T.T Inc.'s Inventory Optimization Analysis Using Structured Query Language

OVERVIEW

T.T. Inc. is a prominent company in the consumer electronics sector.

The main objectives for the Supply Chain Management team include optimizing inventory levels to minimize both overstock and understock situations, understanding the seasonal trends of sales for different products, and improving customer satisfaction by ensuring product availability.

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Problem Statement

T.T. Inc. challenge lies in analyzing extensive sales data to identify patterns and trends, accurately forecasting demand, and implementing data-driven strategies to maintain optimal inventory levels.

This requires a comprehensive understanding of sales dynamics, customer behaviour, and supply chain processes to effectively enhance operational efficiency and meet customer demands.

The goal is to leverage data analytics to provide actionable insights that will streamline inventory management, reduce costs, and ultimately improve the overall customer experience

Data Description

This case study contains 3 datasets, and they are as follows;

Sales Data

- Sales id: Unique sales identifier.
- Product ID: Unique product identifier.
- Sales Date/month/year: Date/month/year of product sale (Date)
- Sales Quantity (Units): Number of units sold (Units).
- Product Cost (USD per Unit): Cost per product unit in USD
(USD per Unit).

Data Description

Product Information Data

- Product ID: Unique product identifier.
- Product Category: Product type.
- Promotions: Indicator of promotions.

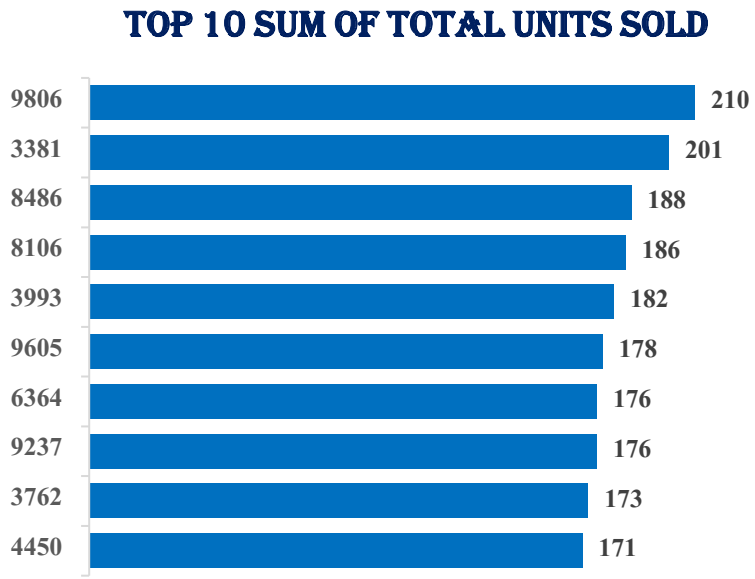
External Information Data

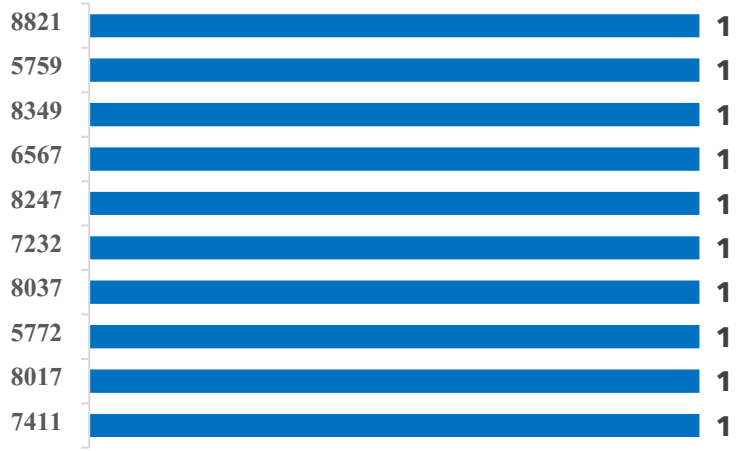
- Sales Date/month/year: Date/month/year of product sale (Date)
- GDP (Gross Domestic Product) (USD): Economic data in
USD (USD).
- Inflation Rate (%): Percentage change in prices.
- Seasonal Factor (Dimensionless): Index for seasonal effects.

