

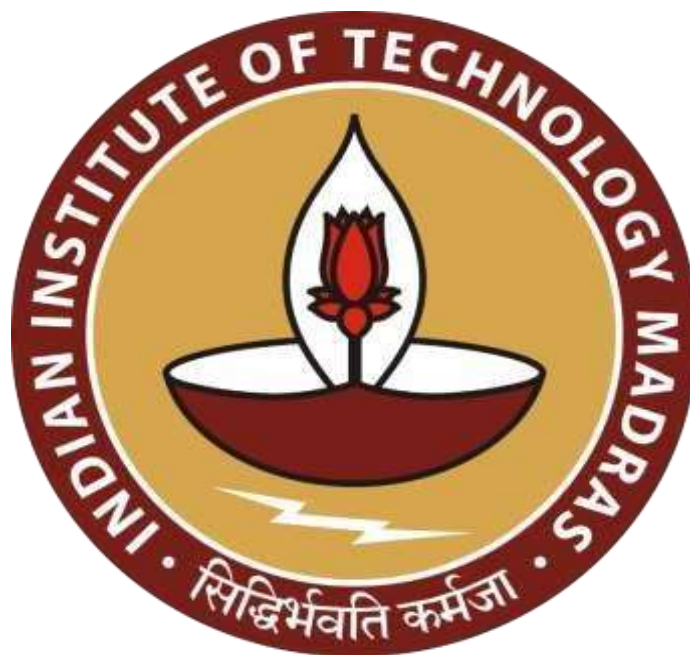
Analysing Customer Behaviour to Optimize Stock Levels

Final Submission Report for BDM Capstone Project

Submitted by

Name: VIJAYAGEETHA.V

Roll number: 23F1000049



IITM Online BS Degree Program,

Indian Institute of Technology, Madras, Chennai

Tamil Nadu, India, 600036

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1 Executive Summary and Title

The project titled "**Analysing Customer Behaviour to Optimize Stock Levels**" addresses the crucial issue of inventory management at Reliance Digital, with the goal of minimizing stockouts and overstocking. Through the application of various analytical techniques such as seasonal trend analysis, time series analysis, product performance analysis, and inventory analysis, the project examines two years of sales data (**2022-2024**). The analysis seeks to uncover patterns in customer purchasing behaviour and product demand, allowing for more accurate demand forecasting and better stock management.

Primary data for this project were collected from a Reliance Digital store in Thanjavur, Tamil Nadu, which offers over 50 electronic products and appliances, catering to both individual consumers and businesses. Key performance indicators include inventory turnover, product sales growth, and profit margins. Particular attention was given to identifying seasonal demand variations, the impact of promotional activities, and the contribution of specific products to overall sales.

The findings revealed significant seasonal peaks in air conditioner and TV sales, especially during summer and festive seasons, emphasizing the need to adjust stock levels accordingly. In contrast, underperforming items like blenders and toasters present opportunities for targeted promotions and pricing strategies.

The project recommends maintaining optimal stock levels for high-demand products, enhancing promotional campaigns during peak periods, and offering tailored discounts for slower-moving items. Implementing these strategies is expected to reduce inventory waste, improve profitability, and enhance customer satisfaction at Reliance Digital.

2 Detailed Explanation of Analysis Process

The analysis process was methodical, enhancing result accuracy and relevance. The initially unstructured sales data was organized for easier analysis, leading to clearer insights and informed decision-making.

The first step involved importing the dataset into **Excel**, which facilitated straightforward visualization. This included checking the data structure, examining the row count, identifying

variable types, and reviewing initial rows for inconsistencies. This preliminary inspection was essential for ensuring data integrity and preparing the dataset for further analysis.

2.1 Pattern Visualization:

Used various data visualization techniques to communicate key insights effectively.

- ❖ Created line graphs, bar charts, and pie charts using Excel: **Line graphs** illustrated changes over time in Customer Rating and Price, showing trends in satisfaction and pricing.
- ❖ **Bar charts** highlighted differences in Amount Paid among Appliance Names and Brand Names, identifying key sales drivers.
- ❖ Visual tools provided quick overviews of trends and comparisons.
- ❖ **Pie charts** displayed the top-selling products.
- ❖ Bar charts compared appliances and total quantity across various products, emphasizing price and efficiency of the product
- ❖ These visualizations facilitated easy interpretation of patterns and trends for stakeholders.

2.2 Sales Analysis:

Analysing sales for electronics involves several steps to understand patterns, trends, and factors affecting sales performance.

- ❖ Comprehensive examination of sales performance over the past year using Amount Paid to identify peak demand periods and pinpoint top-selling Appliance Names.
- ❖ Identified which products or promotions drive the most sales, optimizing stock levels based on insights from Price and Customer Rating data.
- ❖ Evaluate underperforming items by analysing their Price, Customer Rating, and features to understand reasons for low sales.
- ❖ Focus on best-selling products that drive revenue by optimizing their availability, quantity, and targeted promotions based on past sales data
- ❖ Identify fast-selling products by monitoring the Sales Volume to manage inventory effectively and prevent overstock and stockouts.
- ❖ Analyse sales data to identify seasonal trends in electronic appliance sales, such as increased demand for Air Conditioners and Heaters during summer and winter seasons, respectively. This helps optimize Stock Levels and pricing strategies.

By implementing these steps, the electronics shop can boost sales, improve inventory management, and increase profitability.

2.3 Inventory Management Analysis:

Inventory management for an electronics seller involves aligning stock levels with customer behaviour patterns to ensure optimal product availability while minimizing waste.

