
SalesSharePercentage
FROM TotalNoveltySales2016 NNS
CROSS JOIN TotalSales2016 TS;

```



*Figure 7 - Sales Share of Newly Introduced Novelty Items in 2016*

Novelty Items introduced in 2016 contributed a significant share of 21.06% to the total sales quantity that year, making an immediate impact. Therefore, we explore further into factors pushing the category's growth to utilize in future marketing and product expansion plans.

The sharp increase could be driven by demand trends or seasonal events, which we try to prove by checking for possible seasonality trends in new Novelty Items:

The results from this query, combined with our dashboard SALES GROWTH AND CHANGES BY GROUP, let us have a seasonal insight into this category.

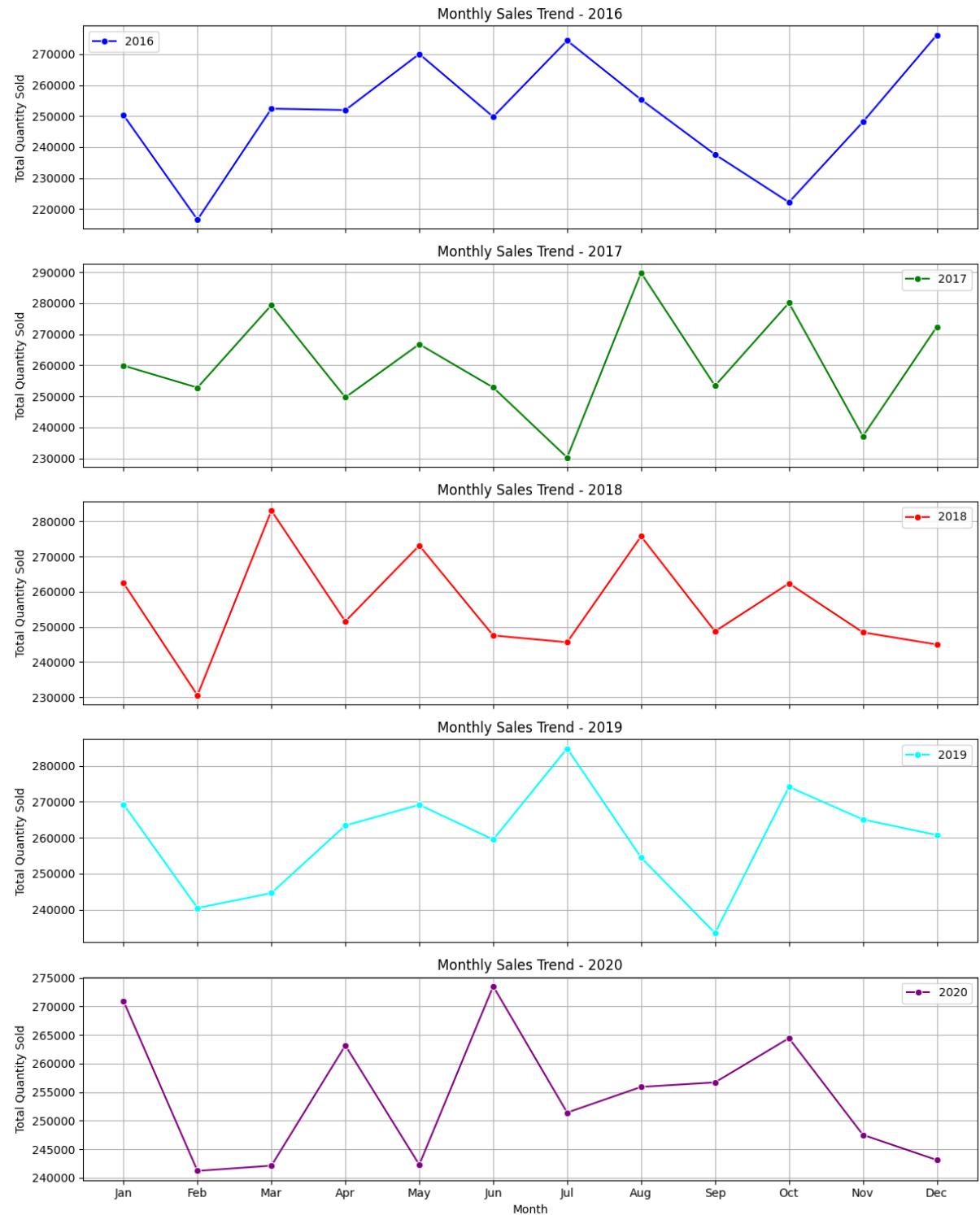


Figure 8 - Monthly Sales of newly introduced Novelty Items by the years

Sales patterns reveal recurring peaks and dips, with significant increases in May–July and declines in February–March and September–November. The mid-year rise indicates a consistent seasonal trend like summer demands and corporate restocks.

### 2.2.3. Category-level analysis

#### 2.2.3.1. Clothing Deep Dive – Strong Seasonality Trends

To analyze seasonality in more depth, we looked into the category of Clothing from 2013 - 2024. The category's sales trends revealed strong seasonal fluctuations:

```
SELECT YEAR(I.InvoiceDate) AS Year, MONTH(I.InvoiceDate) AS Month, SUM(IL.Quantity) AS TotalQuantitySold
FROM Sales.Invoices I
JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
WHERE SG.StockGroupName = 'Clothing'
AND YEAR(I.InvoiceDate) BETWEEN 2013 AND 2024
GROUP BY YEAR(I.InvoiceDate), MONTH(I.InvoiceDate)
ORDER BY Year, Month;
```

The results from this query, combined with our dashboard SALES GROWTH AND CHANGES BY GROUP, let us have a seasonal insight into this category.

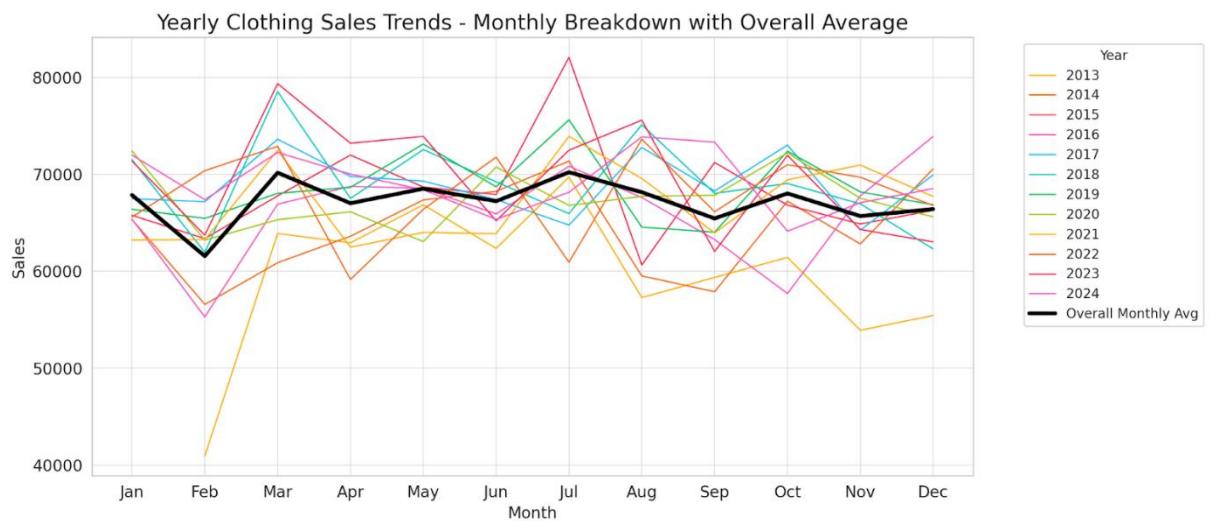


Figure 9 - Yearly Clothing Sales Trend - Monthly Breakdown with Overall Average

We can observe clear yearly peak trends in July (5 out of 12 years), followed by March and October. Underlying this July peak is a demand spike for mid-year seasonal clothing transition, which can be attributed to holiday spending. Spikes in March are hypothesized to be spring shopping, while rises in October may be an indication of end-of-year stockups for holiday shopping like Christmas, Black Friday, and Cyber Monday.

On the other hand, February had the most sales declines (4 out of 12 years), possibly due to post-holiday shopping slump. Additionally, May sales declines can be due to a lack of major shopping events, while November drops may indicate a shift in Christmas shopping.

#### 2.2.3.2. *T-Shirt and USB Novelties stunted growth:*

T-Shirts and USB Novelties categories show similar growth trajectory with stunted long-term growth opportunities. Looking at our SALES GROWTH AND CHANGES dashboard, we then use Python to more easily identify these trends

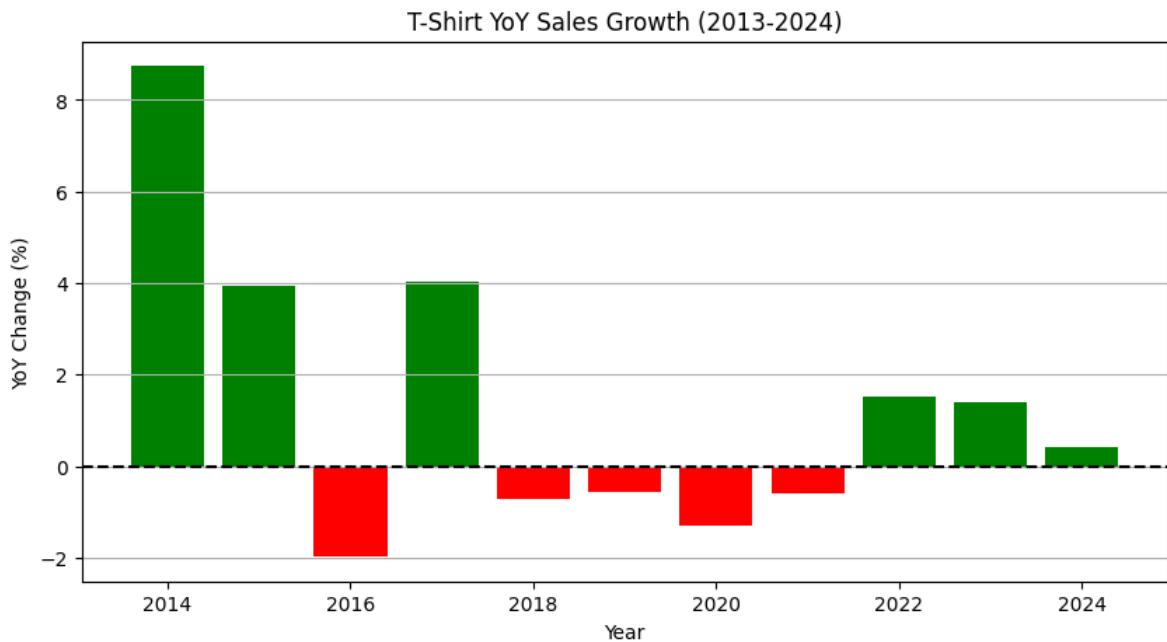


Figure 10 - T-Shirt YoY Sales Growth

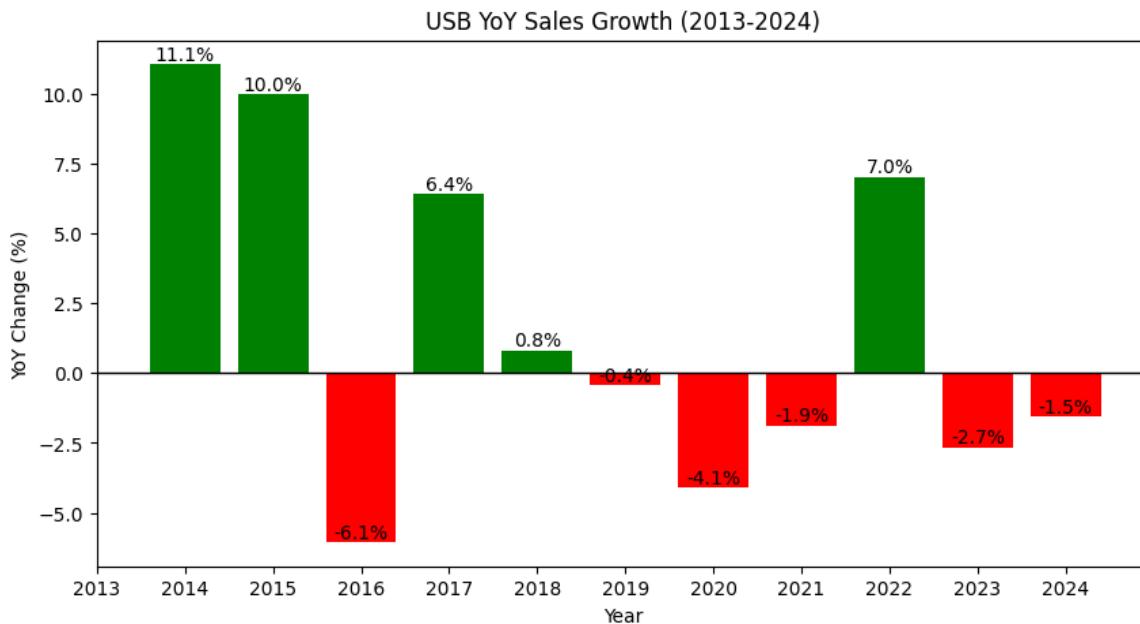


Figure 11 - USB YoY Sales Growth

Both T-Shirts and USB Novelties have shown stable but low sales patterns and minimal growth. However in 2016, USB Novelties had a 6.1% decline in YoY change and a sharp gross profit margin drop. We hypothesize that this was due to 2 consecutive discounts for the categories (10% and 15%) in Q1 and Q2 2016:

```

SELECT YEAR(o.OrderDate) AS Year, sg.StockGroupName, SUM(line.ExtendedPrice) AS
TotalRevenue, SUM(line.ExtendedPrice - line.LineProfit) AS TotalCOGS,
SUM(line.LineProfit) AS GrossProfit, (SUM(line.LineProfit) /
NULLIF(SUM(line.ExtendedPrice), 0)) * 100 AS GrossProfitMargin
FROM Sales.InvoiceLines line
JOIN Sales.Invoices inv ON inv.InvoiceID = line.InvoiceID
JOIN Sales.Orders o ON o.OrderID = inv.OrderID
JOIN Warehouse.StockItems si ON line.StockItemID = si.StockItemID
JOIN Warehouse.StockItemStockGroups sisg ON si.StockItemID = sisg.StockItemID
JOIN Warehouse.StockGroups sg ON sisg.StockGroupID = sg.StockGroupID
WHERE sg.StockGroupName IN ('T-Shirts', 'USB Novelties')
GROUP BY YEAR(o.OrderDate), sg.StockGroupName
ORDER BY Year, sg.StockGroupName;

```

The results from this query leads us to the creation of another dashboard, SALES MARGINS AND MARKUPS. After using Python to visualize, we get this:

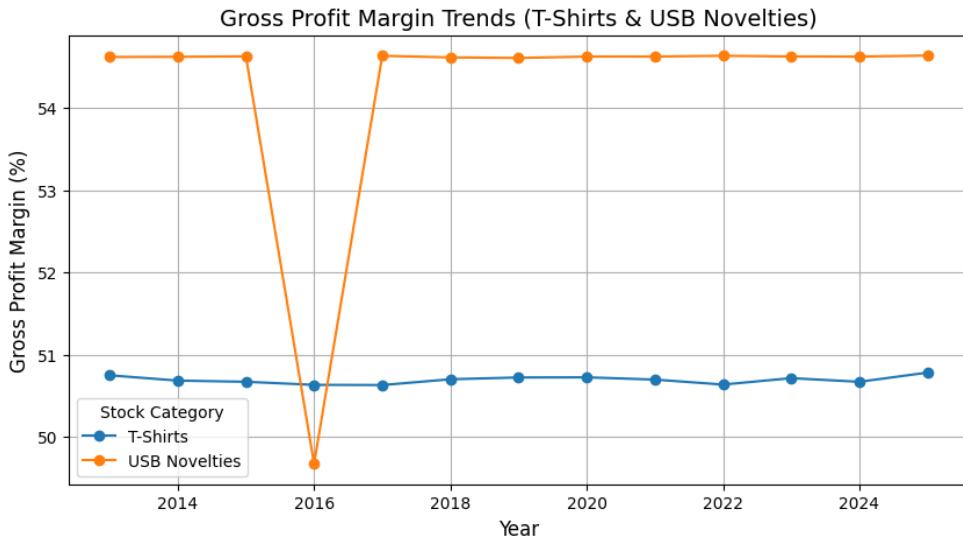


Figure 12 - Gross Profit Margin Trends of T-Shirts and USB

After 2 discount periods, gross profit margin of USB Novelties stabilized again but demand wasn't increasing. However, the category had a temporary sales spike in 2022. Since the average is only 5 units per order, the surge may have resulted from increased sales volume rather than large individual purchases. Therefore, we speculate that promotional campaigns or seasonal demand may have influenced the spike.

```

SELECT YEAR(I.InvoiceDate) AS Year, MONTH(I.InvoiceDate) AS Month, COUNT(DISTINCT
I.InvoiceID) AS TotalOrders, SUM(IL.Quantity) AS TotalQuantitySold, AVG(IL.Quantity)
AS AvgQuantityPerOrder
FROM Sales.Invoices I
JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
WHERE SG.StockGroupName = 'USB Novelties' AND YEAR(I.InvoiceDate) = 2022
GROUP BY YEAR(I.InvoiceDate), MONTH(I.InvoiceDate)
ORDER BY TotalQuantitySold DESC;
    
```

	Year	Month	TotalOrders	TotalQuantitySold	AvgQuantityPerOrder
1	2022	6	401	2430	5
2	2022	8	391	2354	5
3	2022	3	391	2353	5
4	2022	12	377	2284	5
5	2022	10	373	2253	5
6	2022	5	366	2208	5
7	2022	1	370	2166	5
8	2022	7	341	2118	5
9	2022	9	352	2085	5
10	2022	11	358	2061	5
11	2022	2	352	2036	5
12	2022	4	325	1974	5

Table 3 – Results - Quantity Sold of USB

As T-shirts and USB Novelties had no significant price changes, price sensitivity and competitive markets may have stagnated the growth. To boost growth, we suggest the business should direct marketing efforts toward specific target audiences and reevaluate whether these products should be expanded or replaced.

#### 2.2.4. Trends by best-selling stock items

```
WITH TopStockItems AS (
    SELECT TOP 5 IL.StockItemID, SI.StockItemName, SUM(IL.Quantity) AS TotalQuantitySold
    FROM Sales.InvoiceLines IL
    JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
    GROUP BY IL.StockItemID, SI.StockItemName
    ORDER BY TotalQuantitySold DESC)
SELECT I.InvoiceDate AS Date, SI.StockItemName, SUM(IL.Quantity) AS TotalQuantitySold
FROM Sales.Invoices I
JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
JOIN TopStockItems TS ON SI.StockItemID = TS.StockItemID
WHERE YEAR(I.InvoiceDate) BETWEEN 2013 AND 2024
GROUP BY I.InvoiceDate, SI.StockItemName
ORDER BY Date, StockItemName;
```

These queries are best represented in the SALES OVERVIEW dashboard below, which shows items sold within the whole period. Looking at this query in particular however:



Figure 13 - Top 5 Best-selling Items Over Time

According to the data visualization, Packaging Materials, specifically Black and orange fragile despatch tape, Clear packaging page and Shipping carton consistently perform well in the top 5. The overall quantity sold for these products exhibits an upward trend from. From 2018 to 2022, the general trend stabilized, indicating a matured market calling for new strategies. In more detail, supply chain disruptions, economic downturns, or shifting preferences could have affected sales.

#### 2.2.4.1. Strong Correlation (0.71) Between Best-Seller Sales and Total Sales:

```

WITH MonthlySales AS (
    SELECT DATEFROMPARTS(YEAR(IL.LastEditedWhen), MONTH(IL.LastEditedWhen), 1) AS SalesMonth, SUM(IL.Quantity) AS Total_Monthly_Sales
    FROM Sales.InvoiceLines IL
    GROUP BY YEAR(IL.LastEditedWhen), MONTH(IL.LastEditedWhen)),
BestSellerItems AS (
    SELECT TOP 5 IL.StockItemID, S.StockItemName, SUM(IL.Quantity) AS Total_Sales
    FROM Sales.InvoiceLines IL
    JOIN Warehouse.StockItems S ON IL.StockItemID = S.StockItemID
    GROUP BY IL.StockItemID, S.StockItemName
    ORDER BY SUM(IL.Quantity) DESC),
BestSellerSales AS (
    SELECT DATEFROMPARTS(YEAR(IL.LastEditedWhen), MONTH(IL.LastEditedWhen), 1) AS SalesMonth, SUM(IL.Quantity) AS Best_Seller_Sales
    FROM Sales.InvoiceLines IL
    WHERE IL.StockItemID IN (SELECT StockItemID FROM BestSellerItems)
    GROUP BY YEAR(IL.LastEditedWhen), MONTH(IL.LastEditedWhen))
SELECT MS.SalesMonth, MS.Total_Monthly_Sales,
    COALESCE(BS.Best_Seller_Sales, 0) AS Best_Seller_Sales
FROM MonthlySales MS
LEFT JOIN BestSellerSales BS ON MS.SalesMonth = BS.SalesMonth
    
```

```
ORDER BY MS.SalesMonth;
```

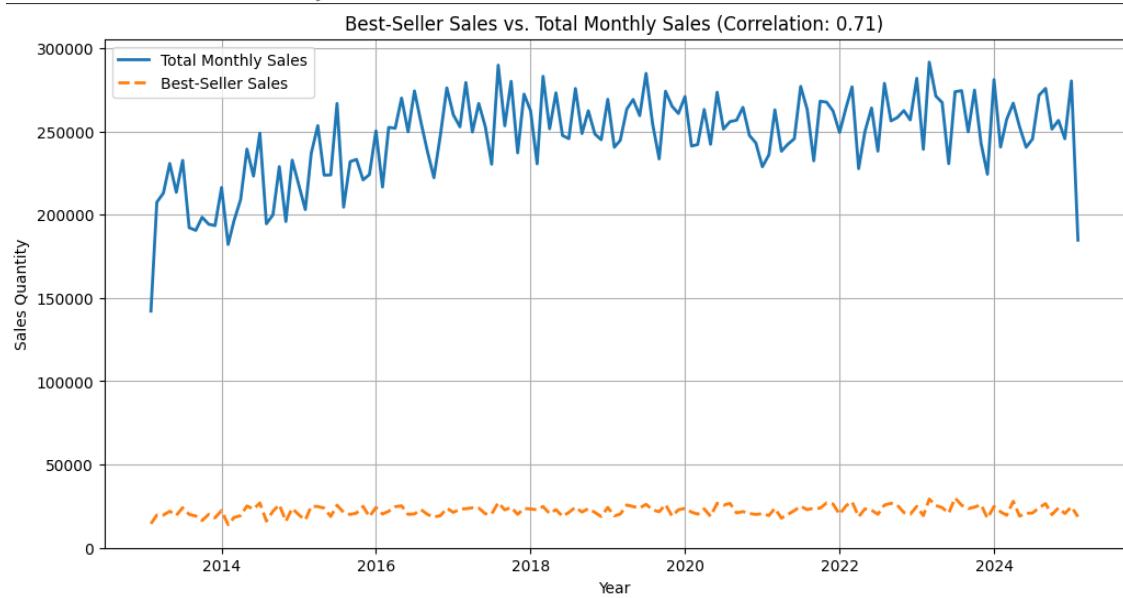


Figure 14 - Best-seller Sales vs. Total Monthly Sales

We can derive from a 0.71 correlation point that best-sellers significantly impact the total sales trend of all product categories. Therefore, peaks are likely caused by high-performing items sales increases rather than broad-based growth. Similarly, sales declines in February possibly resulted from lower performance of best-sellers. However, while these items has stable trend, extreme sales peaks appear to be driven by other factors or promotions.

Improving upon our SALES MARGINS AND MARKUPS dashboard, we also ran a query to investigate the percentage contribution of the top 5 best-selling stock items to total profit on a monthly basis:

```
WITH MonthlyTotalProfit AS (
    SELECT
        YEAR(IL.LastEditedWhen) AS Year,
        MONTH(IL.LastEditedWhen) AS Month,
        SUM(IL.LineProfit) AS Total_Monthly_Profit
    FROM Sales.InvoiceLines IL
    GROUP BY YEAR(IL.LastEditedWhen), MONTH(IL.LastEditedWhen)
),
Top5Items AS (
    SELECT
        IL.StockItemID, SI.StockItemName,
        RANK() OVER (ORDER BY SUM(IL.Quantity) DESC) AS SalesRank,
        RANK() OVER (ORDER BY SUM(IL.LineProfit) DESC) AS ProfitRank
    FROM Sales.InvoiceLines IL
    JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
    GROUP BY IL.StockItemID, SI.StockItemName
),
MonthlyProfitByItems AS (
    SELECT
        YEAR(IL.LastEditedWhen) AS Year,
        MONTH(IL.LastEditedWhen) AS Month,
```

```

        SUM(CASE WHEN TI.SalesRank <= 5 THEN IL.LineProfit ELSE 0 END) AS
BestSellers_Profit,
        SUM(CASE WHEN TI.ProfitRank <= 5 THEN IL.LineProfit ELSE 0 END) AS
MostProfitable_Profit
    FROM Sales.InvoiceLines IL
    JOIN Top5Items TI ON IL.StockItemID = TI.StockItemID
    GROUP BY YEAR(IL.LastEditedWhen), MONTH(IL.LastEditedWhen)
)
SELECT
    T.Year, T.Month, T.Total_Monthly_Profit,
    M.BestSellers_Profit,
    (M.BestSellers_Profit * 100.0 / NULLIF(T.Total_Monthly_Profit, 0)) AS
BestSellers_Contribution_Percentage,
    STRING_AGG(CASE WHEN TI.SalesRank <= 5 THEN TI.StockItemName END, ', ') AS
Best_Selling_Items,
    M.MostProfitable_Profit,
    (M.MostProfitable_Profit * 100.0 / NULLIF(T.Total_Monthly_Profit, 0)) AS
MostProfitable_Contribution_Percentage,
    STRING_AGG(CASE WHEN TI.ProfitRank <= 5 THEN TI.StockItemName END, ', ') AS
Most_Profitable_Items
FROM MonthlyTotalProfit T
LEFT JOIN MonthlyProfitByItems M ON T.Year = M.Year AND T.Month = M.Month
LEFT JOIN Top5Items TI ON TI.StockItemID IN (
    SELECT DISTINCT StockItemID FROM Top5Items
)
GROUP BY T.Year, T.Month, T.Total_Monthly_Profit, M.BestSellers_Profit,
M.MostProfitable_Profit
ORDER BY T.Year, T.Month;

```

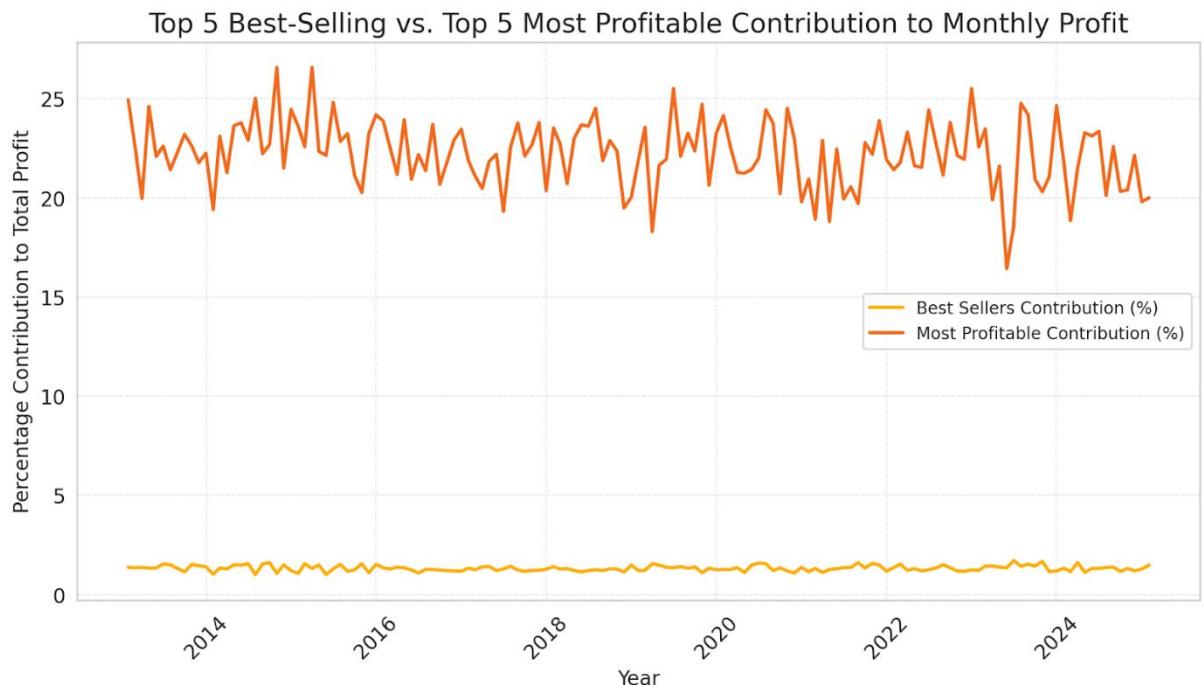


Figure 15 - Top 5 Best-Selling vs. Top 5 Profitable Contribution to Monthly Profit

After further investigation, best-sellers add up to only 1-2% of the total profit, while most profitable items contribute up to 20-25%. The substantial difference in profit

contribution highlights that WideWorldImporters should explore different markup and bundling strategies.

## 2.3. Price markups

### 2.3.1. Markup percentages

Aside from profit margins, we are also investigating the markups of each product and product groups. The following SQL queries and our dashboards are designed to show this.

*Markup Percentage by Stock Group:*

```
WITH StockMarkup AS (
    SELECT SI.StockItemID, SI.StockItemName, SG.StockGroupName, SI.UnitPrice,
        (SI.RecommendedRetailPrice - SI.UnitPrice) AS MarkupAmount,
        ((SI.RecommendedRetailPrice - SI.UnitPrice) / NULLIF(SI.UnitPrice, 0)) * 100
    AS MarkupPercentage
    FROM Warehouse.StockItems SI
    JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
    JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID)
SELECT StockGroupName, COUNT(StockItemID) AS TotalItems, ROUND(AVG(MarkupPercentage),
2) AS AvgMarkupPercentage,
    MIN(MarkupPercentage) AS MinMarkup,
    MAX(MarkupPercentage) AS MaxMarkup
FROM StockMarkup
GROUP BY StockGroupName
ORDER BY AvgMarkupPercentage DESC;
```

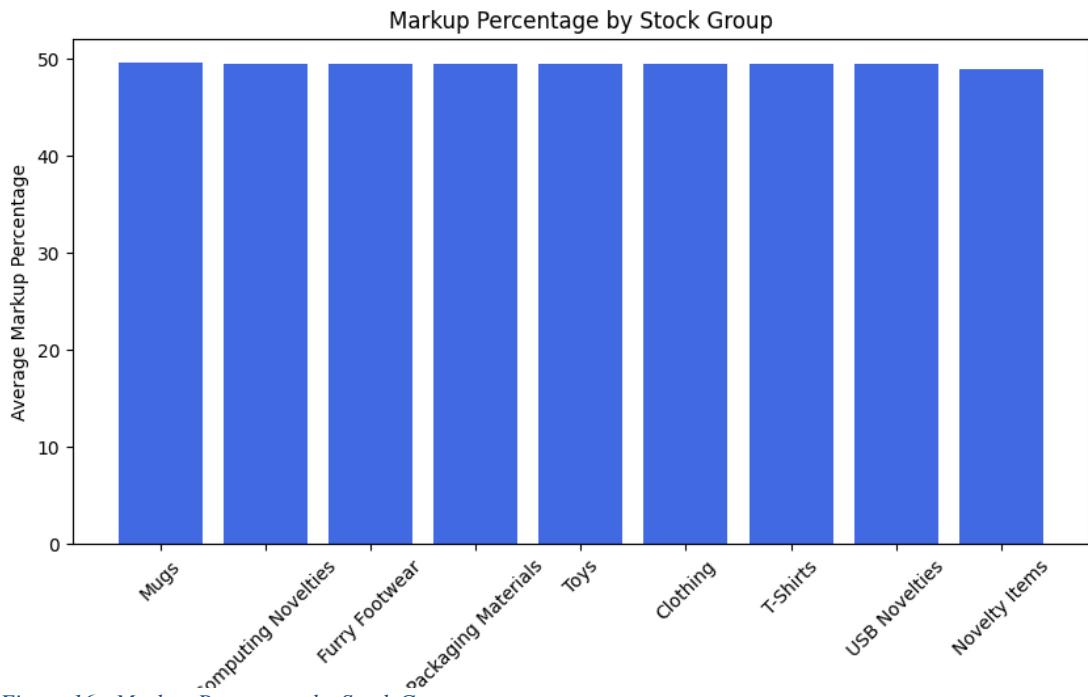


Figure 16 - Markup Percentage by Stock Group

```

SELECT SI.StockItemID, SI.StockItemName, SG.StockGroupName, SI.UnitPrice,
       (SI.RecommendedRetailPrice - SI.UnitPrice) AS MarkupAmount,
       ((SI.RecommendedRetailPrice - SI.UnitPrice) / NULLIF(SI.UnitPrice, 0)) * 100 AS
MarkupPercentage,
       SUM(IL.Quantity) AS TotalQuantitySold
FROM Warehouse.StockItems SI
JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
JOIN Sales.InvoiceLines IL ON SI.StockItemID = IL.StockItemID
GROUP BY SI.StockItemID, SI.StockItemName, SG.StockGroupName, SI.UnitPrice,
SI.RecommendedRetailPrice;

```

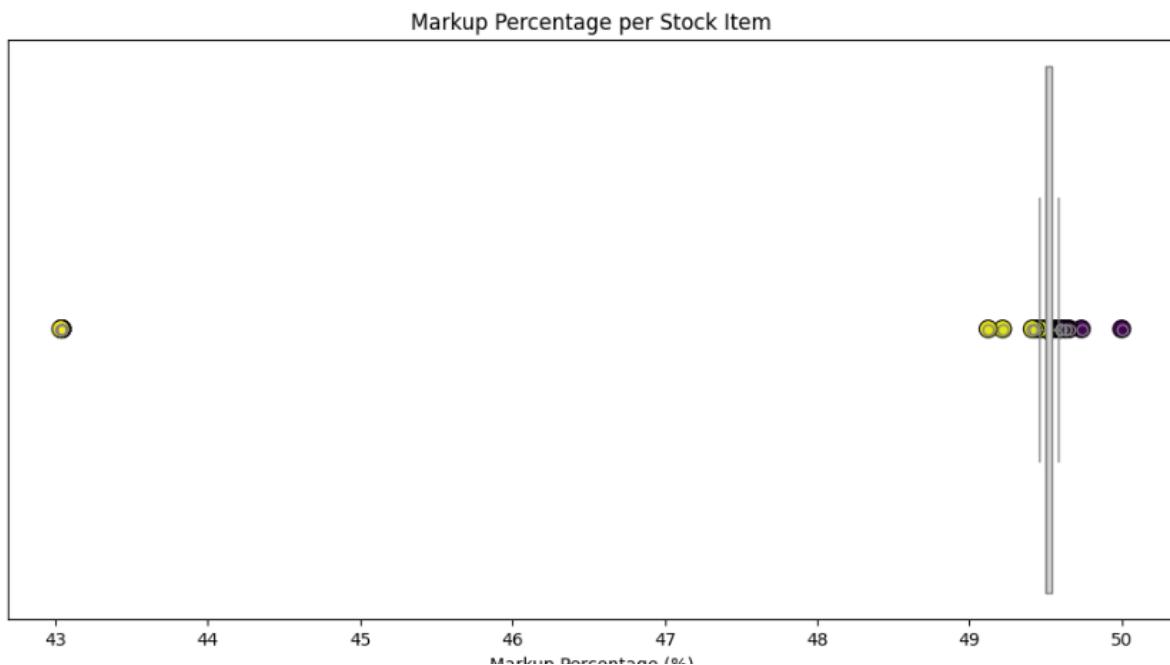


Figure 17 - Markup Percentage per Stock Item

Markup percentages fluctuate tightly around a 49%-50% markup, indicating the business has standardized pricing approach. Novelty Items have a slightly lower markup of 48.95% and a minimum of 43.03%, indicating some pricing flexibility for low-cost, low sales, price-sensitive items like USB Novelties.

#### *Correlation Between Markup and Sales:*

```

WITH StockMarkup AS (SELECT SI.StockItemID, SI.StockItemName, SG.StockGroupName,
SI.UnitPrice, (SI.RecommendedRetailPrice - SI.UnitPrice) AS MarkupAmount,
((SI.RecommendedRetailPrice - SI.UnitPrice) / NULLIF(SI.UnitPrice, 0)) * 100 AS
MarkupPercentage
   FROM Warehouse.StockItems SI
  JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
  JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID),

StockSales AS (SELECT IL.StockItemID, SUM(IL.Quantity) AS TotalQuantitySold
   FROM Sales.InvoiceLines IL
  GROUP BY IL.StockItemID)

```

```

SELECT SM.StockItemID, SM.StockItemName, SM.StockGroupName, SM.UnitPrice,
SM.MarkupAmount, ROUND(SM.MarkupPercentage, 2) AS MarkupPercentage,
COALESCE(SS.TotalQuantitySold, 0) AS TotalQuantitySold
FROM StockMarkup SM
LEFT JOIN StockSales SS ON SM.StockItemID = SS.StockItemID
ORDER BY SM.MarkupPercentage DESC;

```

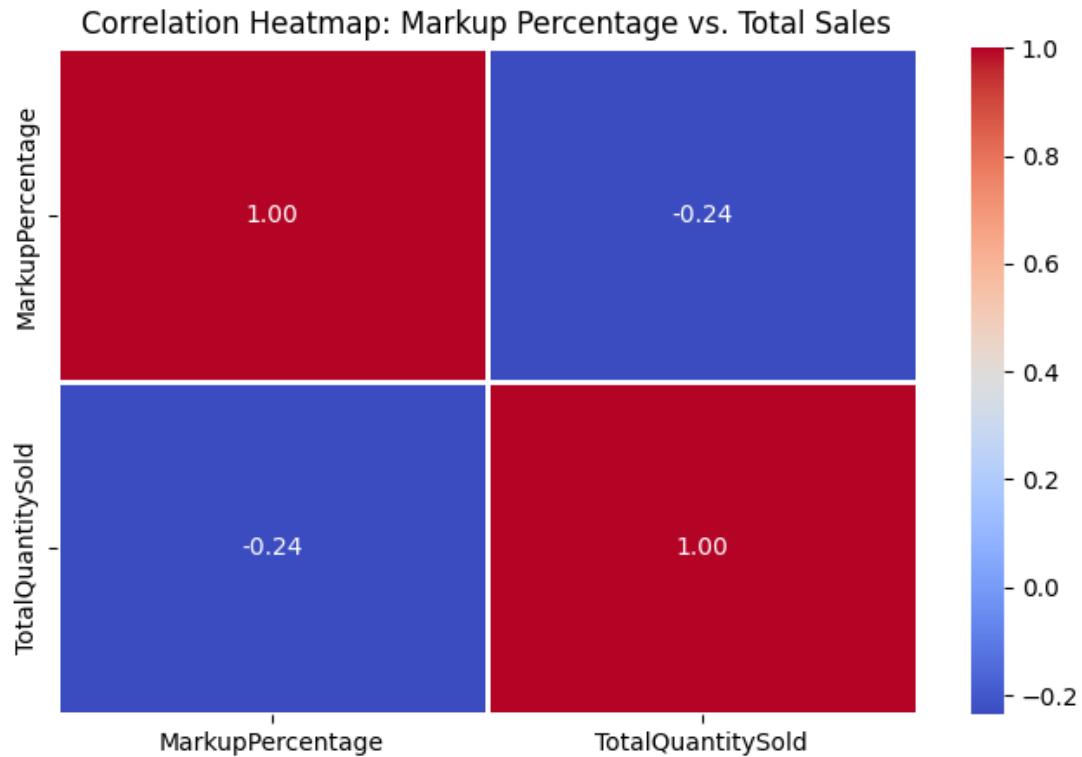


Figure 18 - Correlation Heatmap: Markup % vs. Total Sales

According to our test's result, a correlation point of -0.24 shows a weak negative relationship between markup percentage and total quantity sold. Higher markups may slightly reduce sales but with low long-term impact.

### 2.3.2. Correlation Between Quantity Sold and Profit Margin

For the last part of our dashboard, SALES MARGINS AND MARKUPS, we design a query that measures and illustrate the relationship between quantity sold and profit margins:

```

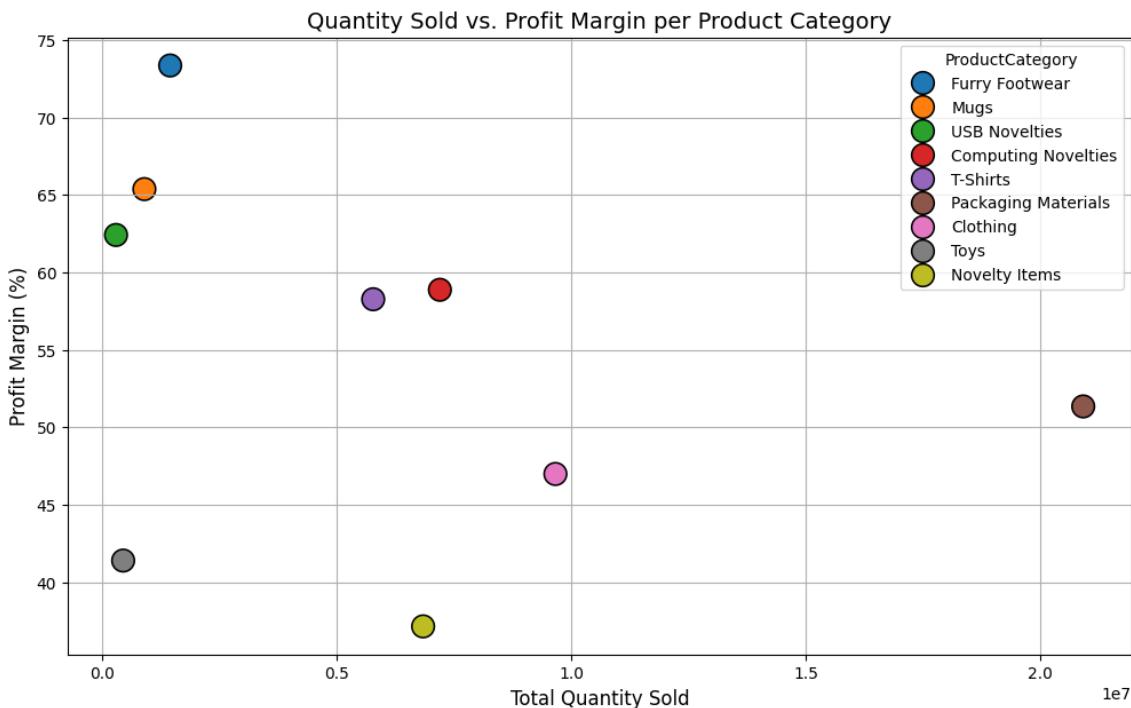
WITH SalesData AS (
    SELECT sg.StockGroupName AS ProductCategory, SUM(il.Quantity) AS
    TotalQuantitySold, SUM(il.UnitPrice * il.Quantity) AS TotalRevenue, SUM(il.LineProfit)
    AS TotalProfit, (SUM(il.LineProfit) / NULLIF(SUM(il.UnitPrice * il.Quantity), 0)) *
    100 AS ProfitMargin
    FROM Sales.InvoiceLines il
    INNER JOIN Sales.Invoices i ON il.InvoiceID = i.InvoiceID
    INNER JOIN Warehouse.StockItems si ON il.StockItemID = si.StockItemID
    INNER JOIN Warehouse.StockItemStockGroups sisg ON si.StockItemID =
    sisg.StockItemID
    INNER JOIN Warehouse.StockGroups sg ON sisg.StockGroupID = sg.StockGroupID
)

```