Analysis

1. What is the total number of units sold per product SKU?

```sql
SELECT
  productid,SUM(sales.inventoryquantity) AS total_units_sold
FROM
  sales
GROUP BY
  productid
ORDER BY
  total_units_sold;
```



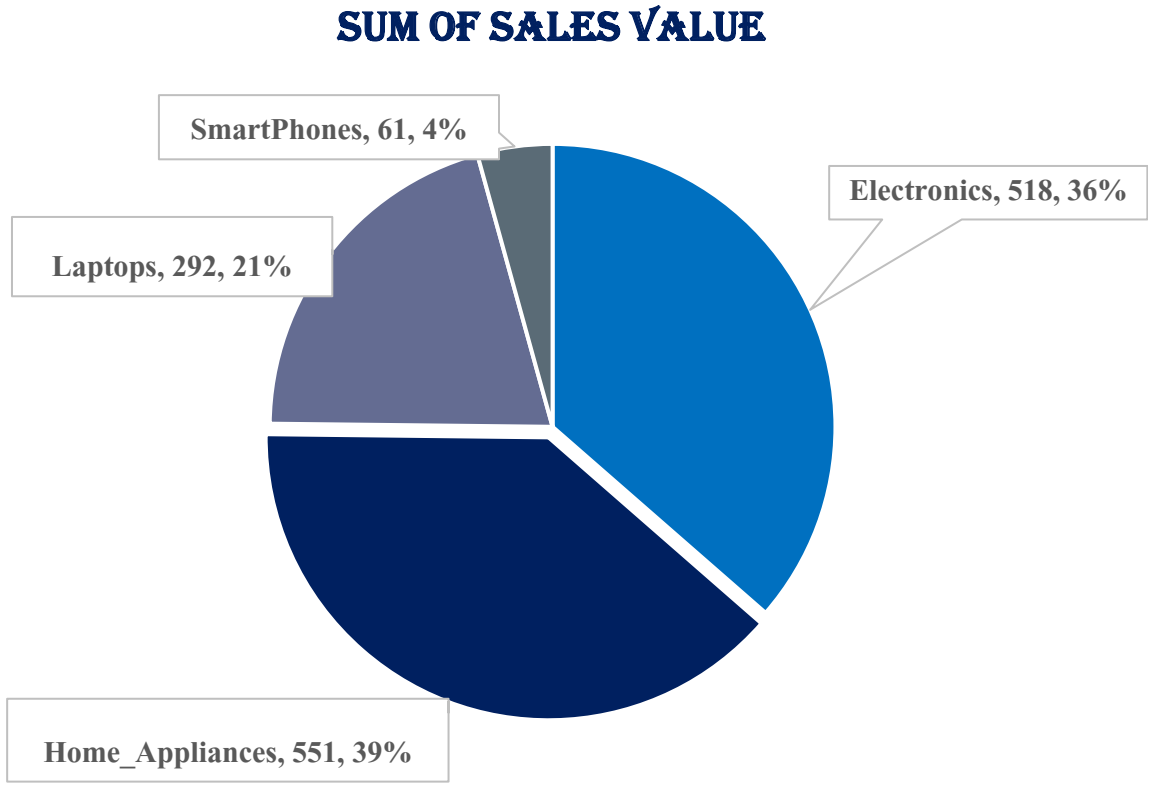


Insights

Some products are top-selling products, this shows that these products are in high demand and the bottom ten products as seen in the charts show extremely low patronage

2. Which product category had the highest sales volume last month?

```sql
SELECT
  productcategory, SUM(inventoryquantity) AS sales_volume
FROM
  sales
JOIN
  product ON product.productid = sales.productid
WHERE
  sales_year='2022' AND sales_month ='11'
GROUP BY
  productcategory
ORDER BY
  sales_volume DESC;
LIMIT 1;
```