- ❖ **Categorization by Demand:** Appliance Name and Brand Name are grouped based on customer purchasing trends, including seasonal demand for items like Air Conditioners or Heaters.
- ❖ **Demand Based Stock Levels:** Minimum and maximum stock levels are set for products like Mobile Phones and Air Conditioners based on Amount Paid and Sales Volume, and are adjusted periodically to prevent stockouts or overstock.
- ❖ **FIFO Stock Rotation:** High-demand items, such as products with higher Customer Rating, are restocked first, minimizing spoilage and ensuring freshness.
- ❖ **Real-Time Adjustments:** Data on EMI Mode, Price, and Customer Rating is analysed in real-time to keep inventory aligned with current sales trends.

These steps optimize stock levels and improve inventory efficiency.

2.4 Product performance analysis:

This analysis process involves understanding customer behaviour through sales data to tailor offerings effectively. The steps include:

- ❖ **Sales Trends and Patterns:** By analysing the sales data of each product, we can identify recurring patterns and trends. These trends can include seasonal fluctuations, cyclical variations, and short-term spikes in sales. Understanding these patterns helps anticipate demand, plan inventory, and allocate resources more effectively.
- ❖ **Growth and Decline:** Product performance analysis allows us to identify products that are experiencing growth as well as those that are declining. Products with consistent positive growth rates are valuable contributors to revenue, while declining products may require strategic adjustments or marketing efforts to revive their sales.
- ❖ **Identify Popular Products:** Use sales data to pinpoint products with the highest demand, focusing on best-sellers.

- ❖ **Contribution to Revenue:** Assessing the contribution of each product to total revenue provides insights into the business's revenue distribution.
- ❖ **Price Sensitivity:** Analysing product sales in relation to their price points helps understand price sensitivity and its impact on sales volume
- ❖ **Promotion and Campaign Effectiveness:** Evaluating the impact of promotional campaigns and marketing initiatives on product sales helps gauge the effectiveness of marketing strategies. This analysis guides future campaign planning and resource allocation.
- ❖ **Segment Customer Demographics:** Group customers by factors like age, location, or income to understand how these impacts their purchasing decisions.

This approach enhances product relevance and improves overall customer satisfaction.

2.5 Time Series Analysis:

Time series analysis is a powerful statistical method used to analyse data points collected at regular intervals over time. In the context of this project analysing sales data, time series analysis helps us uncover **patterns, trends, and seasonality** in the sales performance.

- ❖ In this project, time series analysis was applied to understand the sales performance of various electronic appliances, including overall sales for products like mobile phones, laptops, and air conditioners over different months and quarters.
- ❖ By plotting the sales data on line charts and bar graphs, periods of growth, decline, or stability were visually identified.
- ❖ Time series analysis provided valuable insights into how external factors, such as promotions, seasons, and customer preferences, influenced the sales patterns.
- ❖ The key components of Time Series Analysis in this project are:
 - 1) **Trend Component:** Indicates long-term sales movement, showing if demand for electronic appliances is increasing, decreasing, or stable.
 - 2) **Seasonal Component:** Captures regular sales fluctuations due to factors like holidays or seasonal demand (e.g., air conditioners in summer).
 - 3) **Decomposition:** Breaks down time series data into trend, seasonality, and noise to understand their contributions to overall sales patterns.