```

        WHERE i.InvoiceDate BETWEEN '2013-01-01' AND '2024-12-31'
        GROUP BY sg.StockGroupName)
SELECT * FROM SalesData
ORDER BY ProfitMargin DESC;

```



*Figure 19 - Quantity Sold vs. Profit Margin per Product Category*

As seen in the graph, product categories like Furry Footwear, USB Novelties and Mugs have good profit margins with small sales volumes. These are most likely inexpensive products with customers in specialized markets. WideWorldImporters, therefore, should focus on product quality and customer targeting for marketing to ensure profit. On the contrary, other product categories generate high sales with reduced profit margins, perhaps due to intense competition, price elasticity, or increased costs. Finally, one of the compelling outliers to reassess is the Toys category because it is not only low-selling but also has a low-profit margin.

## 2.4. Recommendations

### 2.4.1. Optimization of Sales Performance & Market Positioning

Clear seasonal peaks are revealed in sales records of Clothing category, with July, March, and October being the top sales months. Meanwhile for Novelty Items, mid-year is the recurrent period for high sales. Acknowledging this, WideWorldImporters should align marketing campaigns with these category-specific trends to optimize profit. Demand fluctuations should also be monitored on a periodic basis in order to enhance product lines and market patterns prediction.

For instance, Novelty Items and Computing Novelties both have sustained demand growth and can be developed with complementary products or bundling offers. T-Shirts and USB Novelties, however, had long-term stagnation and need strategic reevaluation. Refreshing USB Novelties sales boost plan with promotions or complementary products may stimulate growth, and focusing on seasonal promotions of T-shirts may revive interest. More specifically for Clothing, July, March, and October inventories must be replenished for peak demand, while supply should be reduced in February.

#### **2.4.2. Pricing Strategy & Profit Optimization**

Best-sellers account for a significant portion of quantity sold but take up just 1-2% of the total profit. To boost profitability, the company can slightly adjust their markup percentage of high-margin products. In detail, prices can be increased prior to peak-demand seasons through event-driven pricing while selective discounts can allow sales to remain stable in lean months.

Category-specific insights suggested that the 2016 sales fall in USB Novelties results from ineffective and unsuitable promotions of consecutive discounts . Subsequent discounts have to be strategically implemented and piloted in controlled phases to both push sales and avoid eroding profit margins. Moreover, some categories' performances depend on sales volume more compared to high margins. The company can experiment higher markups in less price-sensitive categories, ensuring a balanced pricing policy.

Furthermore, correlation analysis indicates that some of the low-selling items have low profit margins. These underperforming items must be optimized, repositioned, or discontinued to make the product portfolio more efficient and profitable.

#### **2.4.3. Inventory Management & Stock Optimization**

A correlation test between quantity sold and profit margin have shown that Toys category underperforms both in terms of volume sales and margin profit and should undergo immediate re-examination. For unprofitable categories, WideWorldImporters can discontinue low-selling items or redesignate them as premium goods to increase profit.

Similarly, synchronizing stock levels with demand cycles can help them achieve optimal inventory turnover. In depth, Clothing is often high demand during Julys, and

Novelty Items have mid-year surges, which call for careful planning and preparation of stock to prevent shortages or overstock.

Bestsellers drive overall sales trends, but make little contribution in terms of profit. To counteract this, the business can bundle these items with high-margin complements, such as USB Novelties with tech products. Because certain categories have low profit margins, the company can also consider cost reduction through the renegotiation of supplier contracts and partnership with alternative suppliers to reduce cost.

#### **2.4.4. Data-Driven Business Expansion & Future Strategy**

The substantial 92.49% growth in Novelty Items in 2016 was mainly fueled by the launch of new products, highlighting the power of innovation to stimulate sales. To replicate this success, WideWorldImporters can create a consistent pipeline of new, trend-driven product releases.

Additionally, external market conditions had a powerful impact on sales, particularly the downturn in 2019-2020, which can be attributed to widespread economic disruptions of Covid-19 pandemic. Macroeconomic variables will need to be included in forecasting models in the future to better predict shifts in consumer trends and market conditions.

Finally, some of the most profitable stock items of the company are those that remain under-marketed. These items have high potential for additional growth, which can be done by implementing focused marketing on high-margin items.

### **3. Decoding Sales Dynamics: Strategic Insights into Profitability, Seasonality, and Market Evolution**

#### **3.1. Introduction**

In the ever-changing business world, success is not simply about moving products - it's about understanding why products move, when they move, and what makes them profitable. Every business experiences cycles of growth, stagnation, and sometimes decline. Some products launch like rockets and then fizzle into obscurity, while others just keep on making money. But what separates the winners from the laggards?

Our historical data tells a compelling story:

- *Revenue has been increasing steadily year over year, with growth highs in 2019 and 2022, but rising at a slower rate in the last five years.*
- *Certain categories, such as Novelty Items and Packaging Materials, have been most impactful profitability drivers, but their performance hasn't been linear. In certain years, these grew rapidly, while others experienced decline.*
- *Market conditions have had a noticeable impact, from the stabilization of product categories after 2017 to the shocks caused by external events like the COVID-19 pandemic, which registered a fall in 2020-2021 and a rebound in 2022.*

These trends beg the question:

- *What is driving these shifts?*
- *Which product categories have driven profitability over the years, and which ones are losing steam?*
- *Is seasonality a major factor affecting sales trends? If so, how can businesses anticipate and capitalize on peak periods?*
- *Are pricing strategies effective in driving sales, or do they inadvertently hurt profit margins?*
- *What can we learn from historical mistakes, such as overstocking low-demand products?*

In this part, we try to identify trends that influence purchasing behavior. For instance, why did Novelty Items regain popularity in 2021-2022 after a dormant period? What caused sluggish sales of packaging materials when they had been consistent performers in the past? And why was a Halloween mask product line always operated at a loss, and yet continued to be carried?

This report does not simply give numbers—it tells the story behind the data. We will look at not just what happened, but why it happened, and most importantly, how businesses can use these insights to inform future growth and avoid costly mistakes.

From historical trends to actionable business strategies, this report is a guide for businesses trying to untangle the complexity of sales, profitability, and market growth.

### 3.2. Revenue, COGS, and Gross Profit Per Year

There's rhythm to each business—there are times of prosperity, decline, and stability. It is extremely crucial to know how revenue and profitability evolve in the long term for deciding the next business move. For the first goal, we analyze the yearly performance of the company by observing total revenue, cost of goods sold (COGS), and gross profit trends. This is carried out by extracting annual sales data to understand the business cycles that affect profitability over the years.

To do this, we design both a dashboard, PROFITABILITY REPORT, and a set of SQL queries that will help us. Starting with calculating gross profits:

```
SELECT
    YEAR(o.OrderDate) AS Year,
    SUM(line.ExtendedPrice) AS TotalRevenue,
    SUM(line.ExtendedPrice - line.LineProfit) AS TotalCOGS,
    SUM(line.LineProfit) AS GrossProfit
FROM Sales.InvoiceLines line
JOIN Sales.Invoices inv
    ON inv.InvoiceID = line.InvoiceID
JOIN Sales.Orders o
    ON o.OrderID = inv.OrderID
WHERE o.OrderDate < '2025'
GROUP BY YEAR(o.OrderDate)
ORDER BY Year;
```

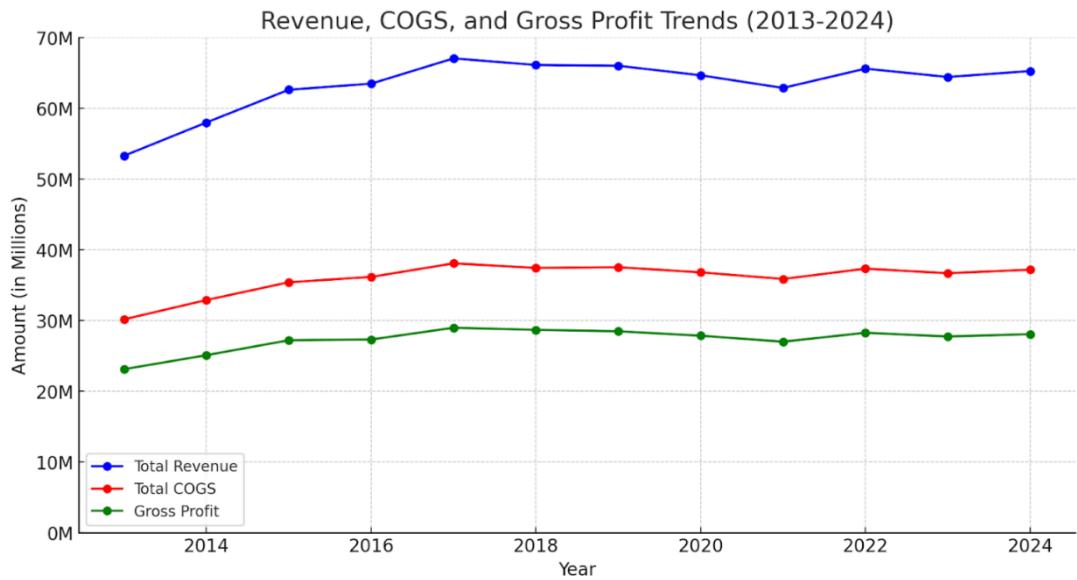


Figure 20 - Revenue, COGS, and Gross Profit Trends (2013-2024)

### **3.2.1. Steady Growth with Periodic Peaks (2015-2022)**

In general, revenue trended in a consistent pattern of growth, with noteworthy peaks in 2019 and 2022. This shows that the company had favorable market conditions, shifts in demand for products, or operational efficiency gains. Gross Profit followed a similar trajectory, indicating that costs were relatively well managed during these growth phases.

### **3.2.2. “Boom” period**

2015-2017 and 2021-2022 were two notable periods of bloom, with certain product categories regaining traction and boosting sales. Our future analysis showed that these categories include Novelty items and Packaging materials. Understanding what drives this growth can be beneficial for future planning. These boom periods warrant a deeper investigation. Were they seasonal spikes, a result of effective marketing campaigns, or external economic conditions?

### **3.2.3. The slowdown - a warning sign?**

Despite overall growth, profitability appears to be slowing down over the last half-decade. While the decline isn't drastic, it suggests maturation of the business model. Are certain product categories becoming saturated? Is competition eroding margins? These questions need further exploration.

We'll deep dive in these product categories later, but as for now, we can deduce that our profitability in general has been stable, with some signs of slowing down the last half a decade, though not necessarily noticeable.

### **3.2.4. The plan**

To uncover the factors behind these trends, we need to zoom in on specific product categories that contributed most to revenue and profit.

- Seasonality Effects – Are specific months consistently underperforming, or outperforming others?
- Product Category Performance – Which categories drive profit growth, and which are declining?
- Market Shifts – Are external factors (economic conditions, consumer behavior) influencing the numbers?

By answering these questions, we can craft more precise strategic recommendations that align with the company's evolving landscape.

### 3.3. Revenue, COGS, and Profit Analysis – Spotting Seasonal Patterns

Next, we identify if seasonality is worth exploring into for this dataset. Our main question going into this was: Are there notable peaks or troughs in the months in total revenue, total COGS, and gross profit per month?

To analyze seasonality, we use the following SQL query to break down monthly sales trends across multiple years:

```
SELECT
    YEAR(o.OrderDate) AS Year,
    MONTH(o.OrderDate) AS Month,
    SUM(line.ExtendedPrice) AS TotalRevenue,
    SUM(line.ExtendedPrice - line.LineProfit) AS TotalCOGS,
    SUM(line.LineProfit) AS GrossProfit
FROM Sales.InvoiceLines line
JOIN Sales.Invoices inv
    ON inv.InvoiceID = line.InvoiceID
JOIN Sales.Orders o
    ON o.OrderID = inv.OrderID
GROUP BY
    YEAR(o.OrderDate),
    MONTH(o.OrderDate)
ORDER BY
    Year,
    Month;
```

	Year	Month	TotalRevenue	TotalCOGS	GrossProfit
1	2013	1	4379939.77	2466667.97	1913271.80
2	2013	2	3211934.60	1820307.30	1391627.30
3	2013	3	4521494.74	2552407.29	1969087.45
4	2013	4	4735845.48	2689300.68	2046544.80
5	2013	5	5157831.57	2888598.72	2269232.85
6	2013	6	4728150.30	2698121.85	2030028.45
7	2013	7	5139403.34	2913257.39	2226145.95

Table 4 - Results - Sales Profit by Month

Some notable trend that we can deduce from these results and our dashboard PROFITABILITY REPORT includes:

- March, July and October show noticeable spikes, often following a period of troughs. Possible reasons include pre-holiday inventory buildup, mid-year sales campaigns or bulk restocking trends.

- February consistently has the lowest drop across the years, followed by June and September, likely due to lower consumer spending after the holiday season. These months show low activity across multiple years, indicating a pattern rather than a one-time anomaly.
- Other months are fairly stable. There are no extreme volatility patterns, meaning fluctuations are predictable rather than erratic.

## Investigating the February Drop: A Product-Level Deep Dive

A major question arises: Is February's revenue drop caused by a decline in specific product categories, or is it a universal trend?

Expanding our query to include product categories and improving our PROFITABILITY REPORT dashboard, we get:

```
SELECT
    sg.StockGroupName,
    YEAR(o.OrderDate) AS Year,
    MONTH(o.OrderDate) AS Month,
    SUM(line.LineProfit) AS TotalProfit
FROM Sales.InvoiceLines line
JOIN Sales.Invoices inv
    ON inv.InvoiceID = line.InvoiceID
JOIN Sales.Orders o
    ON o.OrderID = inv.OrderID
JOIN Warehouse.StockItems s
    ON line.StockItemID = s.StockItemID
JOIN Warehouse.StockItemStockGroups ss
    ON s.StockItemID = ss.StockItemID
JOIN Warehouse.StockGroups sg
    ON ss.StockGroupID = sg.StockGroupID
WHERE o.OrderDate <= '2024-12-31'
GROUP BY
    sg.StockGroupName,
    YEAR(o.OrderDate),
    MONTH(o.OrderDate)
ORDER BY
    sg.StockGroupName,
    Year,
    Month;
```

	StockGroupName	Year	MONTH	TotalProfit
1	Clothing	2013	1	505799.00
2	Clothing	2013	2	358698.00
3	Clothing	2013	3	564167.50
4	Clothing	2013	4	568849.50
5	Clothing	2013	5	590867.00
6	Clothing	2013	6	538509.00

Table 5 - Results - Sales Profit (Clothing) by Month

Using Python and our PROFITABILITY BY PRODUCT GROUP dashboard to visualize:

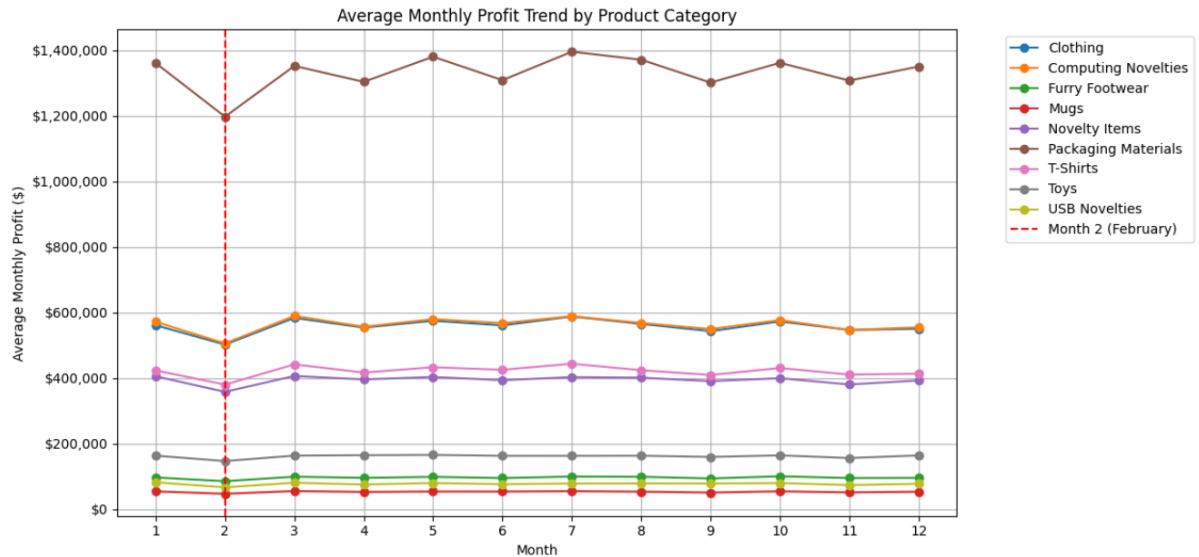


Figure 21 - Average Monthly Product Trend by Product Category

This shows that the decline in month 2 is hardly tied to any specific categories, but rather a common trend that happens across all categories. Packaging Materials stands out as the main driver of the business' profit. Then we looked into the decline, to see what categories specifically have the strongest impact on the trend. Some products, most prominently Packaging materials, are more sensitive to seasonal changes and contribute largely toward overall profitability. This means their performance in February should be examined further.

### 3.4. Analyzing Long-Term Profitability Trends

Having established seasonality patterns, our next focus will be on identifying profit trends at the product level. Specifically, we will explore:

- Which product categories are consistently profitable?
- Are there signs of product maturity or stagnation?
- How do these trends compare with normal revenue patterns?

By addressing these questions, we can find out business focuses to sustain and improve profitability. Going back to our previous query, but this time by year:

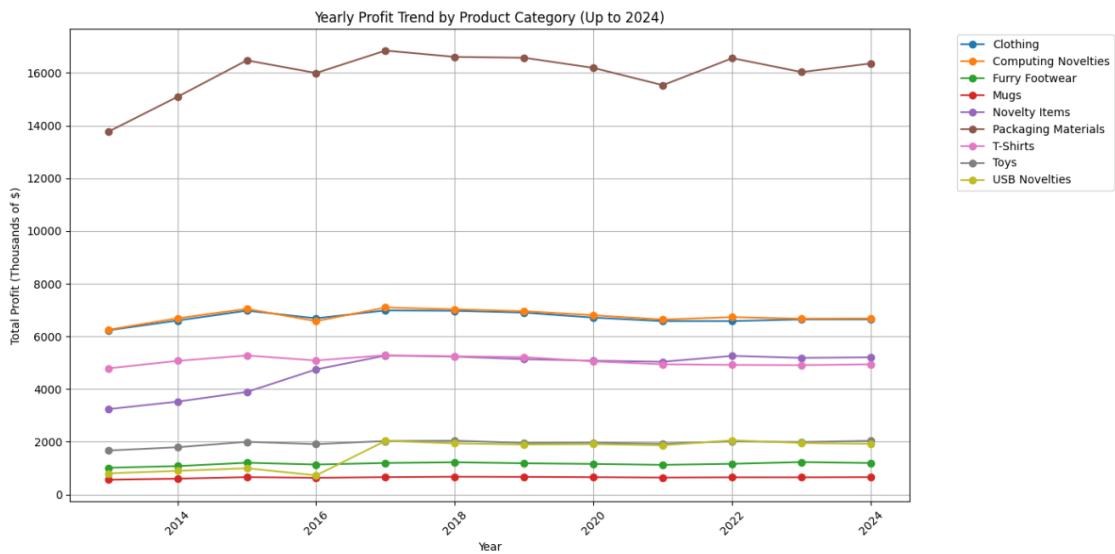


Figure 22 - Yearly Profit Trend by Product Category (2013-2024)

### 3.4.1. Packaging Materials – The Undisputed Profit Leader

Looking at the visual, Packaging Materials has consistently driven the majority of business profit. This category has remained relatively stable over the years, proving to be a foundational revenue stream. However, recent years show signs of a plateau, which raises concerns:

- Is the market reaching saturation?
- Are there cost pressures affecting margins?
- Should the business explore product innovation or diversification to sustain growth?

### 3.4.2. Mid-Tier Categories – Stable Yet Unremarkable Growth

Clothing, Computing Novelties, and T-Shirts show minimal fluctuations. These categories provide a steady revenue stream but lack strong growth momentum. The challenge here is whether they can be optimized for better profitability or if they should remain as secondary revenue contributors.

### 3.4.3. Novelty Items – The Rising Star (With a History of Volatility)

- **Before 2018:** This category grew aggressively, becoming a key profit driver.
- **2018-2020:** Growth slowed down, indicating a temporary stagnation.

- **2021-2022:** The category experienced a revival, but this resurgence was **short-lived**.

Despite fluctuations, Novelty Items show the most promise for future profitability due to renewed consumer interest and emerging trends. The business must explore why this category rebounds periodically and determine how to sustain profitability long-term.

#### **3.4.4. The 2013-2017 Period – The Era of Market Volatility**

- Prior to 2017, many categories saw high fluctuations in profitability.
- After 2017, volatility decreased, suggesting that:
  - The business matured, leading to more predictable revenue streams.
  - The product portfolio became more refined, focusing on stable categories.

#### **3.4.5. Post-2017 Profitability – A Business in Maturity Mode**

- **2017-2021:** A slow but noticeable decline in profit growth occurred.
- **2021-Present:** Signs of recovery, particularly in Novelty Items and Packaging materials.

It's important to note that, while the business is still profitable, its strongest growth periods may be behind it unless new strategies are implemented.

### **3.5. Strategic Recommendations**

The stabilization point in 2017 presents an opportunity to implement new strategies. Since most categories have reached maturity, expansion, innovation, or differentiation should be key priorities. Stabilizing the profitability of Packaging materials and capitalizing on the renewed interest of Novelty are some potential doors to future growth. Some suggestions include Expansion into New Markets, and Product Innovation and Differentiation.

To gain better in-depth knowledge and to identify further opportunity, we will examine in-depth the following categories:

- Packaging Materials to observe how they maintain their popularity.

- Novelty Items to better understand its present promising trend and reasons for past growth
- USB Novelties to understand the effectiveness of promotions.

By analyzing these aspects, we can build a data-driven roadmap for maintaining profitability and unlocking future growth.

### 3.5.1. Packaging Materials

For this company, Packaging Materials have consistently been the strongest contributor to revenue and profit. However, recent data suggests a potential slowdown in growth.

Our key questions in this section:

- Why have Packaging Materials been so successful?
- Is there a risk of market saturation?
- Are there opportunities to reinvigorate growth?

To answer these questions, we design a new query and have put the results in CHANGES IN QUANTITY SOLD AND PROFITABILITY dashboard:

```

SELECT
    YEAR(InvoiceDate) AS Year,
    MONTH(InvoiceDate) AS Month,
    SUM(il.Quantity * il.UnitPrice) AS TotalSales
FROM Sales.InvoiceLines il
JOIN Sales.Invoices i
    ON il.InvoiceID = i.InvoiceID
JOIN Warehouse.StockItems si
    ON il.StockItemID = si.StockItemID
JOIN Warehouse.StockItemStockGroups sisg
    ON si.StockItemID = sisg.StockItemID
JOIN Warehouse.StockGroups sg
    ON sisg.StockGroupID = sg.StockGroupID
WHERE sg.StockGroupName = 'Packaging Materials'
GROUP BY
    YEAR(InvoiceDate),
    MONTH(InvoiceDate)
ORDER BY
    Year,
    Month;

```

Putting this into meaningful visuals:

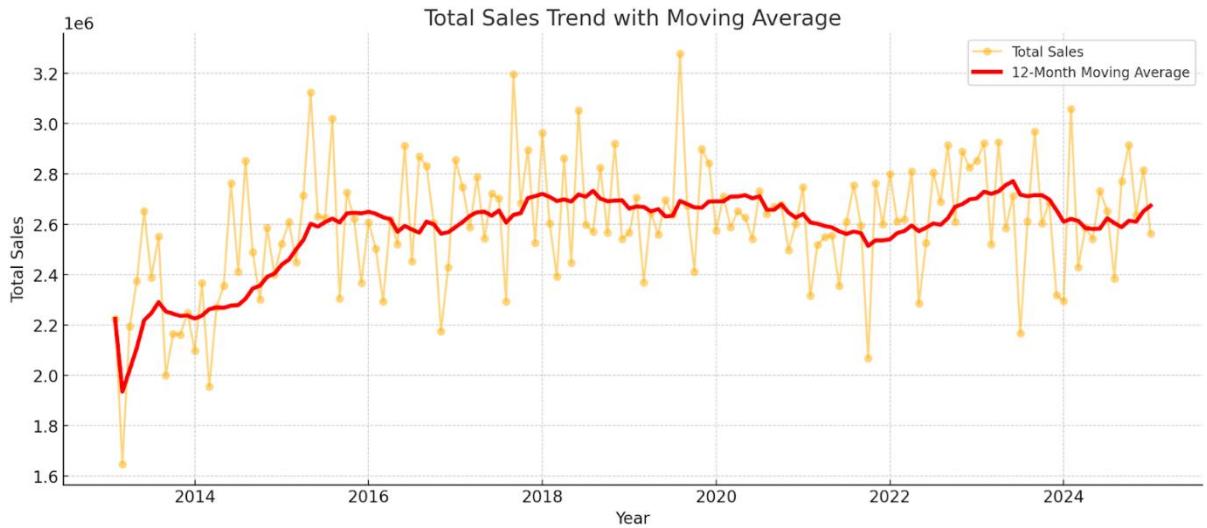


Figure 24 - Total Sales Trend with Moving Average

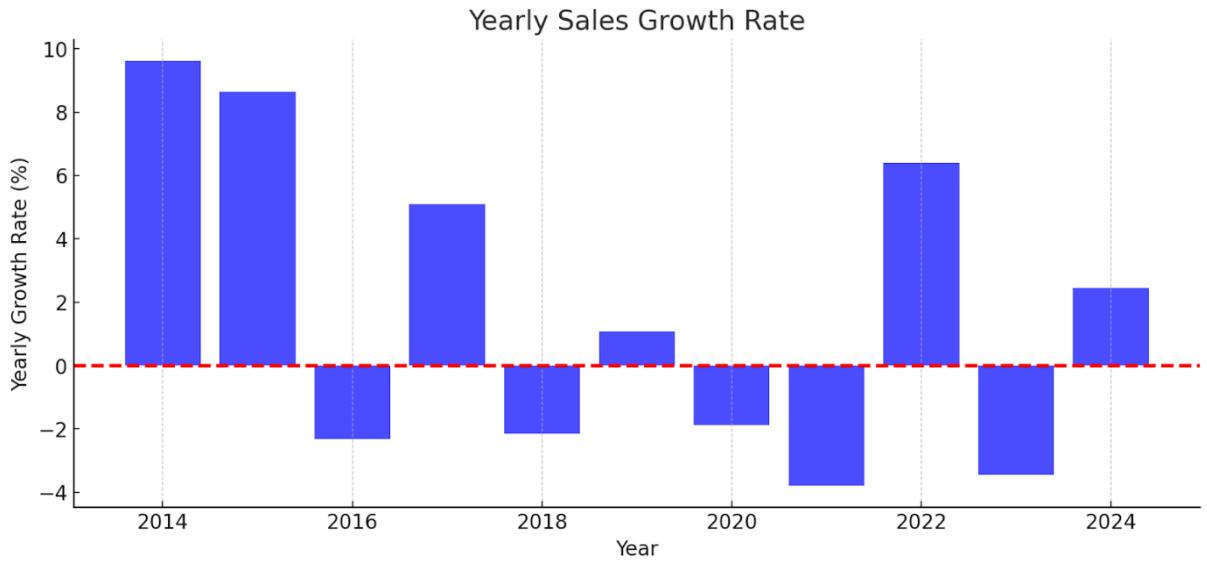


Figure 23 - Yearly Sales Growth Rate

We can see that sales growth of Packaging materials has been very volatile.

- 2020 (-1.88%) and 2021 (-3.80%) saw reduced overall sales, which is presumably due to the Covid-19 pandemic.
- 2022 rebounded sharply (+6.40%), which was a recovery.
- However, 2023 saw another (-3.45%) decrease.

Another notable observation of this graph is that the sales trend is flattening. The moving average demonstrates that whereas in previous years, there was continued growth in sales, years ranging from 2023 to 2024 indicate stagnation.

### *Is the Market Saturated?*

To determine whether the market is saturated, we analyzed key growth indicators:

- Long-Term Growth Rate (CAGR) over the entire period is 1.68%, indicating slow but steady growth.
- The standard deviation of yearly growth rates is 4.96%, which indicates that while sales are stable, they are not increasing significantly. Stability is good - but without growth, profit potential is limited.
- The average growth rate from 2022 to 2024 is only 1.80%, meaning that recent sales have been stagnating compared to earlier years. This supports the idea that the market might be maturing, with fewer growth opportunities.
- However, The Recovery in 2022 (+6.40%) Shows Market Potential, and that growth is possible depending on the strategy. Understanding what worked in this period (pricing, promotions, product differentiation, etc.) can help replicate success.
- Hence, while the market is not entirely stagnant, the slowing CAGR and recent weak growth suggest that it may be nearing saturation. The business needs new growth strategies to avoid further stagnation. Some of the focus include: Market Differentiation & Expansion, Strengthen Customer Retention Strategies, Optimize Pricing & Promotions, Reduce Operational Inefficiencies, Strategic Marketing & Digital Transformation.

#### **3.5.2. Novelty Items**

Now that we have established why Packaging Materials are slowing down, we shift our focus to Novelty Items.

- What caused their past growth spurts?
- Can this category sustain long-term profitability?

- How did promotional strategies impact sales performance?

### 3.5.2.1. Profitability & Quantity Increase (2015-2017)

We now attempt to measure what product drove the initial surge in profits of this category, by measuring profit increase of separate items in the period. To identify profit trends, we extract sales and profit data for Novelty Items across multiple years.

These new fields require a new set of query:

```
WITH NoveltyItems AS (
    SELECT
        si.StockItemID,
        si.StockItemName
    FROM warehouse.StockItems si
    JOIN warehouse.StockItemStockGroups sisg
        ON si.StockItemID = sisg.StockItemID
    JOIN warehouse.StockGroups sg
        ON sisg.StockGroupID = sg.StockGroupID
    WHERE sg.StockGroupName = 'Novelty Items'
),
Profit_2013_2014 AS (
    SELECT
        ni.StockItemName,
        SUM(il.Quantity) AS Quantity_2013_2014,
        SUM(il.LineProfit) AS Profit_2013_2014
    FROM Sales.InvoiceLines il
    JOIN NoveltyItems ni
        ON il.StockItemID = ni.StockItemID
    JOIN Sales.Invoices i
        ON il.InvoiceID = i.InvoiceID
    WHERE YEAR(i.InvoiceDate) BETWEEN 2013 AND 2014
    GROUP BY ni.StockItemName
),
Profit_2015_2017 AS (
    SELECT
        ni.StockItemName,
        SUM(il.Quantity) AS Quantity_2015_2017,
        SUM(il.LineProfit) AS Profit_2015_2017
    FROM Sales.InvoiceLines il
    JOIN NoveltyItems ni
        ON il.StockItemID = ni.StockItemID
    JOIN Sales.Invoices i
        ON il.InvoiceID = i.InvoiceID
    WHERE YEAR(i.InvoiceDate) BETWEEN 2015 AND 2017
    GROUP BY ni.StockItemName
)
SELECT
    p15.StockItemName,
    p13.Quantity_2013_2014,
    p15.Quantity_2015_2017,
    (p15.Quantity_2015_2017 - p13.Quantity_2013_2014) AS QuantityIncrease,
    p13.Profit_2013_2014,
    p15.Profit_2015_2017,
    (p15.Profit_2015_2017 - p13.Profit_2013_2014) AS ProfitIncrease
```

```

FROM Profit_2013_2014 p13
JOIN Profit_2015_2017 p15
ON p13.StockItemName = p15.StockItemName
ORDER BY ProfitIncrease DESC;

```

Finally, we get these results and visuals for our CHANGES IN QUANTITY SOLD AND PROFITABILITY dashboard:

	StockItemName	Quantity_2013_2014	Quantity_2015_2017	QuantityIncrease	Profit_2013_2014	Profit_2015_2017	ProfitIncrease
1	USB food flash drive - dessert 10 drive variety pack	3175	5763	2588	481012.50	810730.50	329718.00
2	Ride on big wheel monster truck (Black) 1/12 scale	3290	5533	2243	460600.00	774620.00	314020.00
3	Ride on vintage American toy coupe (Red) 1/12 sc...	2998	5344	2346	389740.00	694720.00	304980.00
4	Ride on vintage American toy coupe (Black) 1/12 s...	3313	5614	2301	430690.00	729820.00	299130.00
5	USB food flash drive - dim sum 10 drive variety pack	3101	5268	2167	469801.50	740190.00	270388.50
6	Ride on toy sedan car (Pink) 1/12 scale	3175	5785	2610	269875.00	491725.00	221850.00

Table 6 - Results - Profit Increase

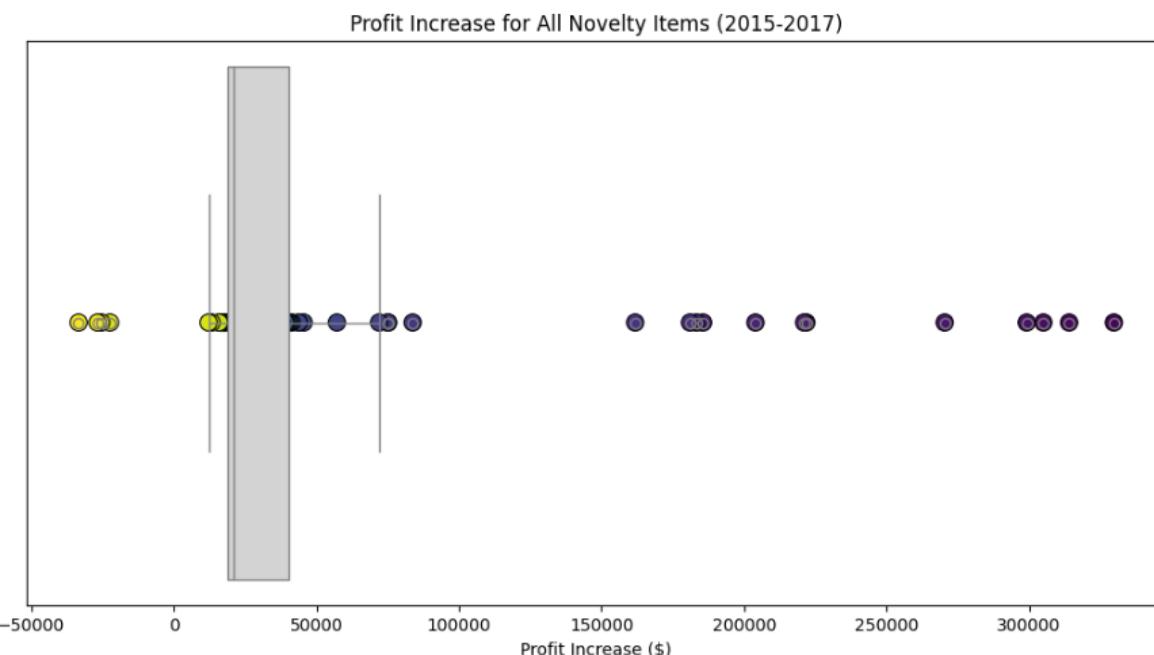


Figure 25 - Profit Increase for all Novelty Items

As we can see here, the growth is driven mostly by the top 11 products (the 11 dots on the right) with exceptionally high profit growth. Most products, however, clustered under \$50,000, indicating that the entire category was not booming—only select items. The list of 11 profit drivers are, correspondingly from right to left:

Which consists of 2 main winners: USB food flash drive, Ride on toys.

And during this period, some products actually decrease in profit. We looked into them, and noticed they are variations of **Halloween zombie masks**.

- Halloween zombie mask (Light Brown) S
- Halloween zombie mask (Light Brown) XL
- Halloween zombie mask (Light Brown) M
- Halloween zombie mask (Light Brown) L

## Quantity Increase Analysis

Using the same results, we can also have a look at quantity changes for these items:

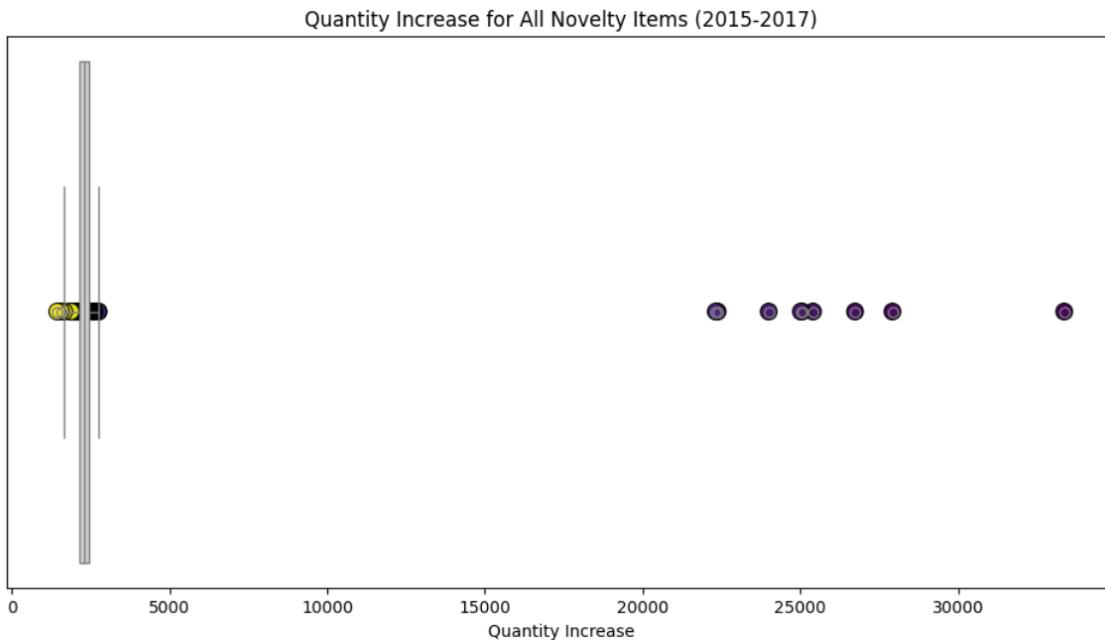


Figure 26 - Quantity Increase for All Novelty Items

The majority of products are clustered near 0-5000 units, meaning the surge wasn't volume-driven for most products. Some products saw over 30,000 units of growth. At first, we thought that this was because of the Ride on toys, because they are the main drivers of profit in this period. However, the result was rather surprising: They were all Halloween zombie masks, which incurred a negative profit growth rate.

- Halloween zombie mask (Light Brown) L
- Halloween skull mask (Gray) XL
- Halloween zombie mask (Light Brown) M
- Halloween zombie mask (Light Brown) XL
- Halloween skull mask (Gray) M
- Halloween skull mask (Gray) S
- Halloween skull mask (Gray) L
- Halloween zombie mask (Light Brown) S

This prompts the questions: What happened to this product? Was it a part of a discount scheme? How was it doing after this period?

But this is a problem for later. As for now, we continue with our original question: What influenced the surge in profit.

### 3.5.2.2. Price and Volume Analysis – What Drove Profitability?

Next up, now that we have identified the top profit drivers (USB food flash drives, Ride-on toys) and the losing products (Halloween zombie masks), we explore why these trends occurred. First, we extracted key details on the top profit-driving products (Ride-on toys & USB food flash drives) from 2015 to 2017 with a query:

```

SELECT
    YEAR(i.InvoiceDate) AS Year,
    ni.StockItemName,
    AVG(il.UnitPrice) AS AvgPrice,
    SUM(il.Quantity) AS TotalUnitsSold,
    SUM(il.ExtendedPrice) AS TotalRevenue
FROM Sales.Invoices i
JOIN Sales.InvoiceLines il
    ON i.InvoiceID = il.InvoiceID
JOIN warehouse.StockItems ni
    ON il.StockItemID = ni.StockItemID
WHERE ni.StockItemName IN (
    'USB food flash drive - dessert 10 drive variety pack',
    'Ride on big wheel monster truck (Black) 1/12 scale',
    'Ride on toy sedan car (Red) 1/12 scale'
)
AND YEAR(i.InvoiceDate) BETWEEN 2015 AND 2017
GROUP BY
    YEAR(i.InvoiceDate),
    ni.StockItemName
ORDER BY
    Year,
    ni.StockItemName;

```

	Year	StockItemName	AvgPrice	TotalUnitsSold	TotalRevenue
1	2015	Ride on big wheel monster truck (Black) 1/12 scale	345.000000	1779	705818.25
2	2015	Ride on toy sedan car (Red) 1/12 scale	230.000000	1693	447798.50
3	2015	USB food flash drive - dessert 10 drive variety pa...	240.000000	2000	552000.00
4	2016	Ride on big wheel monster truck (Black) 1/12 scale	345.000000	1727	685187.25
5	2016	Ride on toy sedan car (Red) 1/12 scale	230.000000	1890	499905.00
6	2016	USB food flash drive - dessert 10 drive variety pa...	207.391304	1784	420665.40
7	2017	Ride on big wheel monster truck (Black) 1/12 scale	345.000000	2027	804212.25
8	2017	Ride on toy sedan car (Red) 1/12 scale	230.000000	1827	483241.50
9	2017	USB food flash drive - dessert 10 drive variety pa...	240.000000	1979	546204.00

Table 7 - Results - Top Profit-driving Products

These results help tremendously with creating our last dashboard for this section, CHANGES IN PRODUCT PRICES. Using the dashboard and Python we are able to see how the price changes for each product.

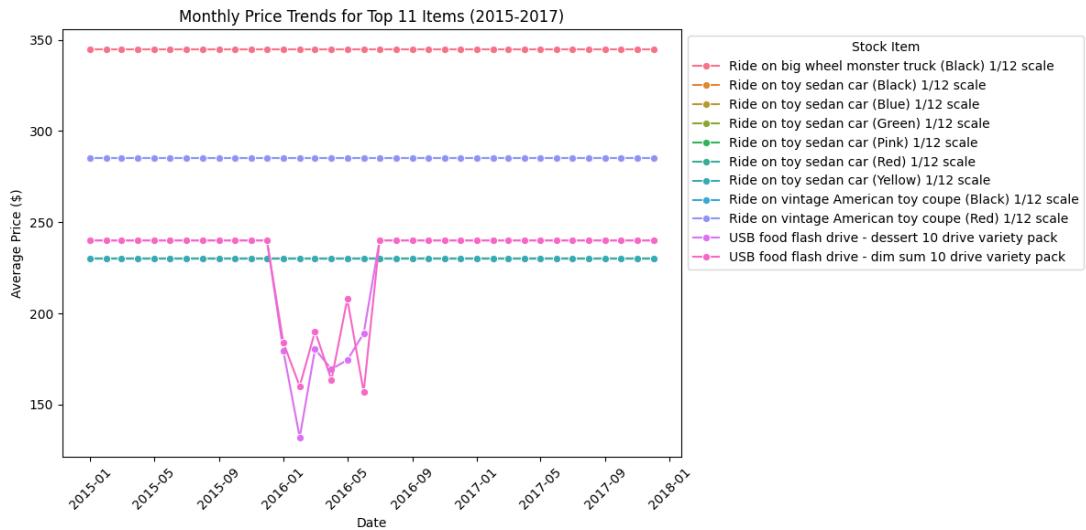


Figure 27 - Monthly Price Trends of Ride-on toys and USB food flash drives

- Most items have no price changes, which means these products likely didn't rely on promotions to boost sales. Only two USB Flash Drive Products Had Major Price Drops, which include:
  - USB food flash drive - dessert 10 drive variety pack
  - USB food flash drive - dim sum 10 drive variety pack

However, this strategy backfired. Profitability was driven more by unit sales than price adjustments.

### 3.5.2.3. The Problem with Discounts – A Failed Strategy

- In 2016, the company attempted a price drop on USB novelty flash drives. Did this work? Let's see with a query and some visuals from our dashboard analysis:

```
WITH PriceTrends AS (
  SELECT
    YEAR(i.InvoiceDate) AS Year,
    MONTH(i.InvoiceDate) AS Month,
    ni.StockItemName,
    AVG(il.UnitPrice) AS AvgPrice,
    SUM(il.Quantity) AS TotalUnitsSold,
    SUM(il.LineProfit) AS TotalProfit
  FROM Sales.Invoices i
  JOIN Sales.InvoiceLines il
    ON i.InvoiceID = il.InvoiceID
  JOIN Warehouse.StockItems ni
    ON il.StockItemID = ni.StockItemID
```