Insights

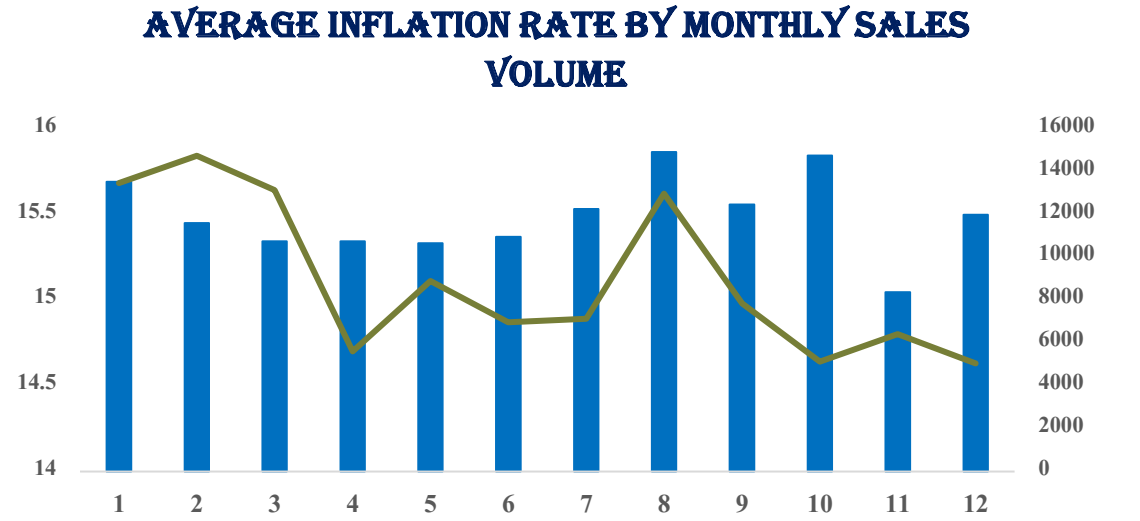
The category; of home appliances had the highest sales in November 2022 at 551 and this indicates that the category was popular among customers showing their demand pattern in November. If there was a black Friday event, this must have been the reason for the increased sales. So, therefore, seasonal factors increased sales of home appliances.

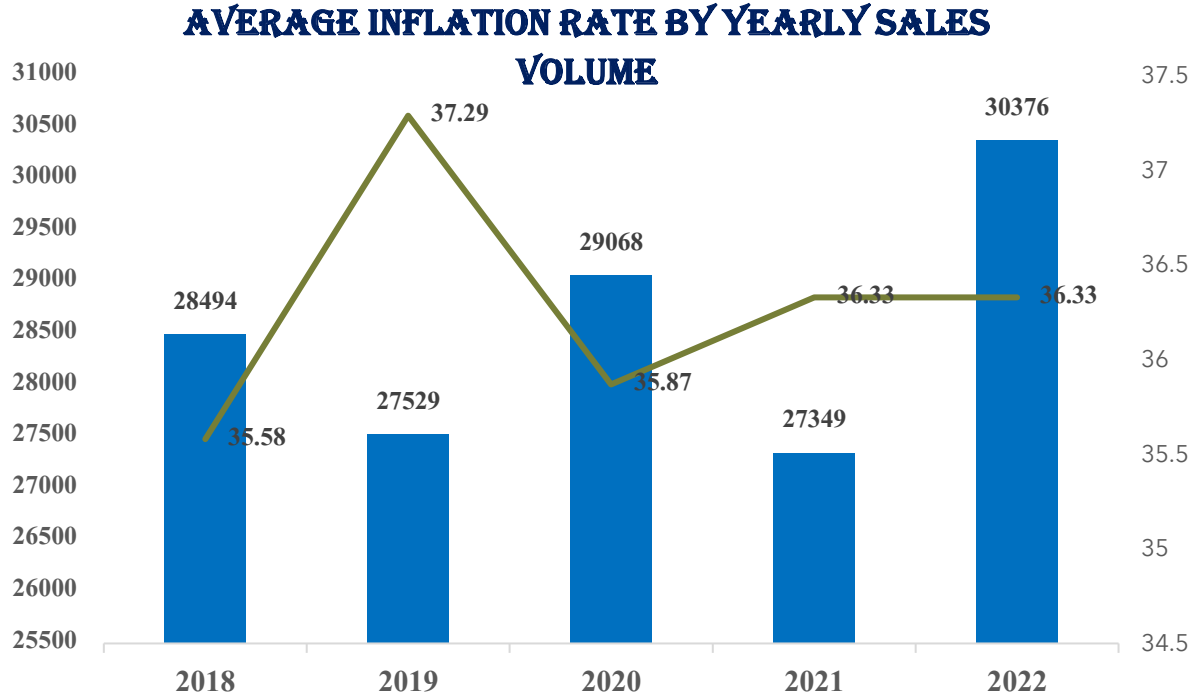
3. How does the inflation rate correlate with sales volume for a specific month?

```sql
SELECT
  s.sales_year,s.sales_month,
  ROUND(AVG(f.inflationrate),2) AS Avg_inflation_rate,
  SUM(s.inventoryquantity)AS sales_volume
FROM
  sales s
JOIN
  factors f ON s.salesdate=f.salesdate
GROUP BY
  s.sales_month,s.sales_year
ORDER BY
  Avg_inflation_rate DESC;
```