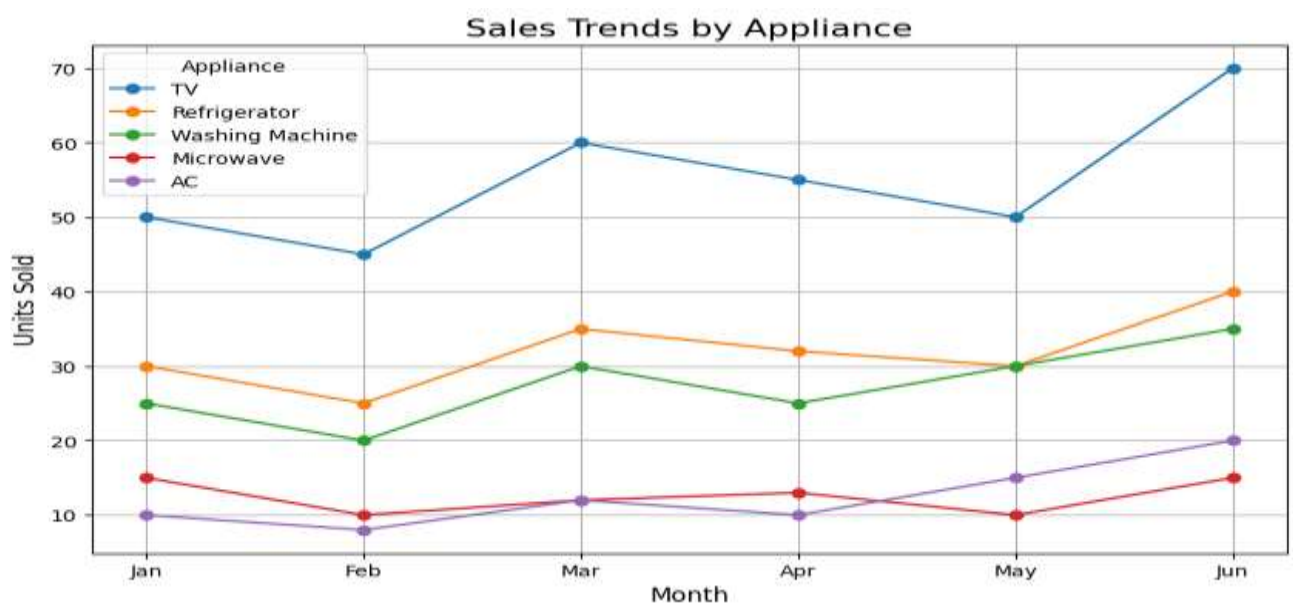
3 Results and Findings

3.1 Sales Performance Analysis:

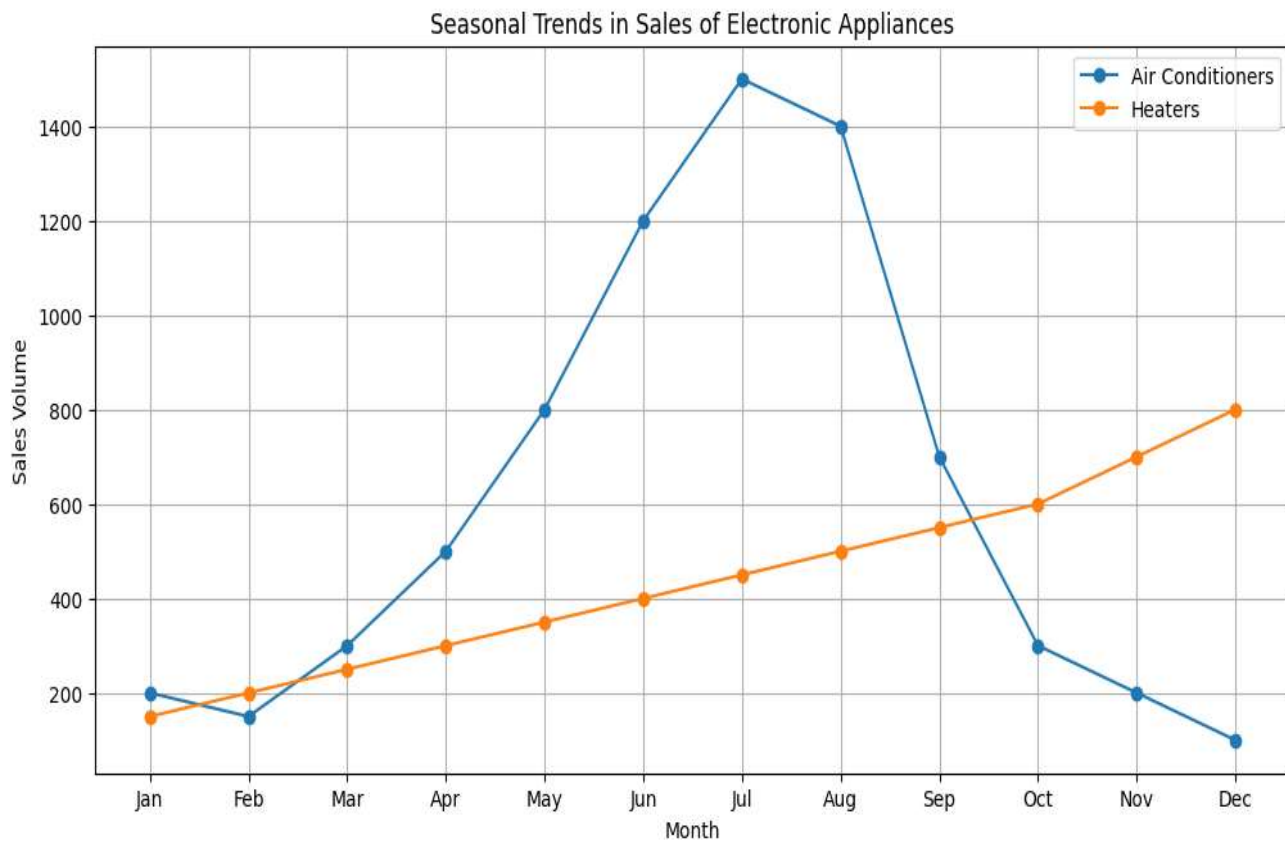
The total sales analysis (Graph 1) of commonly sold electronic appliances over the past six months (2022) provides valuable insights into customer preferences. Among the products analysed, **smart TVs** emerged as the highest-selling item

This aligns with the increased demand for home entertainment systems, especially during festival or holiday seasons when customers are more likely to invest in premium electronics.

- ❖ Smart TVs, being a high-demand product during the festive period, often attract customers willing to pay a premium price for upgraded features and larger screens.
- ❖ **Seasonal Patterns:** Air Conditioners show a strong seasonal trend with peak sales occurring in summer months. Heaters display an inverse seasonal pattern, with sales increasing in colder months.
- ❖ **Air Conditioner Performance:** Sales start to rise significantly in April, peaking in July with approximately, over 250 units sold.
- ❖ The sales remain high through August before sharply declining in September.
- ❖ Lowest sales are observed in December and January.