```
WHERE ni.StockItemName IN (
    'USB food flash drive - dessert 10 drive variety pack',
    'USB food flash drive - dim sum 10 drive variety pack'
)
AND YEAR(i.InvoiceDate) BETWEEN 2015 AND 2017
GROUP BY
    YEAR(i.InvoiceDate),
    MONTH(i.InvoiceDate),
    ni.StockItemName
)
SELECT
    Year,
    Month,
    StockItemName,
    AvgPrice,
    TotalUnitsSold,
    TotalProfit
FROM PriceTrends
ORDER BY
    StockItemName,
    Year,
    Month;
```

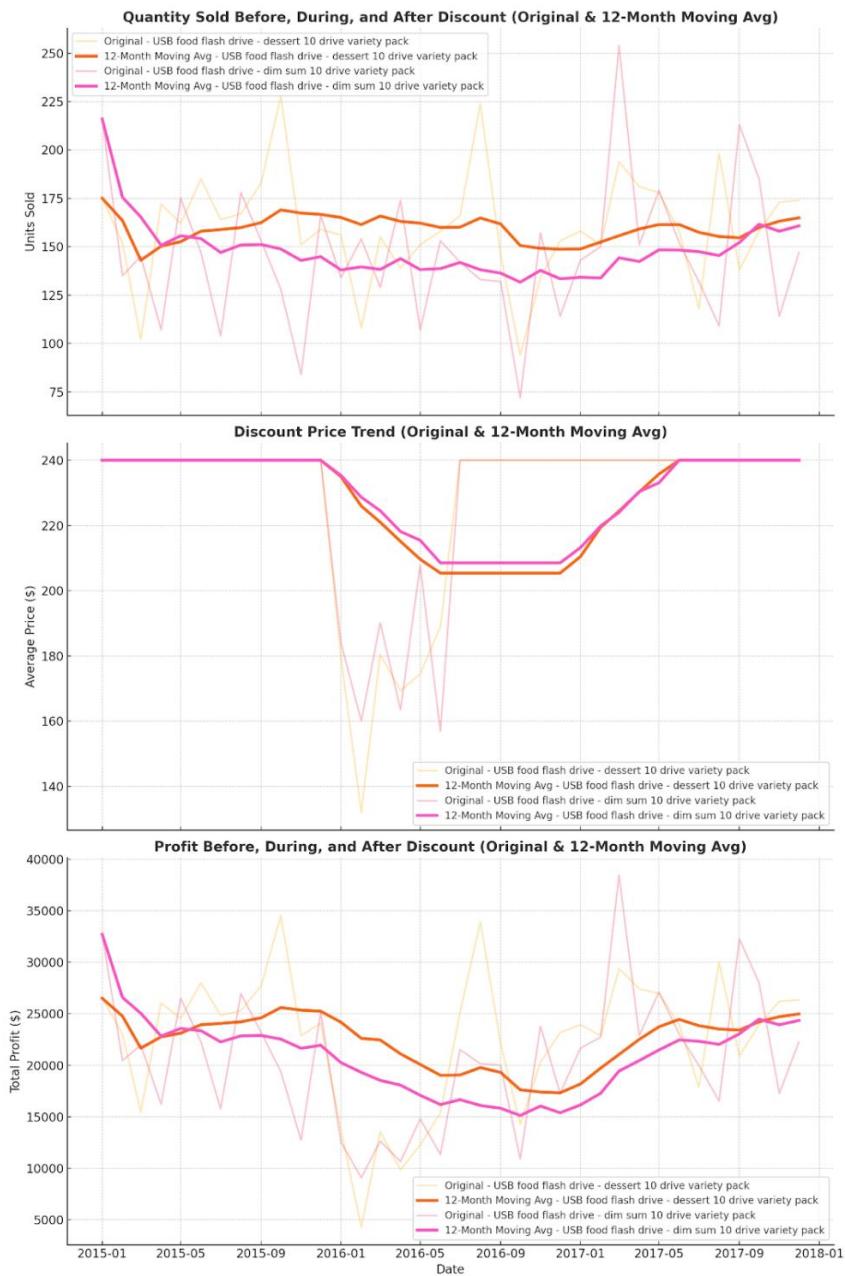


Figure 28 - The influence of Discount on Profit

It seems from the trend that increasing the price doesn't have any positive effect on the quality, thus profit of these two specific product lines inside the novelty category. This can be because of the low elasticity nature of USB sticks.

Furthermore, profits dropped by over 80% during the discount period, which shows that the discounting strategy was not sustainable. The price reduction was too aggressive, cutting into margins without proportionally increasing sales.

- Price vs. Total Units Sold (0.13 - Weak Positive Correlation) suggests that price changes do not significantly affect the number of units sold.
- Price vs. Total Profit (0.68 - Moderate Positive Correlation) suggests that higher prices generally lead to higher profits, meaning reducing prices too much negatively impacts profitability.
- Total Units Sold vs. Total Profit (0.80 - Strong Positive Correlation) indicates that selling more units strongly contributes to higher profits, assuming reasonable pricing.

In terms of attracting new customers, only 6 new customers were acquainted during the discount period (who purchased the discounted USB as their first product or for the first time).

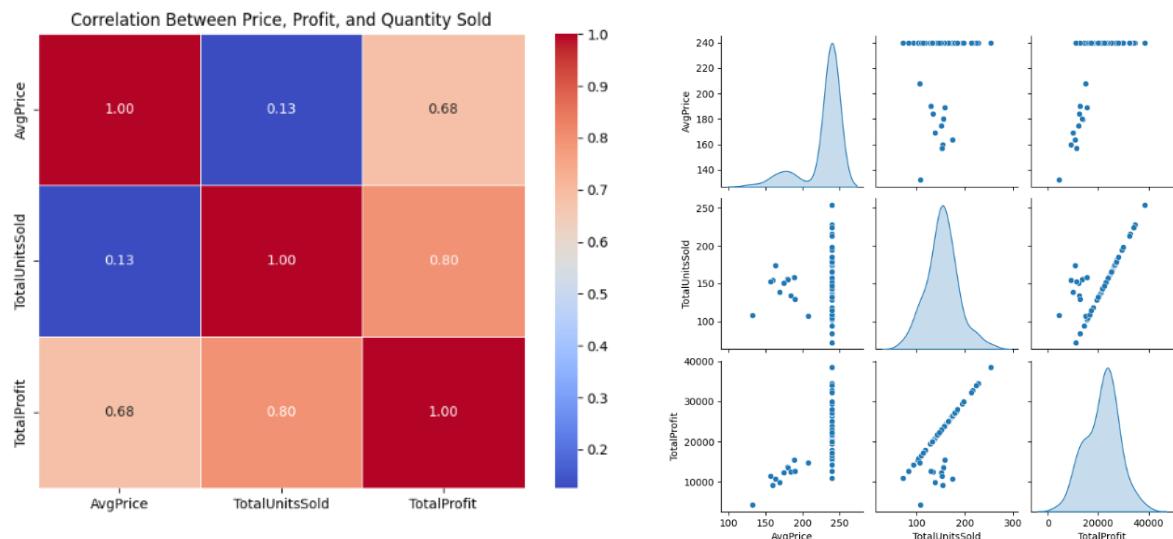


Figure 29 - Correlation Between Price, Profit, and Quantity Sold

	Year	Month	NewCustomers	BoughtOnlyDiscountedProducts	BoughtOtherProducts
1	2016	1	2	1	1
2	2016	2	1	0	1
3	2016	3	1	1	0
4	2016	5	2	0	2

Table 9 - Results - Does discounted products attract new customers?

These results are thanks to this query:

```

WITH PriceDropPeriods AS (
  SELECT
    YEAR(i.InvoiceDate) AS DiscountYear,
    MONTH(i.InvoiceDate) AS DiscountMonth
  FROM Sales.Invoices i
  JOIN Sales.InvoiceLines il
)
```

```

        ON i.InvoiceID = il.InvoiceID
    JOIN Warehouse.StockItems si
        ON il.StockItemID = si.StockItemID
    WHERE si.StockItemName IN (
        'USB food flash drive - dessert 10 drive variety pack',
        'USB food flash drive - dim sum 10 drive variety pack'
    )
    GROUP BY
        YEAR(i.InvoiceDate),
        MONTH(i.InvoiceDate),
        si.StockItemID
    HAVING MIN(il.UnitPrice) < (
        SELECT AVG(il2.UnitPrice)
        FROM Sales.InvoiceLines il2
        WHERE il2.StockItemID = si.StockItemID
    ) * 0.9
),
FirstPurchase AS (
    SELECT
        c.CustomerID,
        MIN(i.InvoiceDate) AS FirstPurchaseDate
    FROM Sales.Customers c
    JOIN Sales.Invoices i
        ON c.CustomerID = i.CustomerID
    GROUP BY c.CustomerID
),
NewCustomers AS (
    SELECT
        YEAR(fp.FirstPurchaseDate) AS NewCustomerYear,
        MONTH(fp.FirstPurchaseDate) AS NewCustomerMonth,
        COUNT(DISTINCT fp.CustomerID) AS NewCustomerCount
    FROM FirstPurchase fp
    GROUP BY
        YEAR(fp.FirstPurchaseDate),
        MONTH(fp.FirstPurchaseDate)
),
AvgNewCustomers AS (
    SELECT
        AVG(NewCustomerCount) AS AvgNewCustomerPerMonth
    FROM NewCustomers
    WHERE NOT EXISTS (
        SELECT 1
        FROM PriceDropPeriods pd
        WHERE pd.DiscountYear = NewCustomers.NewCustomerYear
        AND pd.DiscountMonth = NewCustomers.NewCustomerMonth
    )
),
NewCustomerPurchases AS (
    SELECT
        YEAR(i.InvoiceDate) AS PurchaseYear,
        MONTH(i.InvoiceDate) AS PurchaseMonth,
        fp.CustomerID,
        COUNT(DISTINCT si.StockItemID) AS DistinctProductsBought,
        CASE
            WHEN COUNT(DISTINCT si.StockItemID) = 2 THEN 'Only Discounted Products'
            ELSE 'Other Products Included'
        END AS PurchaseCategory
    FROM FirstPurchase fp
    JOIN Sales.Invoices i

```

```

        ON fp.CustomerID = i.CustomerID
    JOIN Sales.InvoiceLines il
        ON i.InvoiceID = il.InvoiceID
    JOIN Warehouse.StockItems si
        ON il.StockItemID = si.StockItemID
    WHERE i.InvoiceDate = fp.FirstPurchaseDate
    GROUP BY
        YEAR(i.InvoiceDate),
        MONTH(i.InvoiceDate),
        fp.CustomerID
)
SELECT
    nc.NewCustomerYear AS Year,
    nc.NewCustomerMonth AS Month,
    COUNT(DISTINCT ncp.CustomerID) AS NewCustomers,
    SUM(CASE
        WHEN ncp.PurchaseCategory = 'Only Discounted Products'
        THEN 1 ELSE 0
    END) AS BoughtOnlyDiscountedProducts,
    SUM(CASE
        WHEN ncp.PurchaseCategory = 'Other Products Included'
        THEN 1 ELSE 0
    END) AS BoughtOtherProducts
FROM NewCustomers nc
JOIN NewCustomerPurchases ncp
    ON nc.NewCustomerYear = ncp.PurchaseYear
    AND nc.NewCustomerMonth = ncp.PurchaseMonth
WHERE EXISTS (
    SELECT 1
    FROM PriceDropPeriods pd
    WHERE pd.DiscountYear = nc.NewCustomerYear
    AND pd.DiscountMonth = nc.NewCustomerMonth
)
GROUP BY
    nc.NewCustomerYear,
    nc.NewCustomerMonth
ORDER BY
    nc.NewCustomerYear,
    nc.NewCustomerMonth;

```

Therefore, this is a rather modest increase compared to the revenue lost.

The data confirms that discounts were ineffective in boosting sales and attaining new customers but significantly reduced profit. A pricing strategy focused on maintaining value rather than lowering prices will be more sustainable.

### 3.5.3. Halloween Zombie Masks – The Consequences of Overstocking

Not all products that sell well contribute positively to profitability, and the Halloween zombie masks stand out as a notable case of persistent losses.

### 3.5.3.1. Extracting Profitability Trends for Halloween Zombie Masks

First, we check if the loss occurs consistently amongst the year, or is it just a special trend for the 2015-2017 period.

Looking at our dashboard and data from CHANGES IN PRODUCT PRICES, we are able to understand how the masks keep on losing money:

```
WITH Masks AS (
    SELECT
        si.StockItemID,
        si.StockItemName
    FROM Warehouse.StockItems si
    WHERE si.StockItemName LIKE 'Halloween zombie mask (Light Brown)%'
)
SELECT
    ni.StockItemName,
    YEAR(i.InvoiceDate) AS Year,
    SUM(il.LineProfit) AS Profit
FROM Sales.InvoiceLines il
JOIN Sales.Invoices i
    ON il.InvoiceID = i.InvoiceID
JOIN Masks ni
    ON il.StockItemID = ni.StockItemID
GROUP BY
    ni.StockItemName,
    YEAR(i.InvoiceDate)
ORDER BY
    ni.StockItemName,
    Year;
```

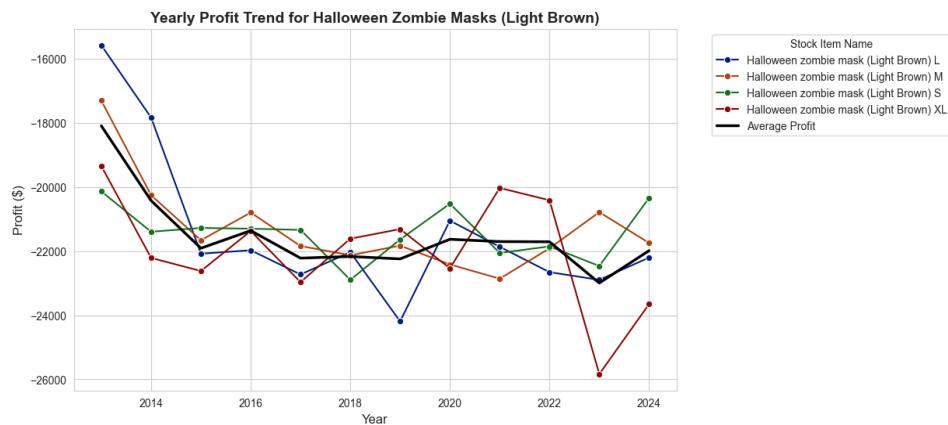


Figure 30 - Yearly Profit Trend for Halloween Zombie Masks (Light Brown)

Moreover, a quick query showed that these masks were consistently sold at a loss:

```
SELECT DISTINCT
    si.StockItemName,
    AVG(il.LineProfit) AS AvgLineProfit,
    (AVG(il.LineProfit) / AVG(il.ExtendedPrice)) * 100 AS "profit margin (%)"
```

```

FROM Sales.Invoices i
JOIN Sales.InvoiceLines il
  ON i.InvoiceID = il.InvoiceID
JOIN Warehouse.StockItems si
  ON il.StockItemID = si.StockItemID
GROUP BY si.StockItemName
HAVING
  SUM(il.LineProfit) < 0
  OR ((SUM(il.LineProfit) / SUM(il.ExtendedPrice)) * 100) < 0;

```

	StockItemName	AvgLineProfit	profit margin (%)
1	Halloween zombie mask (Light Brown) XL	-66.508070	-4.830900
2	Halloween zombie mask (Light Brown) M	-65.862525	-4.830900
3	Halloween zombie mask (Light Brown) S	-65.500125	-4.830900
4	Halloween zombie mask (Light Brown) L	-65.718181	-4.830900

Table 10 - Results - Profit margin of the Halloween masks

This confirms that this was not a temporary issue but an ongoing problem. A deeper analysis of profit margins reveals that the masks were often priced below cost, meaning that every sale actively hurt the company's bottom line.

### 3.5.3.2. Investigating Overstocking & Inventory Turnover

Deeper analysis showed that the Light Brown Halloween zombie mask was massively overstocked, while having relatively low demand:

```

WITH InventoryData AS (
  SELECT
    si.StockItemName,
    i.StockItemID,
    i.QuantityOnHand,
    i.LastCostPrice
  FROM Warehouse.StockItems si
  JOIN Warehouse.StockItemHoldings i
    ON si.StockItemID = i.StockItemID
  WHERE si.StockItemName LIKE 'Halloween zombie mask (Light Brown)%'
),
SalesData AS (
  SELECT
    si.StockItemName,
    s.StockItemID,
    SUM(s.Quantity) AS TotalSold,
    SUM(s.UnitPrice * s.Quantity) AS TotalRevenue
  FROM Sales.InvoiceLines s
  JOIN Sales.Invoices inv
    ON s.InvoiceID = inv.InvoiceID
  JOIN Warehouse.StockItems si
    ON s.StockItemID = si.StockItemID
  WHERE si.StockItemName LIKE 'Halloween zombie mask (Light Brown)%'
  GROUP BY si.StockItemName, s.StockItemID
)
SELECT
  i.StockItemName,

```

```

i.QuantityOnHand AS CurrentStock,
i.LastCostPrice,
s.TotalSold,
(s.TotalSold / NULLIF(i.QuantityOnHand, 0)) AS TurnoverRate,
(i.QuantityOnHand - s.TotalSold) AS OverstockAmount
FROM InventoryData i
LEFT JOIN SalesData s
    ON i.StockItemID = s.StockItemID
ORDER BY OverstockAmount DESC;

```

	StockItemName	CurrentStock	LastCostPrice	TotalSold	TurnoverRate	OverstockAmount
1	Halloween zombie mask (Light Brown) M	1349215	19.00	258708	0	1090507
2	Halloween zombie mask (Light Brown) L	1345754	19.00	260244	0	1085510
3	Halloween zombie mask (Light Brown) S	1168132	19.00	260232	0	907900
4	Halloween zombie mask (Light Brown) XL	892811	19.00	267828	0	624983

Table 11 - Results - Prices changes of the Halloween zombie masks

This is very noteworthy, since there's little to no reason for us to sell this at a price lower than cost from the very beginning. This could indicate that the low-demand and over-stocking was anticipated, and hence, the lower cost. There were quite a few hypotheses as to why this happens, but one of the most notable ones that we came up with was because they are imported in bulk with other Halloween masks, which have higher demand. But this seems to be false and returns no result.

```

WITH BrownMaskOrders AS (
    SELECT
        pli.PurchaseOrderID
    FROM Purchasing.PurchaseOrderLines pli
    JOIN Warehouse.StockItems si
        ON pli.StockItemID = si.StockItemID
    WHERE si.StockItemName LIKE 'Halloween zombie mask (Light Brown)%'
)
SELECT
    pli.PurchaseOrderID,
    si.StockItemName AS OtherMasksImported,
    pli.OrderedOuters AS QuantityOrdered,
    po.OrderDate
FROM Purchasing.PurchaseOrderLines pli
JOIN Warehouse.StockItems si
    ON pli.StockItemID = si.StockItemID
JOIN Purchasing.PurchaseOrders po
    ON pli.PurchaseOrderID = po.PurchaseOrderID
WHERE pli.PurchaseOrderID IN (SELECT PurchaseOrderID FROM BrownMaskOrders)
AND si.StockItemName LIKE '%mask%'
AND si.StockItemName NOT LIKE 'Halloween zombie mask (Light Brown)%'
ORDER BY po.OrderDate ASC;

```

PurchaseOrderID	OtherMasksImported	QuantityOrdered	OrderDate
-----------------	--------------------	-----------------	-----------

Then we checked the import date of this mask. The more obvious answer was that this mask was imported by a large amount at the beginning - 2013, and has been

overstocked since, thus needing to be sold. However, there was hardly any correlation between this to the setting of low price from the beginning.

```
SELECT
    pli.PurchaseOrderID,
    po.OrderDate,
    si.StockItemName,
    pli.OrderedOuters AS OutersOrdered,
    pli.Description AS ItemDescription
FROM Purchasing.PurchaseOrderLines pli
JOIN Purchasing.PurchaseOrders po
    ON pli.PurchaseOrderID = po.PurchaseOrderID
JOIN Warehouse.StockItems si
    ON pli.StockItemID = si.StockItemID
WHERE si.StockItemName LIKE 'Halloween zombie mask (Light Brown)%'
ORDER BY po.OrderDate ASC;
```

	PurchaseOrderID	OrderDate	StockItemName	OutersOrdered	ItemDescription
1	12	2013-01-03	Halloween zombie mask (Light Brown) M	18	Halloween zombie mask (Light Brown) M
2	17	2013-01-04	Halloween zombie mask (Light Brown) S	16	Halloween zombie mask (Light Brown) S
3	17	2013-01-04	Halloween zombie mask (Light Brown) XL	13	Halloween zombie mask (Light Brown) XL
4	21	2013-01-05	Halloween zombie mask (Light Brown) L	18	Halloween zombie mask (Light Brown) L

Table 12 - Results – Excess Procurement of the masks

Regardless, if these masks were overstocked and had to be sold at a loss to clear inventory, it indicates poor demand forecasting or excess procurement. One alternative approach to this would be to only import a small amount first to test demand.

## 4. A Warehouse & Supplier Viewpoint

### 4.1. Objective

The primary objective of this section is to conduct an extensive analysis of WideWorldImporters' warehouse and supply chain data to generate meaningful insights that drive operational efficiency. The analysis aims to evaluate stock levels, supplier performance, and procurement trends to identify potential risks and opportunities within the supply chain. This will help in making informed decisions regarding stock optimization, supplier diversification, warehouse space management, and overall logistics improvements. By starting with a high-level evaluation of warehouse operations and procurement activities, the dataset is examined iteratively, narrowing down to specific stock categories and supplier interactions for a more comprehensive understanding of inventory flow and supply stability.

## 4.2. Warehousing Behaviour Analysis

### 4.2.1. Determine the stock age of every products

Starting with determining the stock age of each of our products sold, we also build our dashboard of RECEIVED AND SOLD VALUE using this query:

```
WITH StockAgeData AS (
    SELECT
        si.StockItemID,
        si.StockItemName,
        MIN(t.TransactionOccurredWhen) AS FirstStockedDate,
        MAX(t.TransactionOccurredWhen) AS LastTransactionDate,
        DATEDIFF(DAY, MIN(t.TransactionOccurredWhen), MAX(t.TransactionOccurredWhen))
    AS StockAgeDays
    FROM Warehouse.StockItemTransactions t
    JOIN Warehouse.StockItems si ON t.StockItemID = si.StockItemID
    WHERE t.TransactionOccurredWhen < '2025-01-01'
    GROUP BY si.StockItemID, si.StockItemName
)
SELECT
    StockItemID,
    StockItemName,
    FirstStockedDate,
    LastTransactionDate,
    StockAgeDays
FROM StockAgeData
ORDER BY StockAgeDays DESC;
```

	StockItemID	StockItemName	FirstStockedDate	LastTransactionDate	StockAgeDays
1	61	RC toy sedan car with remote control (Green) 1/50 ...	2013-01-01 12:00:00.0000000	2024-12-31 12:00:00.0000000	4382
2	63	RC toy sedan car with remote control (Pink) 1/50 sc...	2013-01-01 12:00:00.0000000	2024-12-31 12:00:00.0000000	4382
3	62	RC toy sedan car with remote control (Yellow) 1/50 ...	2013-01-01 12:00:00.0000000	2024-12-31 12:00:00.0000000	4382
4	67	Ride on toy sedan car (Black) 1/12 scale	2013-01-01 12:00:00.0000000	2024-12-31 12:00:00.0000000	4382
5	70	Ride on toy sedan car (Grey) 1/12 scale	2013-01-01 12:00:00.0000000	2024-12-31 12:00:00.0000000	4382
217	215	Air cushion machine (Blue)	2013-01-09 07:00:00.0000000	2024-12-30 12:00:00.0000000	4373
218	3	Office cube periscope (Black)	2013-01-03 07:00:00.0000000	2024-12-24 12:00:00.0000000	4373
219	192	Black and orange fragile despatch tape 48mmx100m	2013-01-07 07:00:00.0000000	2024-12-26 12:00:00.0000000	4371
220	220	Novelty chilli chocolates 250g	2016-01-02 12:00:00.0000000	2024-12-31 12:00:00.0000000	3286
221	221	Novelty chilli chocolates 500g	2016-01-04 07:00:00.0000000	2024-12-31 12:00:00.0000000	3284
222	223	Chocolate echidnas 250g	2016-01-04 07:00:00.0000000	2024-12-31 12:00:00.0000000	3284
223	222	Chocolate beetles 250g	2016-01-04 07:00:00.0000000	2024-12-30 12:00:00.0000000	3283
224	225	Chocolate sharks 250g	2016-01-06 07:00:00.0000000	2024-12-31 12:00:00.0000000	3282
225	227	White chocolate moon rocks 250g	2016-01-07 07:00:00.0000000	2024-12-31 12:00:00.0000000	3281
226	226	White chocolate snow balls 250g	2016-01-07 07:00:00.0000000	2024-12-31 12:00:00.0000000	3281
227	224	Chocolate frogs 250g	2016-01-06 07:00:00.0000000	2024-12-26 12:00:00.0000000	3277

Table 13 - Results - Stock Age

We can see that no product has been cleared from inventory since its initial inventory date since 2013, with all products remaining available as of the latest sales records. While this shows consistency in having products available, it also raises the issue of whether products are relevant and if they could be outdated.

#### 4.2.2. Analysis of Goods Received from Suppliers

Moving on to how we get our products from suppliers, we start to see some discrepancies:

```
SELECT
    YEAR(po.OrderDate) AS OrderYear,
    po.SupplierID,
    s.SupplierName,
    SUM(po.OrderedOuters) AS TotalQuantityReceived
FROM Purchasing.PurchaseOrderLines pol
JOIN Purchasing.PurchaseOrders po ON pol.PurchaseOrderID = po.PurchaseOrderID
JOIN Purchasing.Suppliers s ON po.SupplierID = s.SupplierID
WHERE po.IsOrderFinalized = 1
GROUP BY YEAR(po.OrderDate), po.SupplierID, s.SupplierName
ORDER BY OrderYear DESC, TotalQuantityReceived DESC;
```

	SupplierID	SupplierName	TotalOrders	TotalOrderValue
1	12	The Phone Company	5	50820.00
2	10	Northwind Electric Cars	10	78816.50
3	7	Litware, Inc.	3604	5135795433.40
4	5	Graphic Design Institute	13	6489.00
5	4	Fabrikam, Inc.	3723	9862231860.00
6	2	Contoso, Ltd.	1	313.50
7	1	A Datum Corporation	5	25023.00

Table 14 – Results - Total Received by Suppliers

Using the data and our dashboard RECEIVED AND SOLD VALUE we are able to draw this:

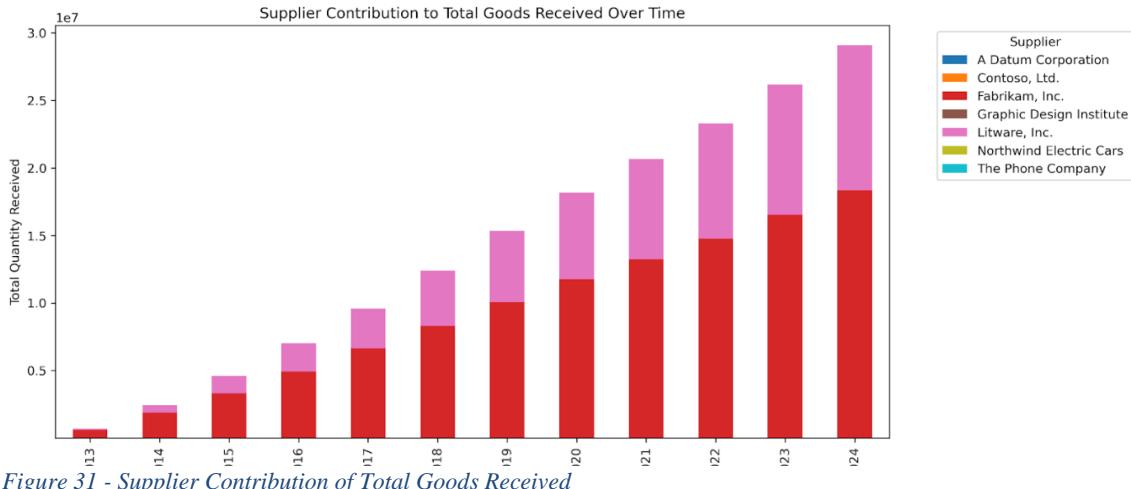


Figure 31 - Supplier Contribution of Total Goods Received

The firm has disclosed extensive dependency on the two large suppliers, Fabrikam, Inc. (Supplier ID 4) and Litware, Inc. (Supplier ID 7). The two firms have provided most of the products acquired from the last several years and hence are major players in the supply chain. The two suppliers remain in operation as of 2024 but, in case of a failure in either, there will be serious risk in inventory holding. Such high reliance on a few suppliers means that if one of them is experiencing production or supply chain issues, it can have a severe impact on the company's ability to meet orders.

The data and chart also depict an overall increase in the quantity of goods received year-over-year. This indicates increasing demand, increased business, or improved supply chain effectiveness. One can also observe a perceptible increase in the quantity of supplies from 2016 onwards, which can be a sign of fresh contracts, a greater variety of products, or greater presence in the market.

#### 4.2.3. Trends between Quantity Received from suppliers and Quantity Sold by Category

Delving even deeper into the distance between quantity ordered and sold that we observed earlier, we created this query:

```
WITH SoldQuantity AS (
    SELECT
        YEAR(o.OrderDate) AS OrderYear,
        sg.StockGroupName,
        SUM(ol.Quantity) AS TotalQuantitySold
    FROM Sales.OrderLines ol
    JOIN Sales.Orders o ON ol.OrderID = o.OrderID
    JOIN Warehouse.StockItems si ON ol.StockItemID = si.StockItemID
    JOIN Warehouse.StockItemStockGroups sisg ON si.StockItemID = sisg.StockItemID
    JOIN Warehouse.StockGroups sg ON sisg.StockGroupID = sg.StockGroupID
    WHERE YEAR(o.OrderDate) < 2025
    GROUP BY YEAR(o.OrderDate), sg.StockGroupName
),
ReceivedQuantity AS (
    SELECT
        YEAR(po.OrderDate) AS OrderYear,
        sg.StockGroupName,
        SUM(po.OrderedOuters) AS TotalQuantityReceived
    FROM Purchasing.PurchaseOrders po
    JOIN Purchasing.PurchaseOrderLines pol ON po.PurchaseOrderID = pol.PurchaseOrderID
    JOIN Warehouse.StockItems si ON pol.StockItemID = si.StockItemID
    JOIN Warehouse.StockItemStockGroups sisg ON si.StockItemID = sisg.StockItemID
    JOIN Warehouse.StockGroups sg ON sisg.StockGroupID = sg.StockGroupID
    WHERE YEAR(po.OrderDate) < 2025
    GROUP BY YEAR(po.OrderDate), sg.StockGroupName
)
SELECT
    sq.OrderYear,
    sq.StockGroupName,
    COALESCE(sq.TotalQuantitySold, 0) AS TotalQuantitySold,
    COALESCE(rq.TotalQuantityReceived, 0) AS TotalQuantityReceived
FROM SoldQuantity sq
LEFT JOIN ReceivedQuantity rq
    ON sq.OrderYear = rq.OrderYear AND sq.StockGroupName = rq.StockGroupName
ORDER BY sq.OrderYear, sq.StockGroupName;
```

	OrderYear	StockGroupName	TotalQuantitySold	TotalQuantityReceived
1	2013	Clothing	767341	593797
2	2013	Computing Novelties	588555	595978
3	2013	Furry Footwear	107839	587
4	2013	Mugs	65713	1442
5	2013	Novelty Items	276609	4417
104	2024	Novelty Items	664356	0
105	2024	Packaging Materials	1846585	10764869
106	2024	Toys	39137	0
107	2024	T-Shirts	575868	18338275
108	2024	USB Novelties	25226	0

Table 15 – Results - Trends between Quantity Received from suppliers and Quantity Sold by category

The data and visualization from our RECEIVED AND SOLD VALUE dashboard simply showcases a gigantic difference between the quantity imported and the quantity sold. Despite the increase in imports over the years, only four product categories, i.e., T-Shirts, Packaging Materials, Computing Novelties, and Clothing are responsible for such increases, and other categories have witnessed no new imports since 2013. This indicates that the company has been exhausting existing stocks for the majority of its inventory, which presents a wealth of operational and financial issues.

The uneven supply-demand gap in the data indicates that purchase decisions might not be guided by genuine market demand. As some categories have registered high imports, others are under-serviced despite the continuation of sales. Unless and until these four top-import categories sell, the business is faced with massive overstocking, and demand in the under-serviced categories may remain under-penetrated, giving way to forgone sales opportunities.

#### 4.2.4. Alignment and Discrepancies in Monthly Peaks and Declines

Next, we'll look into the pattern of imported clothing in months for each year to see if there is any relation to that of the sales trend:

```
WITH SalesData AS (
  SELECT
    YEAR(I.InvoiceDate) AS Year,
    MONTH(I.InvoiceDate) AS Month,
    SUM(IL.Quantity) AS TotalQuantitySold
  FROM Sales.Invoices I
  JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
  JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
  JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
  JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
```

```

        WHERE SG.StockGroupName = 'Clothing'
        AND YEAR(I.InvoiceDate) BETWEEN 2013 AND 2024
        GROUP BY YEAR(I.InvoiceDate), MONTH(I.InvoiceDate)
),
PurchaseData AS (
    SELECT
        YEAR(PO.OrderDate) AS Year,
        MONTH(PO.OrderDate) AS Month,
        SUM(POL.OrderedOuters) AS TotalQuantityReceived
    FROM Purchasing.PurchaseOrders PO
    JOIN Purchasing.PurchaseOrderLines POL ON PO.PurchaseOrderID = POL.PurchaseOrderID
    JOIN Warehouse.StockItems SI ON POL.StockItemID = SI.StockItemID
    JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
    JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
    WHERE SG.StockGroupName = 'Clothing'
    AND YEAR(PO.OrderDate) BETWEEN 2013 AND 2024
    GROUP BY YEAR(PO.OrderDate), MONTH(PO.OrderDate)
)
SELECT
    COALESCE(S.Year, P.Year) AS Year,
    COALESCE(S.Month, P.Month) AS Month,
    COALESCE(TotalQuantitySold, 0) AS TotalQuantitySold,
    COALESCE(TotalQuantityReceived, 0) AS TotalQuantityReceived
FROM SalesData S
FULL OUTER JOIN PurchaseData P
    ON S.Year = P.Year AND S.Month = P.Month
ORDER BY Year, Month;

```

The number of peaks received may not exactly match the peak sales months, and this can be an indication of a misalignment of procurement and actual consumer demand. Although July and March were two of the most successful sales months, the imports preferred to peak earlier, in January and May, so the company is following a preemptive stocking policy. This can be an indication of advance provision for seasonally recurring sales bulges or longer supplier lead times. In addition, February, as a month of recurring sales declines, also reflected moderate receiving levels, pointing to overstock risks during off-demand periods.

#### 4.2.5. Does importing cost affect the importing behavior?

Having imported so much from our suppliers, far out numbering our sales numbers, we have to know if the high import numbers are related to some sorts of price drops:

```

SELECT *
FROM (
    SELECT
        YEAR(PO.OrderDate) AS OrderYear,
        SG.StockGroupName,
        AVG(POL.ExpectedUnitPricePerOuter) AS AvgUnitCost
    FROM Purchasing.PurchaseOrders PO
    JOIN Purchasing.PurchaseOrderLines POL ON PO.PurchaseOrderID = POL.PurchaseOrderID
    JOIN Warehouse.StockItems SI ON POL.StockItemID = SI.StockItemID
    JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID

```

```

JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
WHERE SG.StockGroupName IN ('T-Shirts', 'Clothing', 'Computing Novelties',
'Packaging Materials')
GROUP BY YEAR(PO.OrderDate), SG.StockGroupName
) AS SourceTable
PIVOT (
    MAX(AvgUnitCost)
    FOR OrderYear IN ([2013], [2014], [2015], [2016], [2017], [2018], [2019], [2020],
[2021], [2022], [2023], [2024])
) AS PivotTable
ORDER BY StockGroupName;

```

	StockGroupName	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	Clothing	87.809677	89.026548	88.994096	89.010526	89.000590	88.994690	88.994708	89.011764	89.014662	88.992882	89.024822	88.996503
2	Computing Novelties	86.432613	89.026548	88.994096	89.010526	89.000590	88.994690	88.994708	89.011764	89.014662	88.992882	89.024822	88.996503
3	Packaging Materials	111.494334	91.438828	85.178224	85.702853	77.012875	73.400715	73.064555	73.124454	73.098421	72.622241	72.890134	72.555387
4	T-Shirts	89.033192	89.026548	88.994096	89.010526	89.000590	88.994690	88.994708	89.011764	89.014662	88.992882	89.024822	88.996503

Table 16 - Results - Importing Costs

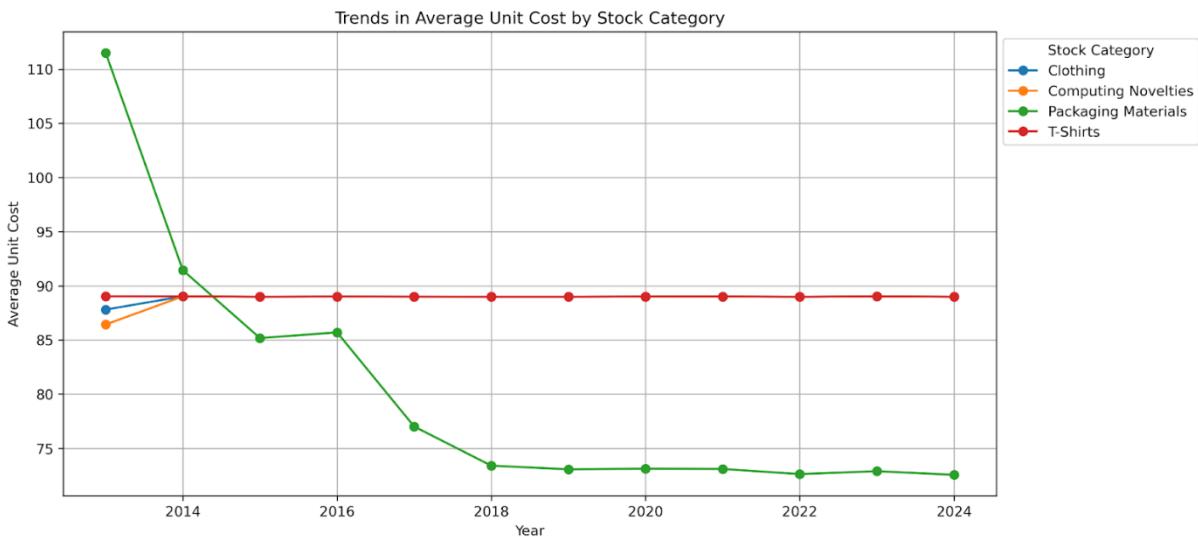


Figure 32 - Trends in Average Unit Cost by Stock Category

One thing we can see is that the unit cost of Packaging Materials has declined overall over the years in a steeply downwards trend from well over 110 to well below 75 over the past few years. But the cost decline would not appear to be connected with the firm's import trend since the amount that is being imported from this category has continuously risen instead of leveling or dropping after a drop in price. On the other hand, the other three categories (Clothing, Computing Novelties, and T-Shirts) have witnessed a relatively stable cost per unit throughout the years.

#### 4.2.6. Are the most profitable products the most imported ones?

Finally, another possible reason for the high imports is high returns. Are the most profitable products the most imported ones? All of which contributes to our dashboard HOW BEING IMPORTED AND BEING SOLD IS DIFFERENT