Insights

Looking at the monthly sales volume, there isn't any serious correlation between inflation and sales volume. The month of January had the highest inflation rate at 15.68% but had a higher sales volume than the month of October and December with the lowest inflation rate at 14.64% and 14.63% respectively





4. Did promotions significantly impact the sales quantity of products?

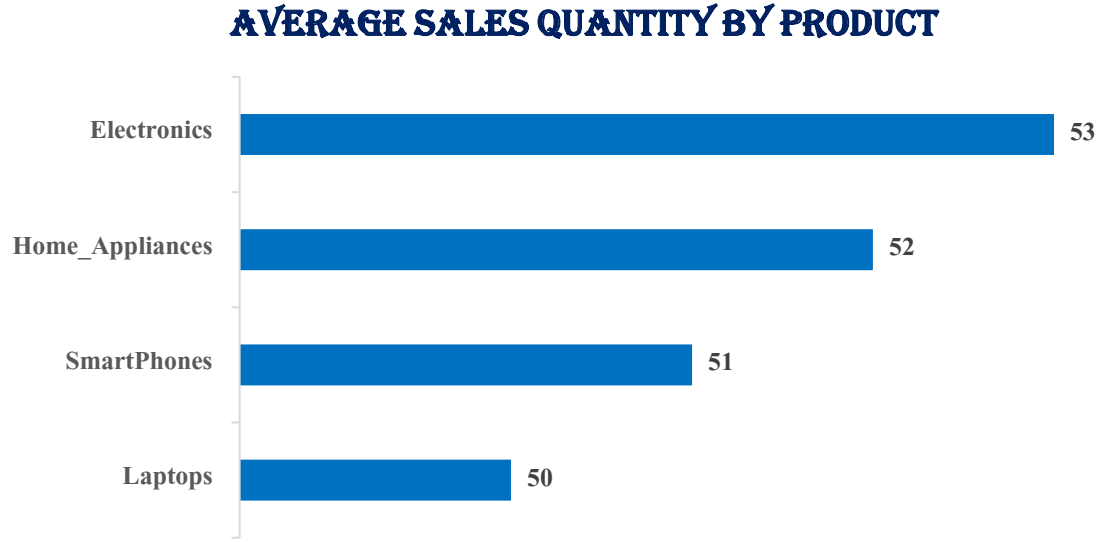
```sql
SELECT
  p.productcategory,
  ROUND(AVG(s.inventoryquantity)) AS Avg_sales_without_promotions,
  p.promotions
FROM
  sales s
JOIN
  product p ON p.productid = s.productid
WHERE p.promotions ='NO'
GROUP BY
  p.productcategory, p.promotions

UNION ALL

SELECT
  p.productcategory,
  ROUND(AVG(s.inventoryquantity)) AS Avg_sales_with_promotions,
  p.promotions
FROM
  sales s
JOIN
  product p ON p.productid= s.productid
WHERE p.promotions ='YES'
GROUP BY
  p.productcategory, p.promotions;
```

Insights

The query returned empty. This implies that promotion did not impact sales quantity of products.