Graph-1: Sales Trends by Appliance



Graph-2: Seasonal Trends in Sales of Electronic Appliances

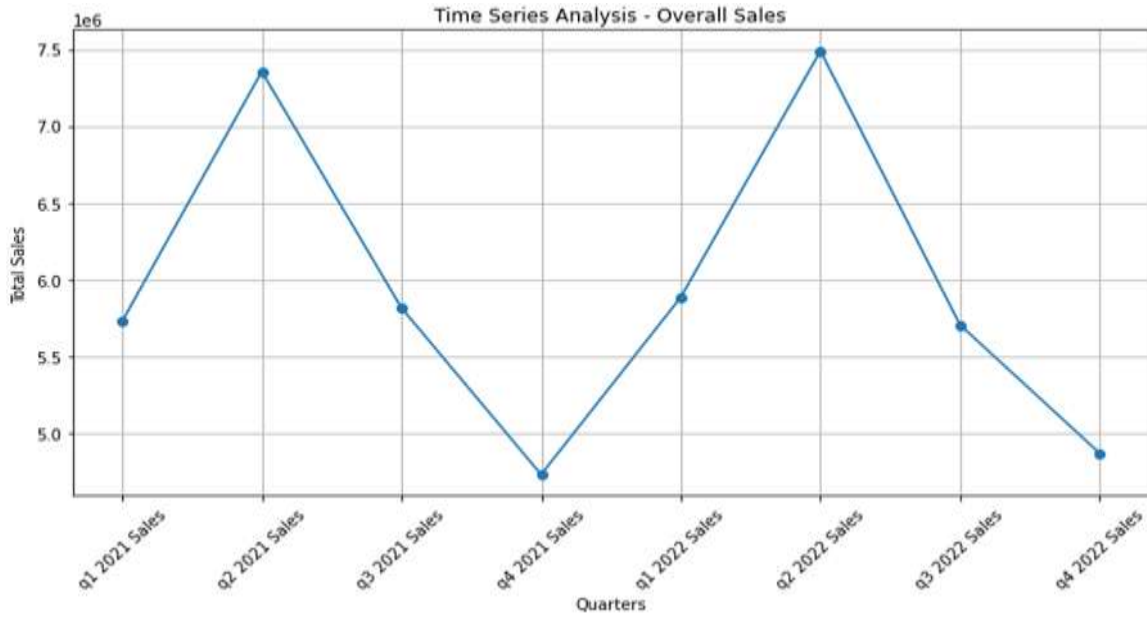
3.2 Time Series Analysis:

The time series analysis revealed several significant patterns and trends in the sales data, providing valuable insights into the performance of different products over time.

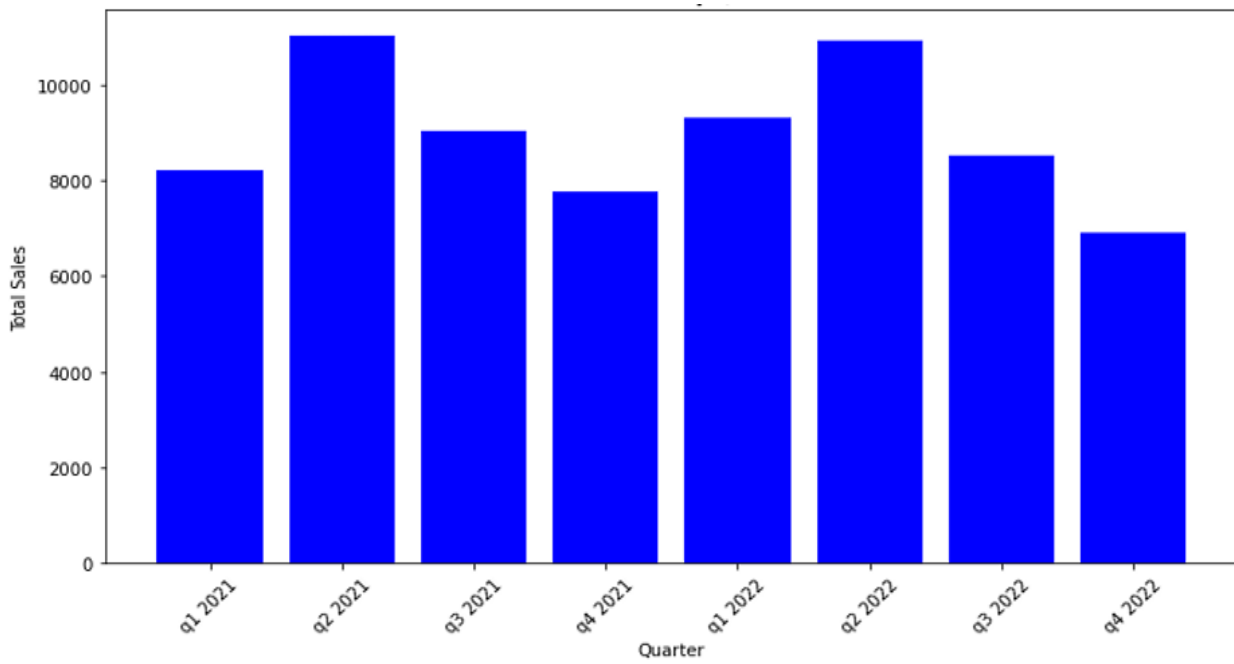
The analysis allows us to identify patterns, seasonality, and potential anomalies that influence stock and sales strategies.

- ❖ **Seasonal Patterns:** A consistent and observable seasonality pattern emerged in the sales data across various products. Quarter 2 (Q2) consistently exhibited peak sales for almost all products. This trend suggests that customers tend to make more purchases during this period, potentially influenced by factors such as holidays, weather conditions, or promotional activities.
- ❖ An interesting observation was the decline in sales during Quarter 4 for both overall sales and individual products. This decline could be attributed to various factors, including the holiday season, reduced consumer spending, or a shift in customer preferences.
- ❖ **Individual Product Performance:** While Q2 consistently showed peak sales, the performance of individual products varied. Some products demonstrated strong seasonality, aligning with the Q2 peak, while others exhibited different patterns. This analysis serves as a valuable tool for decision-makers to assess performance, optimize