```

WITH RankedImports AS (
    SELECT
        YEAR(PO.OrderDate) AS OrderYear,
        SI.StockItemID,
        SI.StockItemName,
        SUM(POL.OrderedOuters) AS TotalQuantityOrdered,
        RANK() OVER (PARTITION BY YEAR(PO.OrderDate) ORDER BY SUM(POL.OrderedOuters)
DESC) AS Rank
    FROM Purchasing.PurchaseOrders PO
    JOIN Purchasing.PurchaseOrderLines POL ON PO.PurchaseOrderID = POL.PurchaseOrderID
    JOIN Warehouse.StockItems SI ON POL.StockItemID = SI.StockItemID
    WHERE PO.IsOrderFinalized = 1
    GROUP BY YEAR(PO.OrderDate), SI.StockItemID, SI.StockItemName
)
SELECT
    OrderYear,
    StockItemID,
    StockItemName,
    TotalQuantityOrdered,
    Rank
FROM RankedImports
WHERE Rank <= 5
ORDER BY OrderYear, Rank;

```

	OrderYear	StockItemID	StockItemName	TotalQuantityOrdered	Rank
1	2013	78	"The Gu" red shirt XML tag t-shirt (White) XS	139407	1
2	2013	98	"The Gu" red shirt XML tag t-shirt (Black) 4XL	124697	2
3	2013	86	"The Gu" red shirt XML tag t-shirt (White) 5XL	109756	3
4	2013	77	"The Gu" red shirt XML tag t-shirt (White) XXS	106377	4
5	2013	95	"The Gu" red shirt XML tag t-shirt (Black) XL	59935	5
6	2014	98	"The Gu" red shirt XML tag t-shirt (Black) 4XL	397388	1
7	2014	78	"The Gu" red shirt XML tag t-shirt (White) XS	384685	2
55	2023	204	Tape dispenser (Red)	3212394	5
56	2024	78	"The Gu" red shirt XML tag t-shirt (White) XS	3711574	1
57	2024	86	"The Gu" red shirt XML tag t-shirt (White) 5XL	3666186	2
58	2024	98	"The Gu" red shirt XML tag t-shirt (Black) 4XL	3612347	3
59	2024	77	"The Gu" red shirt XML tag t-shirt (White) XXS	3572590	4
60	2024	204	Tape dispenser (Red)	3516313	5

Table 17 - Results - Imported Goods Ranking

As one watched the front-running in profitability of the ride-on toys and USB food flash drives, the number one imported product continued to be "The Gu Red Shirt". This lack of congruence indicates that buying is not based on market demand or profitability trends. There are a few possible implications stemming from this: overstocking of the red shirts, obsolescence potential, and ineffective capital deployment.

## CHAPTER IV: COMPREHENSIVE VISUALIZATIONS

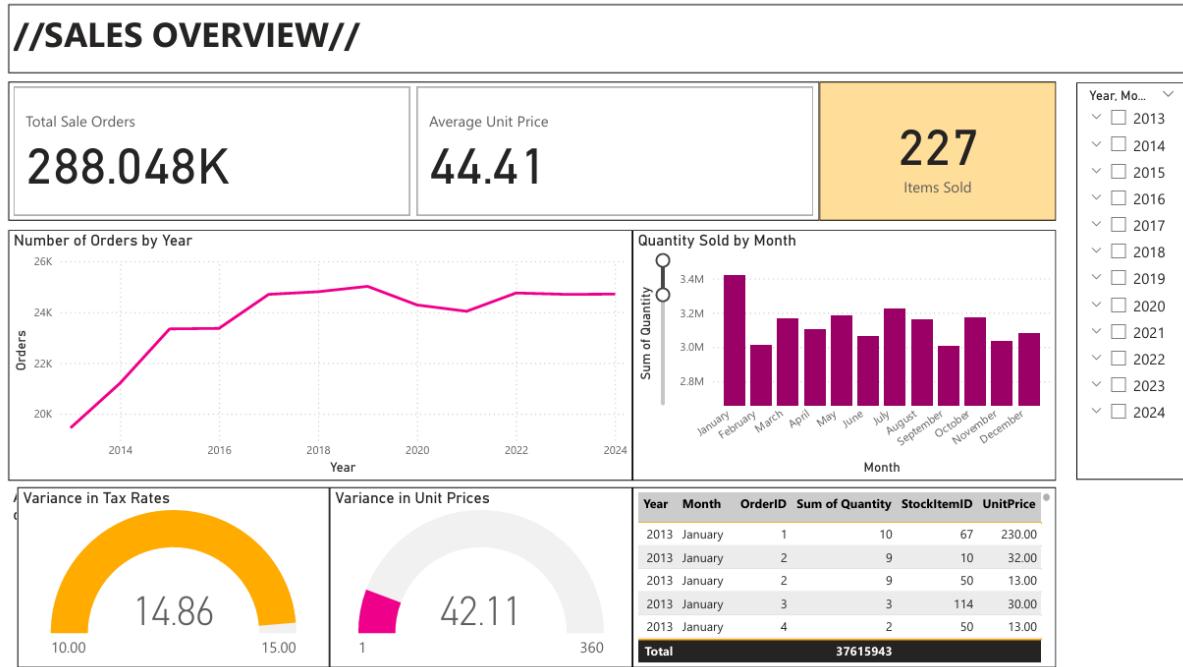


Figure 33 - Visualization - Sales Overview

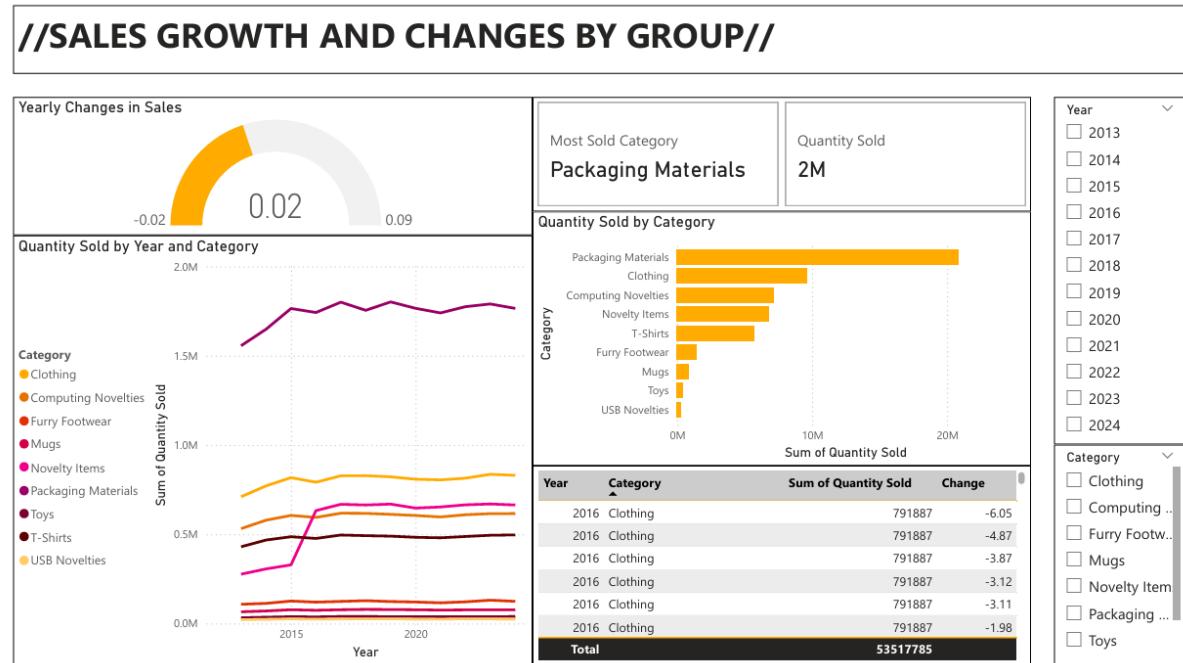


Figure 34 - Visualization - Sales Growth and Changes by Group

## //SALES MARGINS AND MARKUPS//

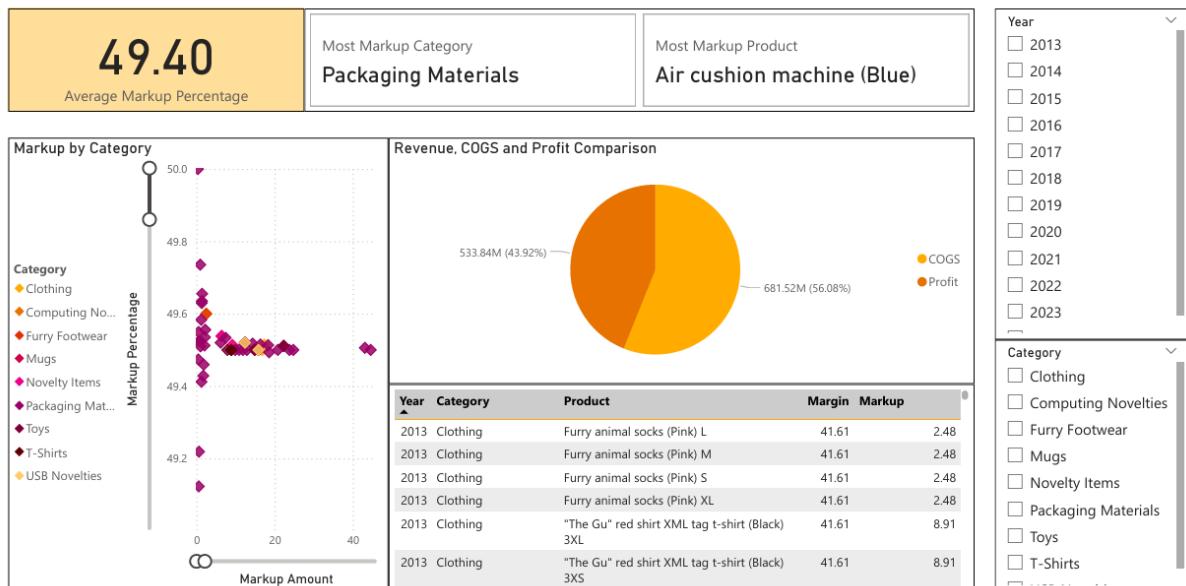


Figure 35 - Visualization - Sales Margins and Markups

## //PRODUCT PROFITABILITY//

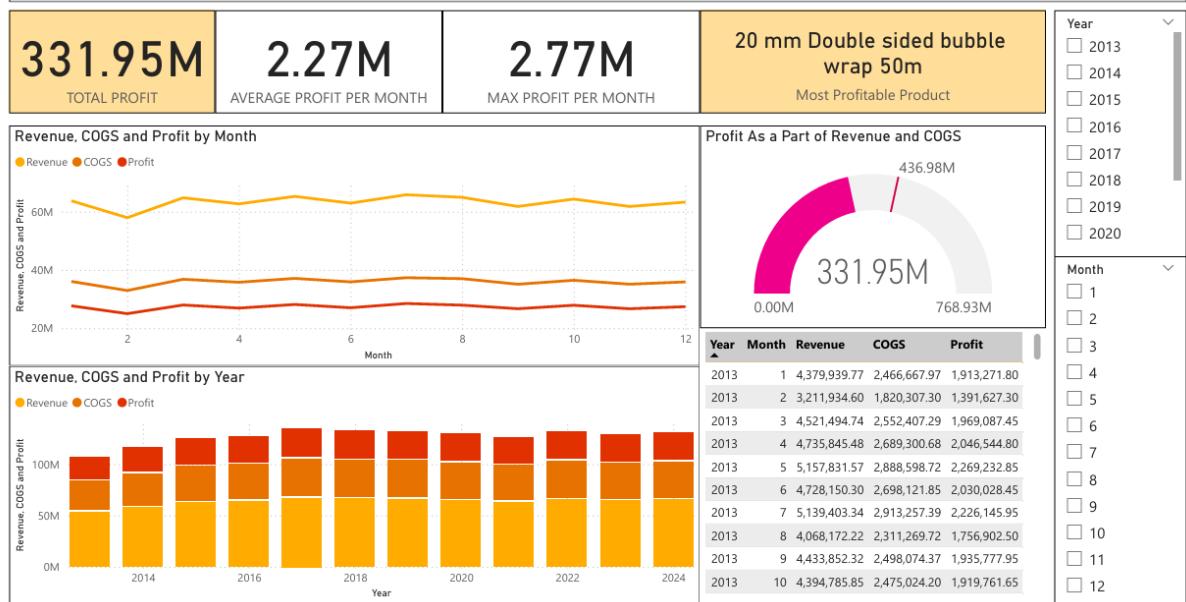


Figure 36 - Visualization - Product Profitability

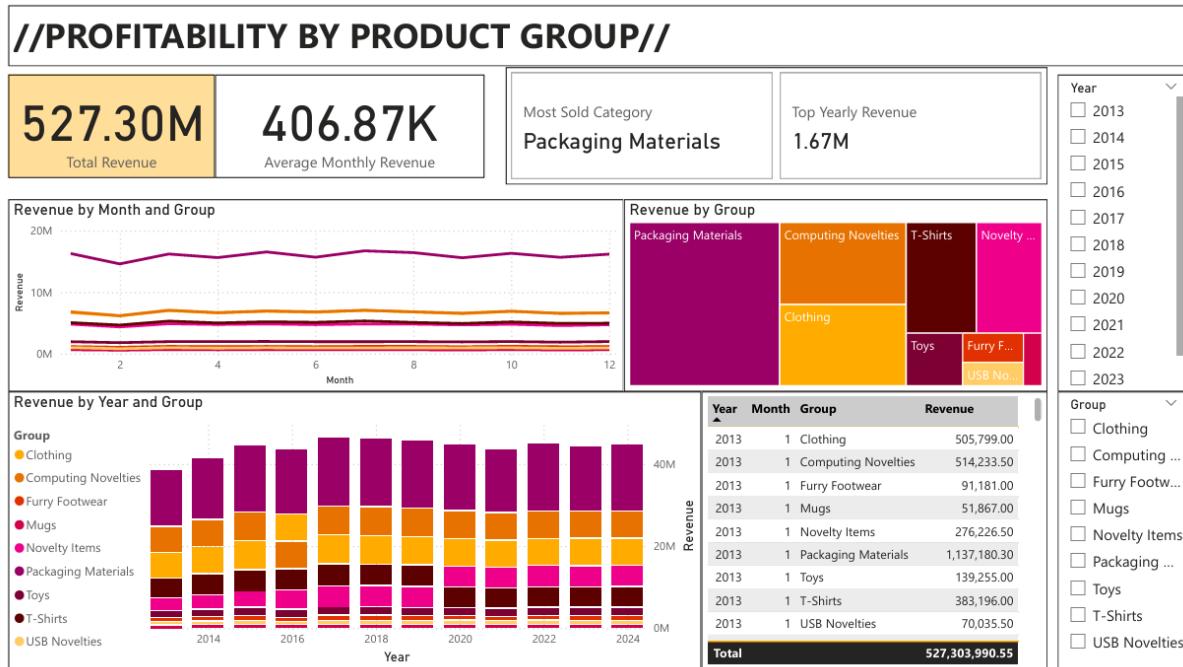


Figure 37 - Visualization - Profitability by Product Group

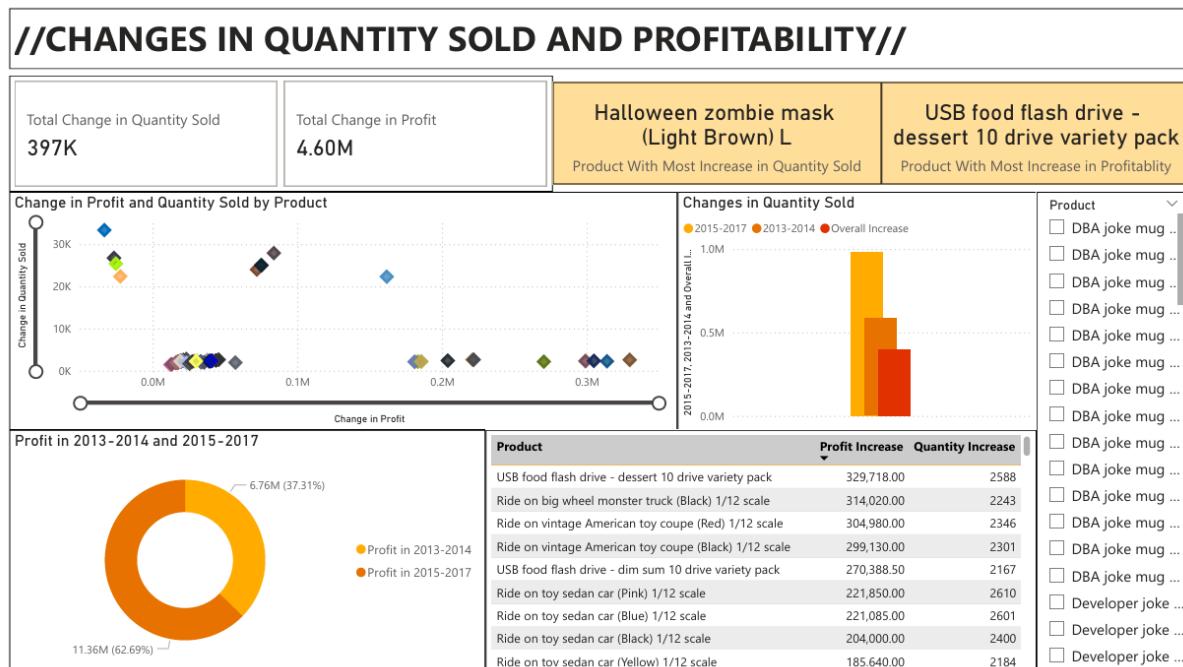


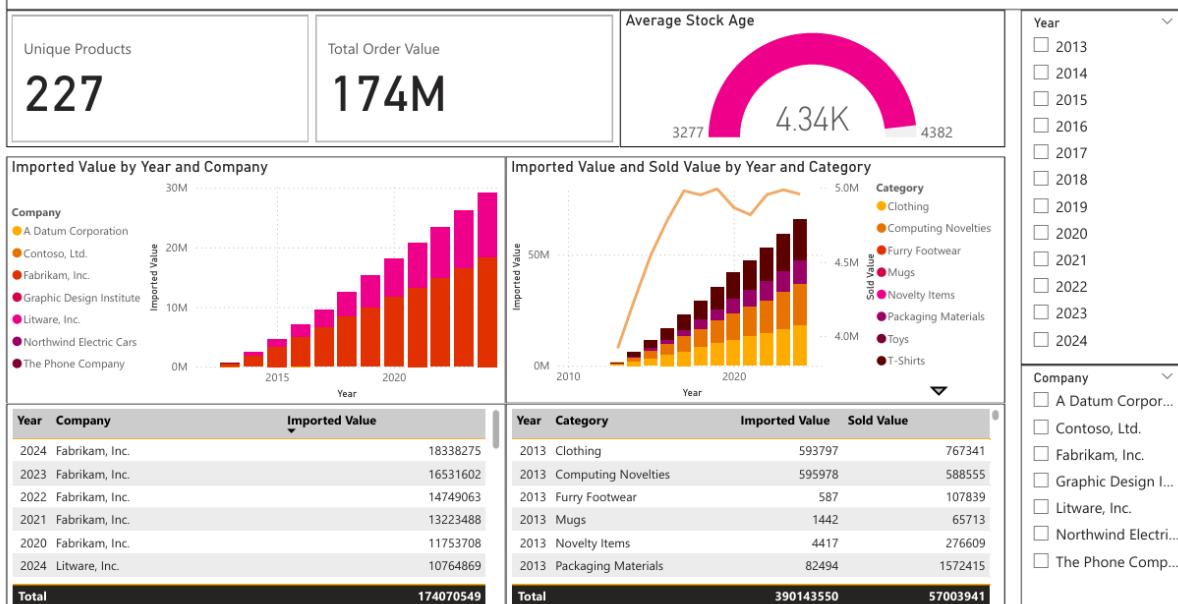
Figure 38 - Visualization - Changes in Quantity Sold and Profitability

## //CHANGES IN PRODUCT PRICES//



Figure 39 - Visualization - Changes in Product Prices

## //RECEIVED AND SOLD VALUE//



## //HOW BEING IMPORTED AND BEING SOLD IS DIFFERENT//

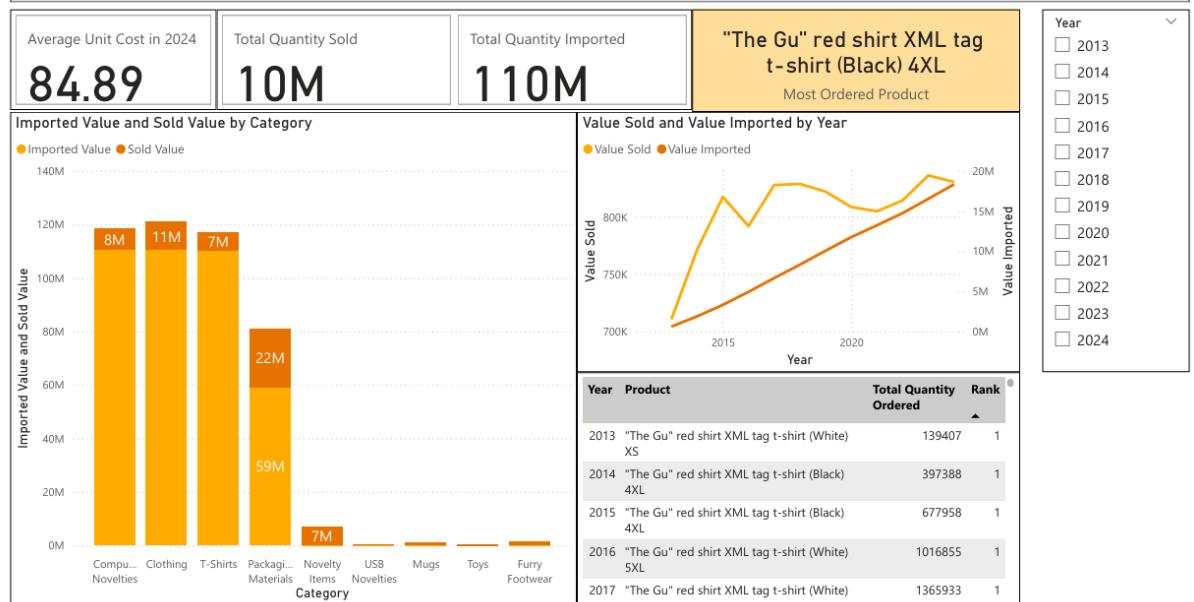


Figure 41 - How being imported and being sold is different

## **CHAPTER V: CONCLUSION & RECOMMENDATIONS**

### **1. Main Issues, Consequences, and Direction**

#### **1.1. Sales Trends and Profitability**

The Packaging Materials is the primary driver of the company's income and the highest performing category. While Novelty Items experienced high growth during the periods 2015-2017 and 2021-2022, the trend has recently decreased as a result of declining consumer interest. The middle-range categories of Clothing and T-Shirts have experienced stable performance, while USB Novelties and Toys have consistently recorded low profitability.

Seasonality is among the reasons for fluctuation in sales. March, July, and October are peak levels that indicate seasonal demand, and February, June, and September are trough levels that represent slow business periods. Packaging Materials is highly influenced by such seasonality fluctuations and needs to plan inventories carefully.

Price strategy analysis reflected discount policy inefficiencies. Though price discounts were offered on certain products, like USB Flash Drives, they failed to achieve long-term customer acquisition, thus decreasing profitability. Likewise, excessive stocking of Halloween Zombie Masks caused ongoing losses owing to erroneous demand forecasting and insufficient consumer demand. These observations signify that certain discount and pricing policies have harmed profit margins, and more data-driven price decision-making is needed.

#### **1.2. Inventory Control and Procurement**

The oldest inventory age among most of the products in the company is one of its most pressing inventory management concerns, with some that are older than 4,000 days. It poses product relevance concerns because aging designs and shifting customer tastes can propel declining demand. Not only do higher storage costs drive inventory surplus, but depreciation and obsolescence risks as well. Goods remaining on shelves for decades may have to be slashed to insignificance, eating into margins and decreasing overall financial effectiveness. Second, inefficiency due to overstocking results in unnecessary use of space. Inventories of unused stock occupy valuable warehouse space that could otherwise be used in the sale of more popular products. This inefficiency would result in congestion, making it increasingly difficult to optimize warehouse operations.

Even though the current suppliers of the company have always maintained business growth, excessive dependence on some of them is a severe threat. In case any of these suppliers experience disruptions—such as production halt, shipping interruptions, or financial challenges—the company may not be able to meet demand. This vulnerability highlights the importance of supplier diversification. Developing relationships with substitute suppliers and designing contingency strategies would reduce supply chain threats and maintain continuity in operations. Apart from that, buying decisions do not necessarily capture true demand, but contracts for supply. Multi-year deals, minimum buys, or bulk rates can compel repeated purchases of suboptimal merchandise. The firm must review these contracts diligently and renegotiate accordingly in order to keep low-margin inventory on hand.

Even with steady levels of sales, the firm has been aggressively importing, especially for four of its largest categories. But the surge does not appear to be based on price cuts or anticipated demand only. The fact that there has been no price variation over several years indicates that bulk buy agreements or supplier power might be a causative factor and not actual customer demand. This mismatching results in a misfit wherein the high-import, low-demand products pile up while demand for other classes remains unsatisfied. If the imported items are poor sellers, the firm faces extreme overstocking, tying up capital in inventory that will not bring substantial revenue.

Carrying heavy amounts of inventory for long periods of time consumes working capital, reducing the company's capacity to reinvest in innovation, marketing, or business growth. This expense prevents the company from reacting to changing market trends, making it vulnerable to competitive forces. Without productive inventory turnover, capital is locked in unsold inventory instead of fueling new growth opportunities. Second, if buying continues to be based on supplier contracts and not on sales success, profitability will be a concern for the company. Prioritizing stock in accordance with high-margin sales and minimizing overbuying of low-moving stock would increase financial health and cash flow efficiency.

The procurement of the company is not exactly in line with sales performance. This has to be corrected by implementing a demand-driven procurement process. This means using predictive analytics and historic sales to align future imports as closely as possible with current customer demand. The supplier relationship must also be reassessed so that purchases are made as per the needs of the market and not as per pre-arrangements.

In the future, the company needs to be more data-oriented in its handling of stock. To start with, stock turnover needs to be optimized. The company needs to dispose of old stocks, package slow-moving items with fast-moving ones, and seek other channels for distribution to avoid overstocking. A move towards a Just-in-Time (JIT) inventory system can more closely match purchases with actual sales patterns, minimize carrying costs, and avoid holding onto unsold products. A complete demand analysis and forecasting model should be adopted to inform procurement decisions supported by real consumer behavior instead of contract obligations to suppliers.

Supplier base diversification is also necessary. The firm has to minimize reliance on a small number of large suppliers and seek alternative sources to maintain stability in the supply chain. Reduction of over-purchasing and overall financial effectiveness would be achieved through renegotiation of contracts on more flexible terms of order. Additionally, restructuring supplier contracts on a performance-based ordering as compared to volume-based contracts would stop unwanted inventory build-up.

Warehouse management is also to be dealt with, utilizing space to the fullest. Enforcing stricter controls on inventories and routine checks on stock levels can avert storage inefficiencies. Liquidation sales, B2B wholesale sales, or re-use of old stock can free capital locked in slow-moving stock. Checking product size dimensions will facilitate better allocation of storage, the result being warehouse space utilization at its maximum.

Finally, supply chain visibility gaps have to be eliminated. Tracking true delivery dates instead of forecasted ones would assist in monitoring the suppliers' performance and avoiding interruptions. Moreover, elimination of inconsistency in backorder information would allow correct demand tracking. With these kinds of solutions implemented, the company can build a leaner, more profitable, and more agile supply chain with unnecessary expenses removed and better long-term sustainability.

## **2. Database Improvement**

### **2.1. Space Utilization Problems**

The database does not yet contain detailed measures of the size for most stock items, with only some (e.g., cartons) packaging materials including width, height, and depth. Since there is a high growth rate in some product groups in stock while others are stagnant with minimal sales, warehouse space management could become increasingly complex. Storage arrangement optimization and capacity utilization maximization would be difficult without proper size data. It is advisable to provide more product dimension data to enhance improved warehouse planning and stock location.

### **2.2. Suspect Backorder Data Integrity**

There is no concern for the business company about unsold stocks as every product appears on the shelf after its initial stocking. Even the solitary product that was not reordered since 551 days ago (StockItemID 184) gets returned since 2014. However, there are two fields in the Sales.Orders table regarding backorders: BackOrderID and IsUndersupplyBackordered. Though BackOrderID does have a few nulls (which point to some orders not being actually backordered), IsUndersupplyBackordered has 1 returned for all orders. This indicates a possible logic flaw in backorder flagging since it is inconsistent with the levels of stock that were seen. Proper validation of backorder calculations needs to be provided in order to ensure proper tracking of supply deficiencies.

### **2.3. Missing Supplier Delivery Data**

The data set does not have actual delivery timestamps from the suppliers, and LeadTime and ExpectedDeliveryDate are the only information available. The lack of actual delivery timestamps complicates supplier delivery performance measurement such as delay, on-time percentage, and reliability trends. As supplier performance affects inventory planning and stock availability, actual delivery timestamps would be important to allow for enhanced procurement strategy and investigation of potential supply chain disruption.

### **2.4. Stocktake Date**

The current database schema is a significant barrier to calculating the inventory turnover ratio over a number of years since the historical stockholding data are absent. Since the Warehouse.StockItemHoldings table only tracks inventory balances as of the most recent stocktake date (25/02/2025), it is impossible to track how inventory levels altered over time. Thus, it is not possible to compute turnover rates for previous years

since the "Average Inventory" part of the formula for previous periods does not exist. This eliminates meaningful analyses of trends in the context of stock efficiency and complicates determining if inventory management attempts have been improving or worsening progressively over the years. In order to do this, the database must capture historical snapshots of stock regularly (e.g., monthly or quarterly stocktakes).

This could be done by including a historical tracking table for inventory that captures quantities of stock at month or quarter-end. Alternatively, if it is feasible to track stock in real-time, including a daily inventory movement log would give more granularity and certainly allow querying by date range. These enhancements would allow for better estimation of turnover rates, which would allow the company to evaluate stock efficiency, streamline reorder policies, and prevent unnecessary holding expenses in the long run.

## **2.5. Data for Predicting Importing Trends**

One most important missing link is customer opinion and product feedback, which would inform consumer attitudes, demand shifts, and obsolescence of some products. It would enable the company to revise its procurement process in advance if they know what products are selling well and which ones are declining in popularity.

Data on market trend analysis and competitor benchmarking must be incorporated as well. By monitoring outside market trends, overall demand within the industry, and stocking practices of competitors, the company can more accurately predict changes in consumer demand and modify imports accordingly. Historical supplier performance data, i.e., actual versus expected delivery time, defect rate, and price volatility, is also an important consideration. This would enhance supplier management and procurement effectiveness, allowing stock levels to meet demand as well as operational dependability.

## **3. Other Factors**

In addition to improved internal information, external inputs like international trade policies also play an important role in the import policy of the company. Being a U.S.-based firm, its procurement policy is heavily influenced by tariff policies, trade policies, and geo-political tensions. For example, during the Trump administration, steep tariff hikes were levied on imports from major manufacturing centers like China. This resulted in higher expenses for most U.S. companies that had foreign suppliers, so companies had to absorb the increased costs, pass them on to customers, or find other ways of sourcing.

If such trade barriers continue or recur, the company ought to be ready for probable supply chain disruption. Diversification of suppliers across different geographic regions may reduce risk from over-reliance on a single country. In addition, keeping track of free trade agreements (FTAs) and preferential trade arrangements may enable the company to identify low-cost substitutes for procurement.

Besides, shipping and logistics expenses are also susceptible to fuel price fluctuations, tariffs, and port traffic, affecting lead times and overall inventory management. The company needs to create a dynamic procurement model that can be flexible to the evolving global trade policy. Supplier negotiations, nearshoring possibilities, and tariff-free sourcing initiatives will be most critical in ensuring profitability and supply chain resilience in the face of a more volatile global economy.

## APPENDIX

During the course of this business analysis report, we leveraged AI, specifically ChatGPT in optimizing SQL queries and proposing alternative lines of research into WideWorldImporters' sales and operations analysis.

### 1. Code Optimization

ChatGPT assisted us in fine-tuning complex SQL queries to optimize performance in execution. The AI-supported approach helped us narrow down our research paths and guaranteed efficient data aggregation with minimal calculations. AI-driven insights also shaped query indexing strategies and join optimizations, resulting in improved running time and accuracy of results.

SQL query optimizations involved query reorganization to minimize redundancy, reducing computational complexity, and enhancing indexing strategy. To do this, we used ChatGPT to eliminate unnecessary joins, improve data filtering, and reduce use of Common Table Expressions (CTEs) to shorten execution time. Furthermore, ChatGPT also proposed alternatives such as computation using window functions instead of subqueries, enhancing query readability and efficiency further.

For instance, in the Yearly Sales Trends query, ChatGPT's improved version directly aggregate in the outer query with less memory usage and faster performance.

Original query:

```
WITH YearlySales AS (
    SELECT YEAR(I.InvoiceDate) AS Year, SUM(IL.Quantity) AS TotalQuantitySold
    FROM Sales.Invoices I
    JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
    WHERE YEAR(I.InvoiceDate) BETWEEN 2013 AND 2024
    GROUP BY YEAR(I.InvoiceDate))
SELECT YS.Year, YS.TotalQuantitySold,
    LAG(YS.TotalQuantitySold) OVER (ORDER BY YS.Year) AS PreviousYearSales,
    CASE WHEN LAG(YS.TotalQuantitySold) OVER (ORDER BY YS.Year) IS NOT NULL
        THEN ((YS.TotalQuantitySold - LAG(YS.TotalQuantitySold) OVER (ORDER BY
YS.Year)) /
            LAG(YS.TotalQuantitySold) OVER (ORDER BY YS.Year)) * 100
        ELSE NULL
    END AS YoYChangePercentage
FROM YearlySales YS
ORDER BY YS.Year;
```

Optimized query:

### Optimized Query:

```
SELECT
    YEAR(I.InvoiceDate) AS Year,
    SUM(IL.Quantity) AS TotalQuantitySold,
    LAG(SUM(IL.Quantity)) OVER (ORDER BY YEAR(I.InvoiceDate)) AS PreviousYearSales,
    CASE WHEN LAG(SUM(IL.Quantity)) OVER (ORDER BY YEAR(I.InvoiceDate)) IS NOT NULL
        THEN ((SUM(IL.Quantity) - LAG(SUM(IL.Quantity)) OVER (ORDER BY YEAR(I.InvoiceDate))) /
            LAG(SUM(IL.Quantity)) OVER (ORDER BY YEAR(I.InvoiceDate)))
        ELSE NULL
    END AS YoYChangePercentage
FROM Sales.InvoiceLines IL
JOIN Sales.Invoices I ON I.InvoiceID = IL.InvoiceID
WHERE I.InvoiceDate BETWEEN '2013-01-01' AND '2024-12-31'
GROUP BY YEAR(I.InvoiceDate)
ORDER BY Year;
```

### Key Optimizations:

- Removed unnecessary CTE to enhance readability and execution speed.
- Aggregated `SUM(IL.Quantity)` directly in the outer query, reducing redundant computations.
- Replaced `BETWEEN YEAR(I.InvoiceDate) AND YEAR(I.InvoiceDate)` with a direct `I.InvoiceDate` range to improve filtering efficiency.

Similarly, in Trends by Product Categories query, ChatGPT's query adjustment reduced the number of operations required, significantly improving performance.

### Original query:

```
SELECT YEAR(I.InvoiceDate) AS Year, SG.StockGroupName AS ProductCategory,
    SUM(IL.Quantity) AS TotalQuantitySold
FROM Sales.Invoices I
JOIN Sales.InvoiceLines IL ON I.InvoiceID = IL.InvoiceID
JOIN Warehouse.StockItems SI ON IL.StockItemID = SI.StockItemID
JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
WHERE YEAR(I.InvoiceDate) BETWEEN 2013 AND 2024
GROUP BY YEAR(I.InvoiceDate), SG.StockGroupName
ORDER BY Year, TotalQuantitySold DESC;
```

### Optimized query:

### Optimized Query:

```
SELECT
    YEAR(I.InvoiceDate) AS Year,
    SG.StockGroupName AS ProductCategory,
    SUM(IL.Quantity) AS TotalQuantitySold
FROM Sales.InvoiceLines IL
JOIN Sales.Invoices I ON I.InvoiceID = IL.InvoiceID
JOIN Warehouse.StockItemStockGroups SISG ON IL.StockItemID = SISG.StockItemID
JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
WHERE I.InvoiceDate BETWEEN '2013-01-01' AND '2024-12-31'
GROUP BY YEAR(I.InvoiceDate), SG.StockGroupName
ORDER BY Year, TotalQuantitySold DESC;
```

### Key Optimizations:

- Removed unnecessary joins with `Warehouse.StockItems`, as `StockItemStockGroups` already links `StockItems` to `StockGroups`.
- Used direct `I.InvoiceDate` filtering instead of `YEAR(I.InvoiceDate) BETWEEN X AND Y` to enhance filtering performance.
- Reduced the number of table joins to improve query execution speed.

AI was used to identify and correct errors in SQL queries. In this case, an issue was detected in the GROUP BY clause, where an aggregated value (TotalProfit) was incorrectly included.

```
point out the mistake in this code i wrote for me: "SELECT
    sg.StockGroupName,
    YEAR(o.OrderDate) AS Year,
    SUM(line.LineProfit) AS TotalProfit
FROM Sales.InvoiceLines line
JOIN Sales.Invoices inv
    ON inv.InvoiceID = line.InvoiceID
JOIN Sales.Orders o
    ON o.OrderID = inv.OrderID
JOIN Warehouse.StockItems s
    ON line.StockItemID = s.StockItemID
JOIN Warehouse.StockItemStockGroups ss
    ON s.StockItemID = ss.StockItemID
JOIN Warehouse.StockGroups sg
    ON ss.StockGroupID = sg.StockGroupID
WHERE o.OrderDate <= '2024-12-31'
GROUP BY
    sg.StockGroupName,
    YEAR(o.OrderDate),
    TotalProfit
ORDER BY
    sg.StockGroupName,
    Year;"
```

There is a mistake in your `GROUP BY` clause. Specifically, you included `TotalProfit`, which is an aggregated value (`SUM(line.LineProfit) AS TotalProfit`). Aggregated values should **not** be in the `GROUP BY` clause; they are derived based on the grouping.

### Mistake:

```
sql
GROUP BY
    sg.StockGroupName,
    YEAR(o.OrderDate),
    TotalProfit -- X Incorrect: Aggregated column should not be here
```

### Correction:

```
sql
GROUP BY
    sg.StockGroupName,
    YEAR(o.OrderDate)
```

AI was utilized to enhance SQL query performance by optimizing execution speed and efficiency. The original query retrieved revenue, cost of goods sold (COGS), and gross profit data but had redundant joins and inefficient filtering.

Optimize this SQL query for better performance while keeping the results accurate:

```
SELECT
    YEAR(o.OrderDate) AS Year,
    SUM(line.ExtendedPrice) AS TotalRevenue,
    SUM(line.ExtendedPrice - line.LineProfit) AS TotalCOGS,
    SUM(line.LineProfit) AS GrossProfit
FROM Sales.InvoiceLines line
JOIN Sales.Invoices inv
    ON inv.InvoiceID = line.InvoiceID
JOIN Sales.Orders o
    ON o.OrderID = inv.OrderID
WHERE o.OrderDate < '2025'
GROUP BY YEAR(o.OrderDate)
ORDER BY Year;
```

## 2. Research and Analytical Support

In addition to query optimization, ChatGPT was used as an intelligent brainstorming assistant. Firstly, it helped provide additional suggestions for researching sales patterns, seasonality, and category-level trends. More than that, we could learn to do correlation analysis via AI, which led to more insightful conclusions, particularly when analyzing drivers of demand volatility, price strategy, and stock planning.

Examples of prompts used:

Suggest ways to analyze sales patterns over time. How can I identify seasonality trends, and what SQL queries should I use to detect recurring peaks and dips in sales?

### Analyzing Sales Patterns Over Time

To track sales trends and identify seasonality, use **Year-over-Year (YoY)** and **Month-over-Month (MoM)** comparisons, detect **seasonal peaks**, and flag **outliers**. Key methods include:

1. **YoY and MoM Growth:** Compare sales over time to identify growth trends and anomalies.
2. **Seasonality Detection:** Aggregate monthly sales over multiple years to find peak and low-demand periods.
3. **Outlier Detection:** Identify months with unusually high or low sales using standard deviations.

### Optimized SQL Queries

#### 1. Yearly Sales Trend (YoY Growth)

```
sql
SELECT YEAR(I.InvoiceDate) AS Year,
       SUM(IL.Quantity) AS TotalQuantitySold,
       LAG(SUM(IL.Quantity)) OVER (ORDER BY YEAR(I.InvoiceDate)) AS PreviousYearSales,
       (SUM(IL.Quantity) - LAG(SUM(IL.Quantity)) OVER (ORDER BY YEAR(I.InvoiceDate))) * 100.0
       NULLIF(LAG(SUM(IL.Quantity)) OVER (ORDER BY YEAR(I.InvoiceDate)), 0) AS YoYChangePercent
FROM Sales.InvoiceLines IL
JOIN Sales.Invoices I ON I.InvoiceID = IL.InvoiceID
GROUP BY YEAR(I.InvoiceDate)
ORDER BY Year;
```

Furthermore, we used AI to give recommendations on researching correlations and relationships between different factors affecting sales. Using its support, we were able to explore drivers of profitability, product performance, and customer demand. For example, ChatGPT recommended performing correlation tests between the total quantity sold and markup percentage to determine the impact of price strategies on volume of sales. It also recommended exploring seasonal trends by analyzing month-over-month fluctuations and correlating sales highs with specific promotional events or external market conditions.

Examples of prompts used:

I want to analyze the relationship between markup percentage and total quantity sold. Provide SQL queries to extract the necessary data

### Analyzing the Relationship Between Markup Percentage and Quantity Sold

To examine how markup affects sales volume, we calculate:

1. **Markup Percentage:**  $(RetailPrice - UnitCost)/UnitCost$
2. **Total Quantity Sold:** Sum of all sales per stock item.
3. **Correlation Analysis:** Determine if higher markups impact sales negatively.

---

### SQL Queries

1. Extract Markup Percentage and Quantity Sold

```
sql
WITH StockMarkup AS (
    SELECT SI.StockItemID, SI.StockItemName, SG.StockGroupName,
           SI.UnitPrice, SI.RecommendedRetailPrice,
           ((SI.RecommendedRetailPrice - SI.UnitPrice) / NULLIF(SI.UnitPrice, 0)) * 100 AS MarkupPercentage,
           SUM(IL.Quantity) AS TotalQuantitySold
    FROM Warehouse.StockItems SI
    JOIN Warehouse.StockItemStockGroups SISG ON SI.StockItemID = SISG.StockItemID
    JOIN Warehouse.StockGroups SG ON SISG.StockGroupID = SG.StockGroupID
    JOIN Sales.InvoiceLines IL ON SI.StockItemID = IL.StockItemID
    GROUP BY SI.StockItemID, SI.StockItemName, SG.StockGroupName, SI.UnitPrice, SI.RecommendedRetailPrice
)
SELECT * FROM StockMarkup
ORDER BY MarkupPercentage DESC;
```

## 2. Check Correlation Between Markup and Sales

```
sql
WITH StockSales AS (
    SELECT SI.StockItemID,
        ((SI.RecommendedRetailPrice - SI.UnitPrice) / NULLIF(SI.UnitPrice, 0)) * 100 AS MarkupPercentage
        SUM(IL.Quantity) AS TotalQuantitySold
    FROM Warehouse.StockItems SI
    JOIN Sales.InvoiceLines IL ON SI.StockItemID = IL.StockItemID
    GROUP BY SI.StockItemID, SI.UnitPrice, SI.RecommendedRetailPrice
)
SELECT CORR(MarkupPercentage, TotalQuantitySold) AS Markup_Sales_Correlation
FROM StockSales;
```

### Key Insights

- If correlation is negative, higher markups might deter sales.
- If correlation is positive, customers are willing to buy higher-priced items.
- If near zero, markup has minimal effect on sales volume.

These queries help determine if price adjustments can optimize sales performance.

AI was also used to help structure the research approach by identifying key areas to focus on when analyzing sales data.

i need to analyze my company's sales data but i'm not sure how to structure it properly. i have numbers for revenue, profit, and costs, and i know i should be looking at trends over time, but i don't really know what patterns to focus on. i feel like some products perform better at certain times, and maybe pricing or inventory issues are affecting profitability, but i don't know how to confirm that. i want to break this down in a way that makes sense and actually helps explain what's happening. can you suggest a structured research approach to analyze this

## **Structured Approach for Analyzing Sales Data**

### **1. Evaluate Pricing Strategy**

- Examine whether price changes impact sales and profitability.
- Identify if discounts increase total revenue but reduce margins, or if higher-priced items remain stable.
- Compare periods of price stability vs. discounting to assess their effectiveness.
- Look for patterns where price changes influenced customer demand and whether certain products have more pricing flexibility than others.

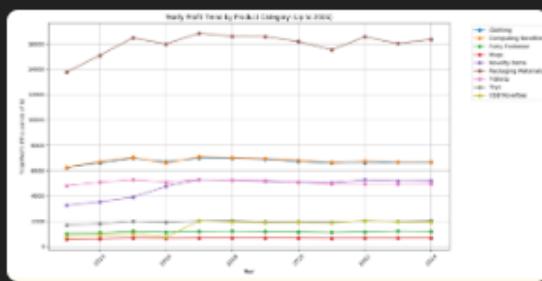
### **2. Analyze Seasonality and Demand Patterns**

- Study monthly sales fluctuations to confirm whether seasonal demand affects revenue.
- Identify peak and low-performing months to determine if trends are consistent or driven by external events.
- If seasonality exists, assess whether adjusting stock levels and promotions during peak periods could improve profitability.
- Compare holiday periods, sales promotions, and external events that may have affected past trends.

### **3. Identify Long-Term Trends**

- Analyze yearly revenue and profit trends to detect periods of growth, stagnation, or decline.
- Investigate potential external factors (economic changes, competitor actions, industry shifts) that could have influenced performance.
- Compare business cycles across multiple years to check for repeating patterns.
- Look for correlations between internal business decisions (product launches, marketing efforts) and shifts in financial performance.

AI assisted in identifying key trends within the sales data, such as the slowdown in packaging materials and the surge in novelty items, and helped propose strategies to dive deeper into these trends.



Okay, so I noticed that there are some notable trend here, such as packaging materials consistently leading the revenue, but seem like it slowing down lately? Also there has been some recent demand surge for novelty item too. How do you suggest i approach this, to get to the bottom and gain actionable business insights. what are driving the revenue? what notable trend should our business capitalize on

Your observations are spot-on. Here's how I suggest breaking this down to gain **actionable business insights**:

### 1. Investigate Packaging Materials' Slowdown

- **Trend:** Packaging Materials have been the dominant revenue driver, but recent years show stagnation or slight decline.
- **Possible Causes:**
  - Market saturation—most customers who need these products already have them.
  - Cost pressures—rising material costs or increased competition affecting margins.
  - Shifting demand—customers opting for alternatives (e.g., eco-friendly packaging).
- **What to Do:**
  - Deep dive into product-level sales—are specific packaging types declining more than others?
  - Check customer retention vs. new customers—is the slowdown due to a drop in repeat purchases?
  - Explore differentiation strategies—premium, sustainable, or customized packaging may help reignite demand.

### 2. Leverage the Surge in Novelty Items

- **Trend:** Novelty Items have seen an increase in demand, suggesting new opportunities.
- **Possible Causes:**
  - Market trends favoring unique, personalized, or collectible items.
  - Social media or influencer marketing driving temporary spikes in popularity.
  - Seasonal demand factors (holidays, trends, or viral products).
- **What to Do:**
  - Analyze product-level trends—which specific novelty items are gaining traction?
  - Identify seasonality—are these surges tied to holidays, gift seasons, or back-to-school trends?
  - Check profitability—do these items have strong margins, or are they volume-driven with low profit per unit?

### 3. Uncover Hidden Revenue Drivers

- Beyond top-performing categories, look at mid-tier products that might be gaining momentum.
- Assess cross-category correlations—are customers buying novelty items alongside packaging materials? Could bundling be an opportunity?
- Compare pricing strategies—do price adjustments lead to increased demand, or is demand independent of price changes?

### 4. Actionable Business Moves

- For Packaging Materials: Introduce premium, sustainable, or customized options to differentiate.
- For Novelty Items: Identify what's trendy vs. sustainable demand and scale up production/marketing accordingly.
- For Overall Growth: Ensure product categories complement each other and explore upselling or bundling strategies to maximize revenue.

By structuring the analysis this way, you'll be able to pinpoint exact growth levers and mitigate risks in slowing categories. 



AI was leveraged to help structure the sales analysis report, ensuring a clear and logical flow of information. This structure guides the reader through essential aspects of the analysis, including performance trends, pricing, and actionable business strategies.



I've been working on a sales analysis report, and I feel like it's kind of all over the place. I have a ton of info, but I'm struggling to structure it properly so that it's clear and easy to follow. organize it for me in headings and sections. also explain what section should include what part of the research

### Structured Outline for Your Sales Analysis Report

Here's how to organize your report so it's clear, logical, and easy to follow:

## 1. Introduction

### What to Include:

- Briefly introduce the purpose of the report—analyzing sales data to identify trends, profitability drivers, and risks.
- Mention key data sources used (historical sales, product categories, pricing, etc.).
- Set up main objectives, such as:
  - Understanding revenue trends.
  - Identifying seasonal demand shifts.
  - Evaluating pricing impact and inventory efficiency.

## 2. Overview of Sales Performance

### What to Include:

- Present total revenue, profit, and COGS trends over the years.
- Highlight key growth years vs. slowdown periods.
- Identify whether the company is in a growth, stabilization, or decline phase.

## 3. Product Category Analysis

### What to Include:

- Break down revenue and profit by product category.
- Identify top-performing categories (e.g., Packaging Materials consistently driving profit).
- Spot underperforming categories (e.g., novelty items previously stagnant but now rising).
- Investigate whether specific products gain and lose momentum over time.

## 4. Seasonality and Demand Patterns

### What to Include:

- Examine monthly sales fluctuations to see if certain months perform better/worse.
- Identify peak sales periods and whether they're predictable (holidays, promotions, industry trends).
- Suggest stocking and marketing strategies to capitalize on seasonal demand.

## 5. Pricing Strategy and Profitability Impact

### What to Include:

- Analyze whether price adjustments correlate with higher/lower sales.
- Identify products that may be too heavily discounted, hurting margins.
- Discuss the price elasticity of key product categories—do price changes actually influence demand?

## 6. Inventory and Overstock Issues

### What to Include:

- Identify overstocked products that are tying up capital without selling fast enough.
- Highlight products like Halloween zombie masks that sell but still lose money (possible over-discounting, excessive stock).
- Suggest ways to improve demand forecasting and reduce unnecessary inventory buildup.

## 7. Key Findings & Actionable Recommendations

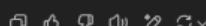
### What to Include:

- Summarize major takeaways—which categories are growing, which are slowing, and why.
- Recommend specific business actions, such as:
  - Adjusting pricing for key items.
  - Reallocating inventory focus.
  - Capitalizing on seasonal demand patterns. 

### Why This Structure Works?

-  Keeps insights logical and easy to digest.
-  Ensures data-backed findings lead to clear business recommendations.
-  Helps focus on actionable strategies, not just numbers.

This structure makes your report more professional and effective, helping the reader quickly understand what's happening and what should be done next. 



AI was used to analyze the trend of packaging materials that were once leading categories but are now showing signs of saturation.

they say that packaging used to be a prominent categories but are reaching saturation. give me an analysis plan, to see what drive them etc.

### Analysis Plan: Understanding the Saturation of Packaging Materials Sales

Since Packaging Materials used to be a prominent category but are now reaching saturation, we need to analyze why this is happening and what factors are driving it. Our approach will cover historical trends, customer behavior, profitability, competitive factors, and potential solutions.

## 📌 Step 1: Define Key Metrics to Analyze

To understand why Packaging Materials are saturating, we will investigate:

1. **Sales Trends Over Time** → Is revenue declining or just stabilizing?
2. **Customer Behavior** → Are repeat purchases declining? Are customers switching?
3. **Profitability & Cost Structure** → Are rising costs affecting profit margins?
4. **Competitive Landscape** → Are competitors offering better alternatives?
5. **Inventory & Supply Chain Efficiency** → Are stock levels mismatched with demand?
6. **Seasonality & External Factors** → Are macroeconomic factors influencing demand?

## 📌 Concise Analysis Plan: Understanding Packaging Materials Saturation

Since Packaging Materials was a top-selling category but is now reaching saturation, we need to analyze what is driving this trend and how to respond.

### 1 Sales & Demand Trends

- Check yearly/monthly revenue & quantity sold to see if sales are declining, plateauing, or fluctuating.
- Identify seasonality patterns to understand demand cycles.

### 2 Customer Behavior & Retention

- Analyze repeat purchases vs. first-time buyers to check for declining retention rates.
- Identify customer segments (wholesale vs. small business vs. individuals) that reduced purchases.

### 3 Profitability & Cost Structure

- Check profit margins to see if rising costs or price changes are affecting profitability.
- Compare historical pricing trends to identify if price increases impacted sales.

### 4 Competitive Landscape

- Investigate if competitor pricing or alternative packaging solutions (e.g., eco-friendly materials) are taking market share.
- Look at shifts in product preferences (e.g., sustainable vs. traditional packaging).

### 5 Inventory & Stock Management

- Identify overstocked packaging materials that may be slow-moving.
- Check if demand projections mismatch stock levels, leading to waste or cash flow issues.

## 📌 Final Steps: Business Strategy

- ✓ **Repricing & Promotions** if price sensitivity is an issue.
- ✓ **Customer Re-engagement** if existing customers are buying less.
- ✓ **Product Diversification** if alternative packaging is trending.
- ✓ **Inventory Adjustments** to avoid overstocking.
- ✓ **Competitor Benchmarking** to stay competitive.

Would you like a visual report or forecast analysis based on these insights? 🚀