5. What is the average sales quantity per product category?

```sql
SELECT
  p.productcategory,
  ROUND(AVG(s.inventoryquantity)) AS Avg_sales_quantity
FROM sales s
JOIN
  product p ON p.productid = s.productid
GROUP BY
  p.productcategory;
```

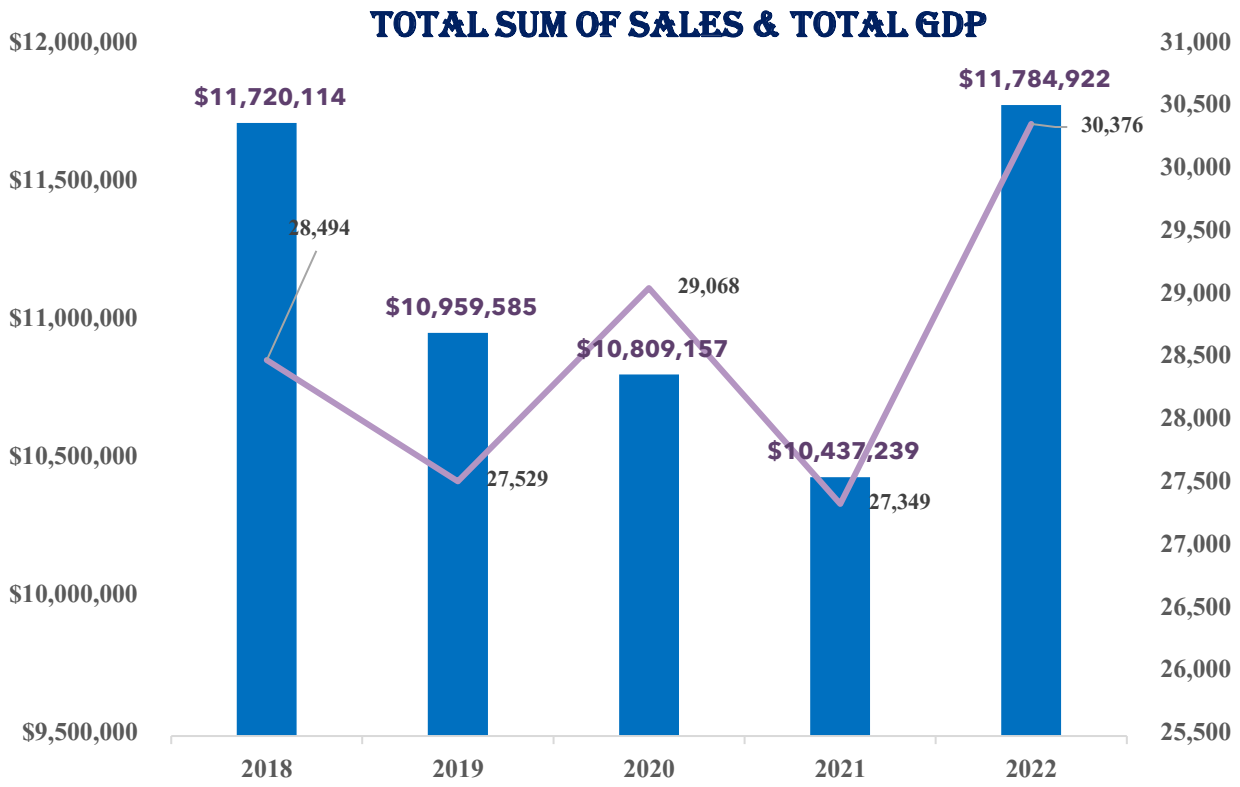


Insights

The category of electronics has the highest average sales quantity at 53.

6. How does the GDP affect the total sales volume?

```sql
SELECT
  s.sales_year,
  ROUND(SUM(f.gdp))AS Total_gdp,
  SUM(s.inventoryquantity) AS Total_sales
FROM
  sales s
JOIN
  factors f ON f.salesdate = s.salesdate

GROUP BY
  s.sales_year
ORDER BY Total_sales
```