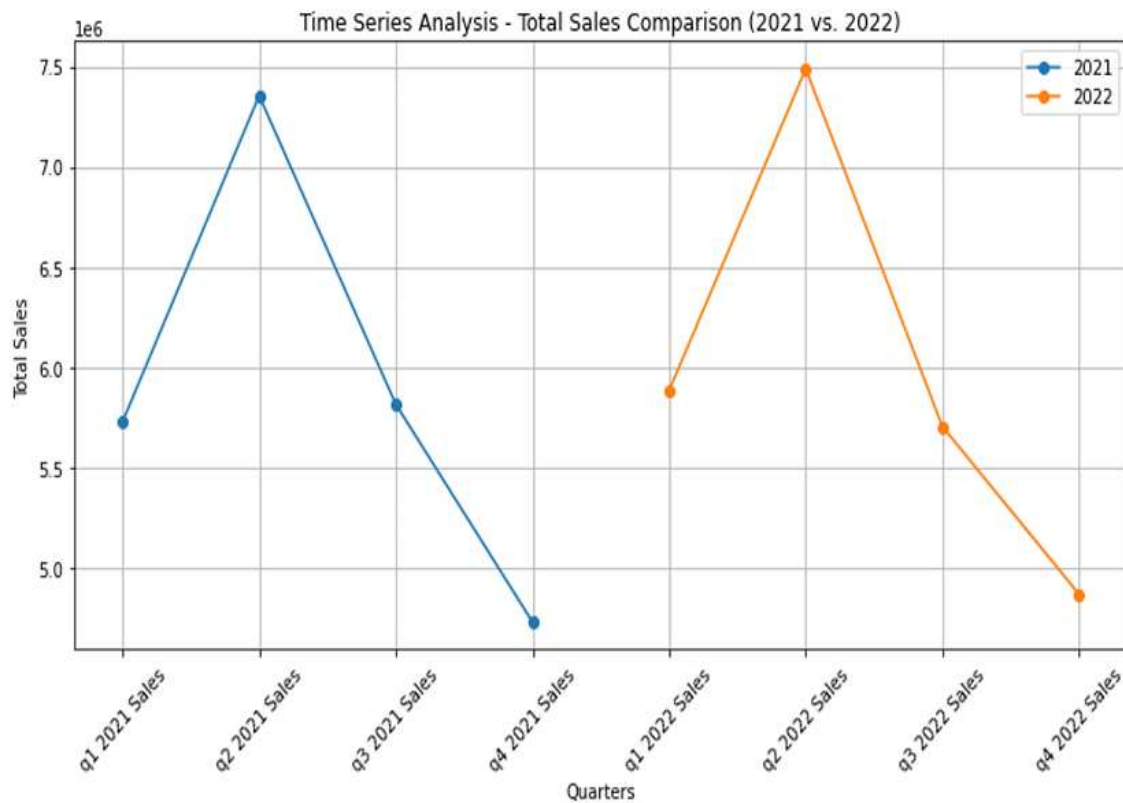
strategies, and steer the company toward sustained success in the competitive market landscape.