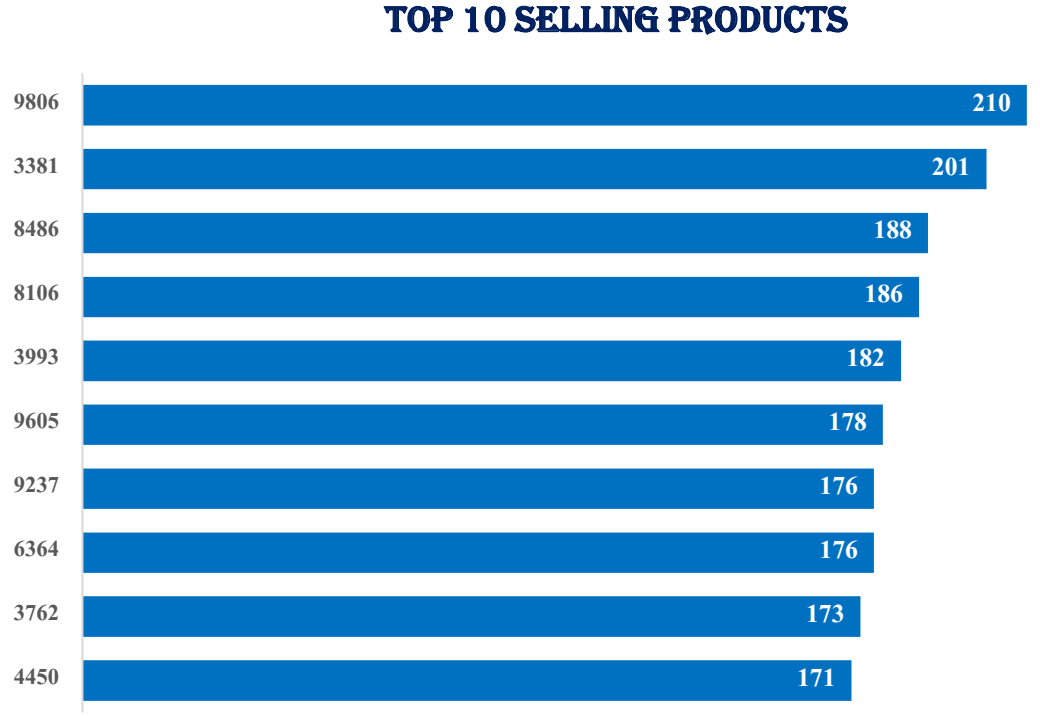


Insights

GDP does not affect sales volume, however, sales fluctuated from year to year with a significant decrease in 2021 and an increase in 2022 and GDP fluctuated around the same year.

7. What are the top 10 best-selling product SKUs?

```sql
SELECT
  productid,
  SUM(inventoryquantity) AS Total_units_sold
FROM
  sales
GROUP BY
  productid
ORDER BY
  Total_units_sold DESC
LIMIT
  10;
```

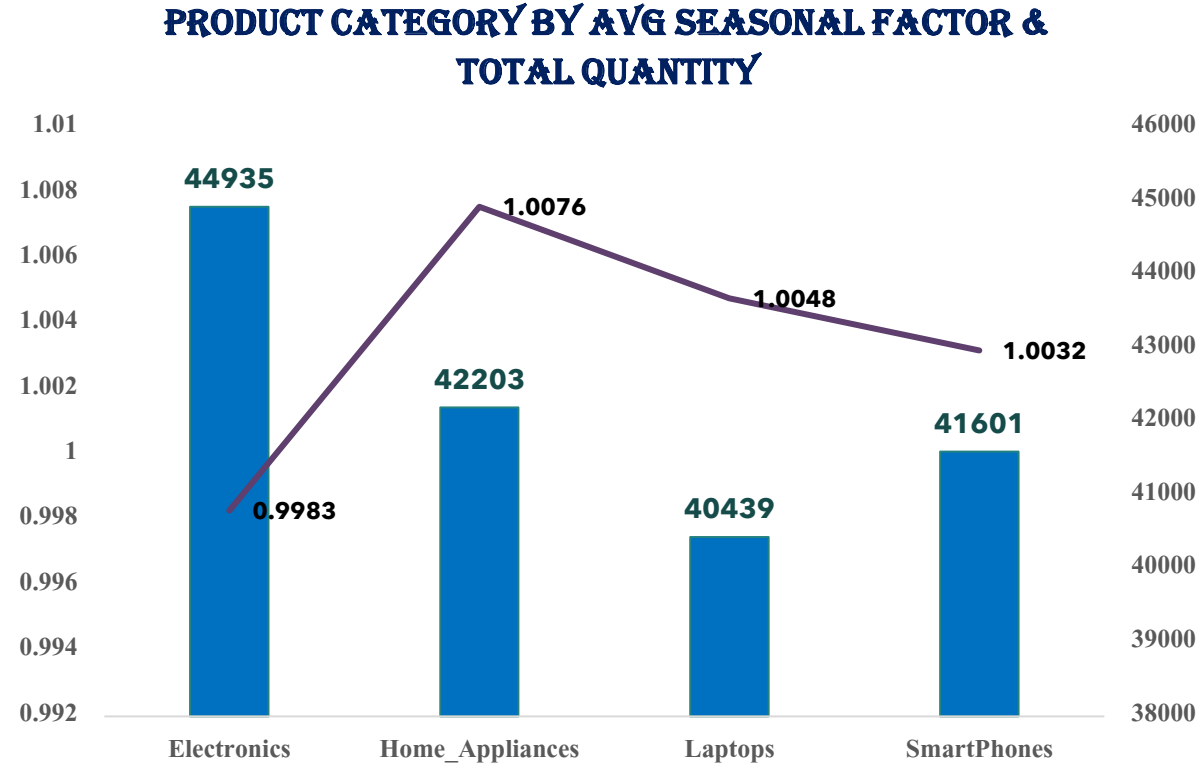


Insights

The chart above reveals the top 10 best-selling products based on sales volume. This can help understand customer preferences and identify which products generate the most revenue

8. How do seasonal factors influence sales quantities for different product categories?

```sql
SELECT
    p.productcategory,
    ROUND(AVG(f.seasonalfactor),4) AS Avg_seasonal_factor,
    SUM(s.inventoryquantity) AS Total_qty
FROM
  sales s
JOIN
  product p ON p.productid = s.productid
JOIN
  factors f ON f.salesdate = s.salesdate
GROUP BY
  p.productcategory
ORDER BY
  Avg_seasonal_factor;
```

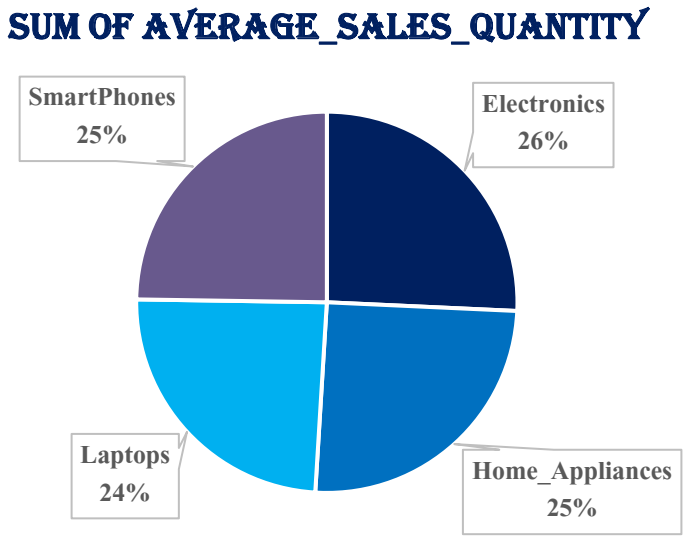


Insights

The chart above reveals that there is no correlation between seasonal factors and sales quantities for the different categories. The category of electronics has the least seasonal factor metric but with the highest total quantity sold and the Home appliances category with the highest seasonal factor metric does not have the least sales.

9. What is the average sales quantity per product category, and how many products are within each category were part of a promotion?

```sql
SELECT
  p.productcategory,
  ROUND(AVG(s.inventoryquantity)) AS
AVG_sales_quantity,
COUNT(CASE WHEN p.promotions = 'YES' THEN 1 END) AS
Promotion_count

FROM sales s

JOIN  product p ON p.productid = s.productid

GROUP BY
  p.productcategory
ORDER BY AVG_sales_quantity;
```



Insights

The chart above reveals the average sales quantity per category. The query for promotion counts returned empty, this implies that promotion does not affect the volume of sales

Recommendation

Based on the insights derived from the analysis, I suggest the following:

1. **Top-performing products indicating high demand should be focused on to ensure availability and frequent restocking to maintain sales momentum. And the underperforming products should be discontinued.**
2. **Promotion should be designed in such a way that it caters to specific product categories and their responsiveness to price reductions.**
3. **Investigate if product categories are frequently needed. Customers might be willing to pay the regular price for items they consider indispensable, making promotions less effective.**
4. **National GDP trends should be monitored and incorporated into sales forecasting models. This can help adjust sales targets for anticipated economic conditions or factors**

CONCLUSION

Implementing the recommendation or suggestion would go a long way in addressing the challenge of overstocking and understocking, enhancing operational efficiency and meet customer demands.

Thank you

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