Graph-3: Time Series Analysis-Overall Sales



Graph-4: Quarter vs Total Sales

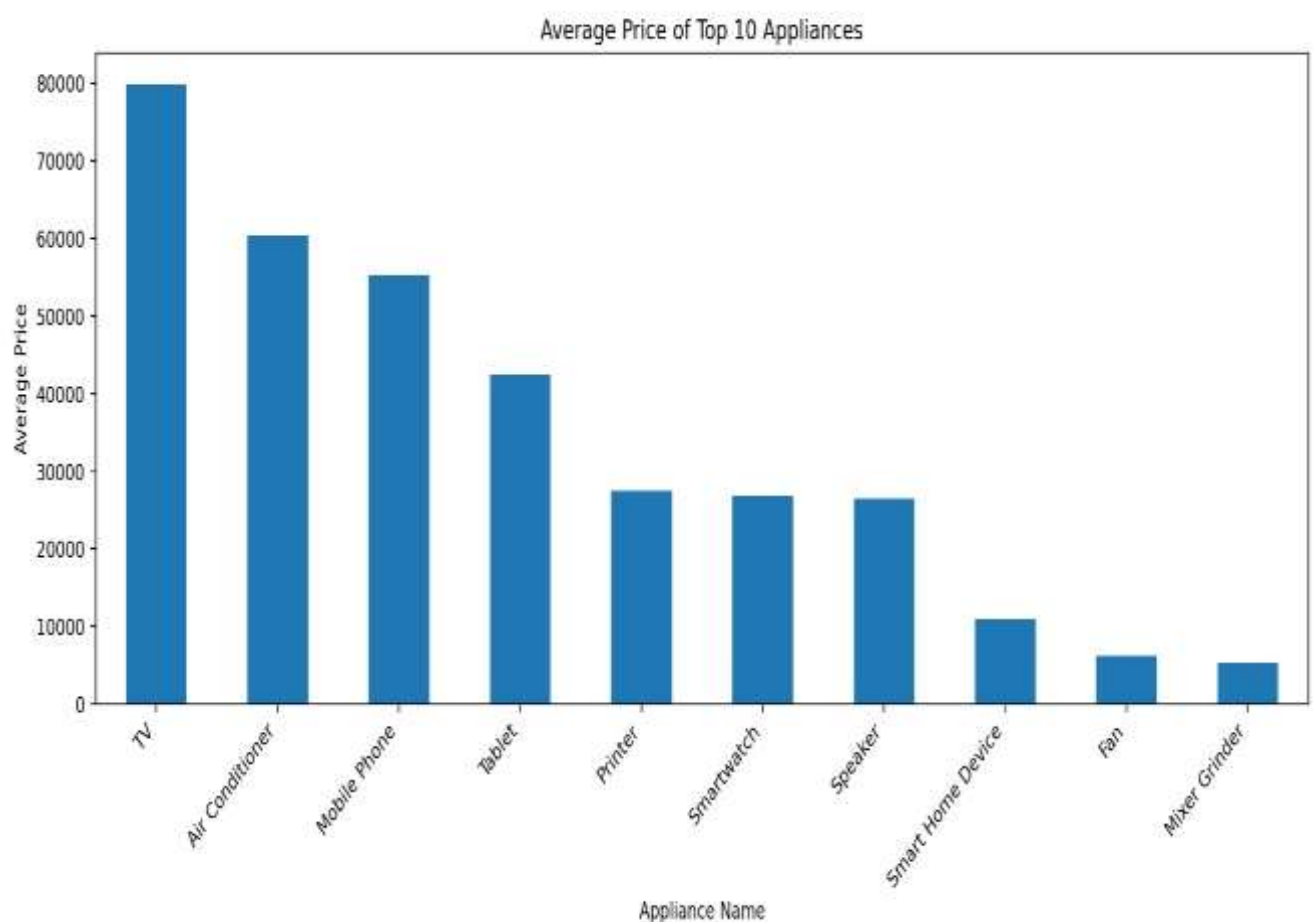


Graph-5: Time Series Analysis-Total Sales Comparison

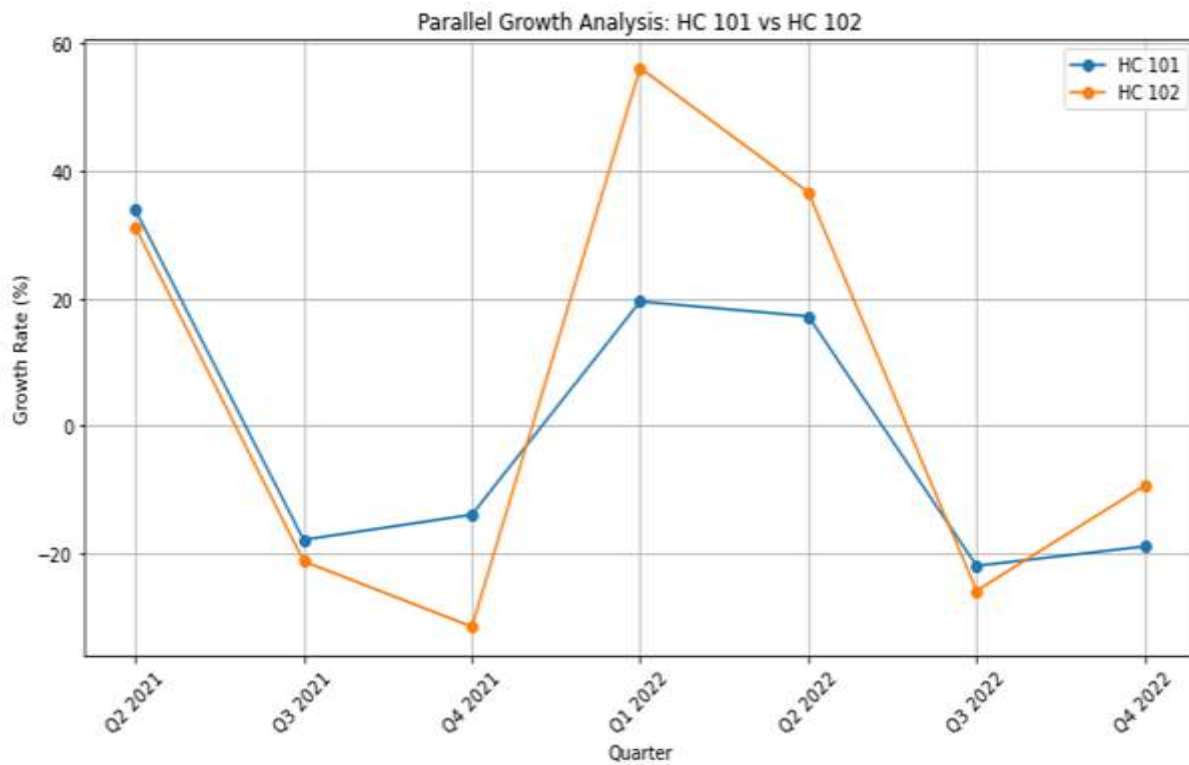
3.3 Product Performance Analysis:

- 1) **Stable Performers Amid Fluctuations:** TVs and air conditioners remained consistent top-sellers despite market fluctuations. Their steady sales indicate they fulfil essential household needs, unaffected by seasonality or trends, making them crucial revenue drivers in the electronics category.
- 2) **Seasonal Peaks in Air Conditioner Sales:** The analysis revealed significant seasonal spikes in air conditioner sales during summer months, with demand more than doubling between April and June. This predictable seasonality highlights the need for strategic stock planning and promotional campaigns during this period to capitalize on high demand while avoiding stockouts.
- 3) **High Revenue Contributors:** TVs and air conditioners, while strong in sales volume, are also top contributors to overall revenue. Together, they account for nearly 60% of total sales in the electronics category. Their relatively high price points, combined with stable consumer demand, ensure they remain central to the business's profitability and inventory strategies.

- 4) **Price Sensitivity in Mid-Range Appliances:** Analysis of mid-range speaker and printer revealed significant price sensitivity. A slight reduction in price resulted in a substantial boost in sales volume, suggesting that customers in this segment are particularly responsive to promotions and discounts.
- 5) **Promotions are crucial** in driving sales across different customer segments. For high-demand products like TVs and air conditioners, seasonal discounts and bundle deals (e.g., with warranties) work well. For mid-range items like speakers or printers, price-sensitive promotions such as limited-time discounts and cashback offers are effective. Flash sales and loyalty programs can also boost sales for these segments. For underperforming items like blenders or toasters, clearance sales or bundling with popular products can help reduce excess inventory.
- ❖ The bar chart shows TVs with the highest average price, followed by air conditioners and mobile phones. Fans and mixer grinders have the lowest prices. The chart reflects a clear price variation across different categories of appliances, with large electronics generally costing more than smaller household items.



Graph-6: Average Price of Top 10 Appliances



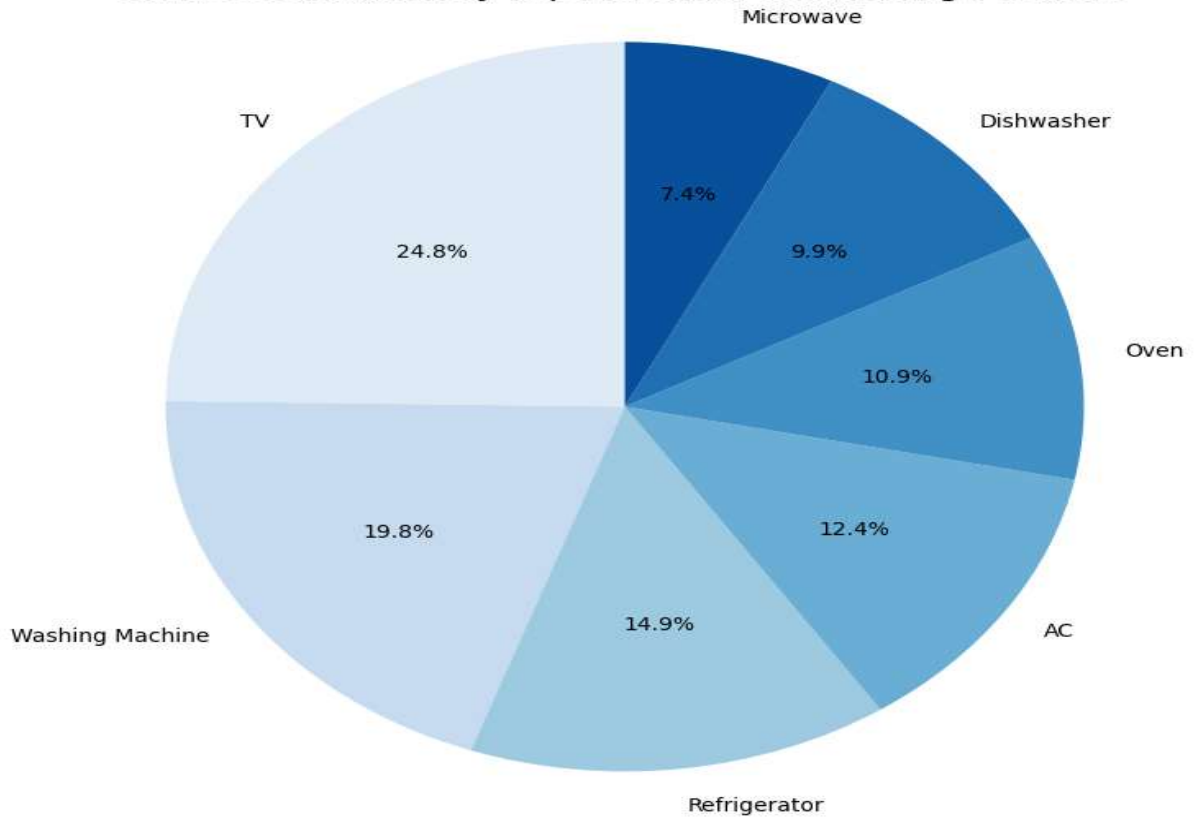
Graph-7: Parallel Growth Analysis

3.4 Top Revenue-Generating Products:

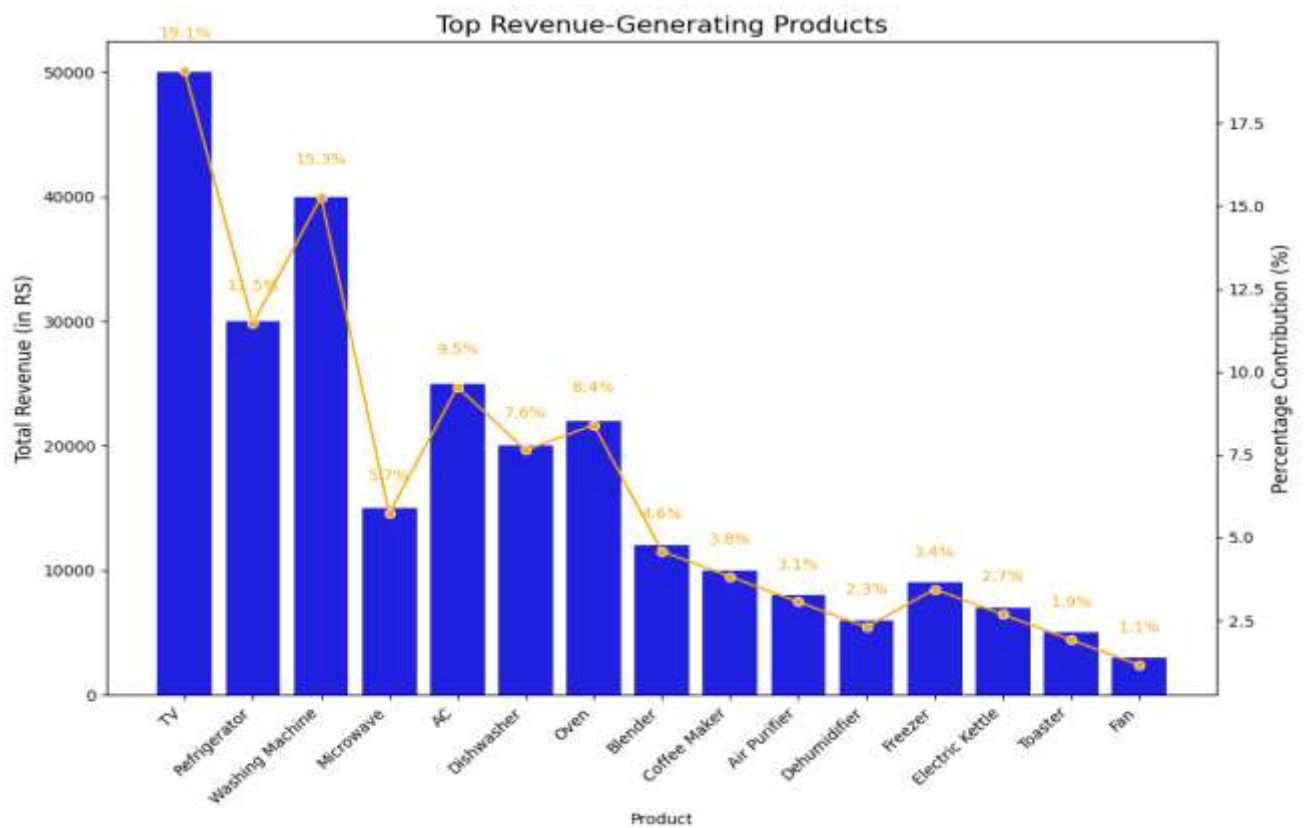
The pie chart effectively visualizes the sales distribution among the top revenue-generating products within the electronics category.

- ❖ **Dominance of Key Products:** The data reveals that a few key products, particularly TVs, washing machines, and mobile phones, dominate the revenue stream. TVs consistently generate the highest revenue, reflecting their central role in modern consumer lifestyles and their frequent upgrades.
- ❖ **Market Strategy Insights:** The significant share held by TVs and washing machines suggests a potential focus for future marketing campaigns and inventory planning. Enhancing promotional activities for these key products could further increase sales.

Sales Distribution by Top Revenue-Generating Products



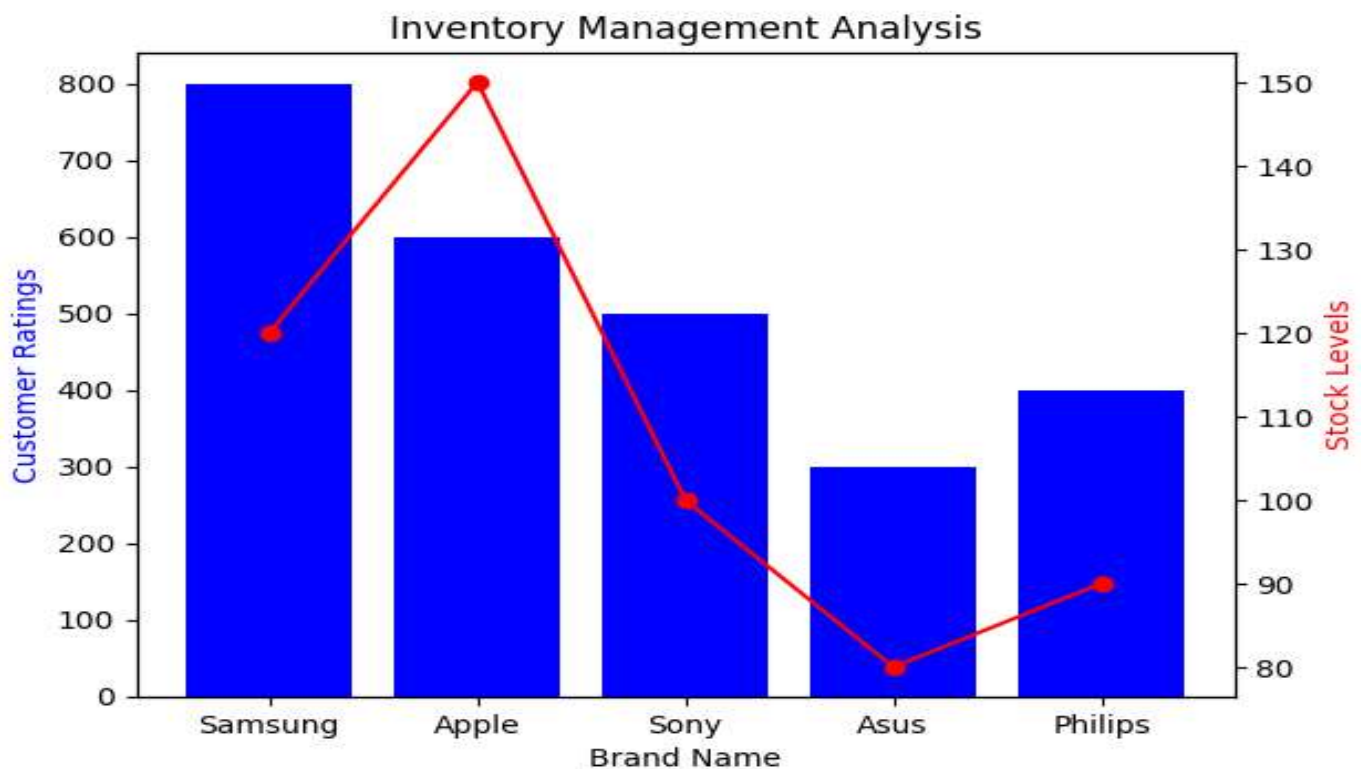
Graph-8: Sales Distribution by Top Revenue-Generating Products



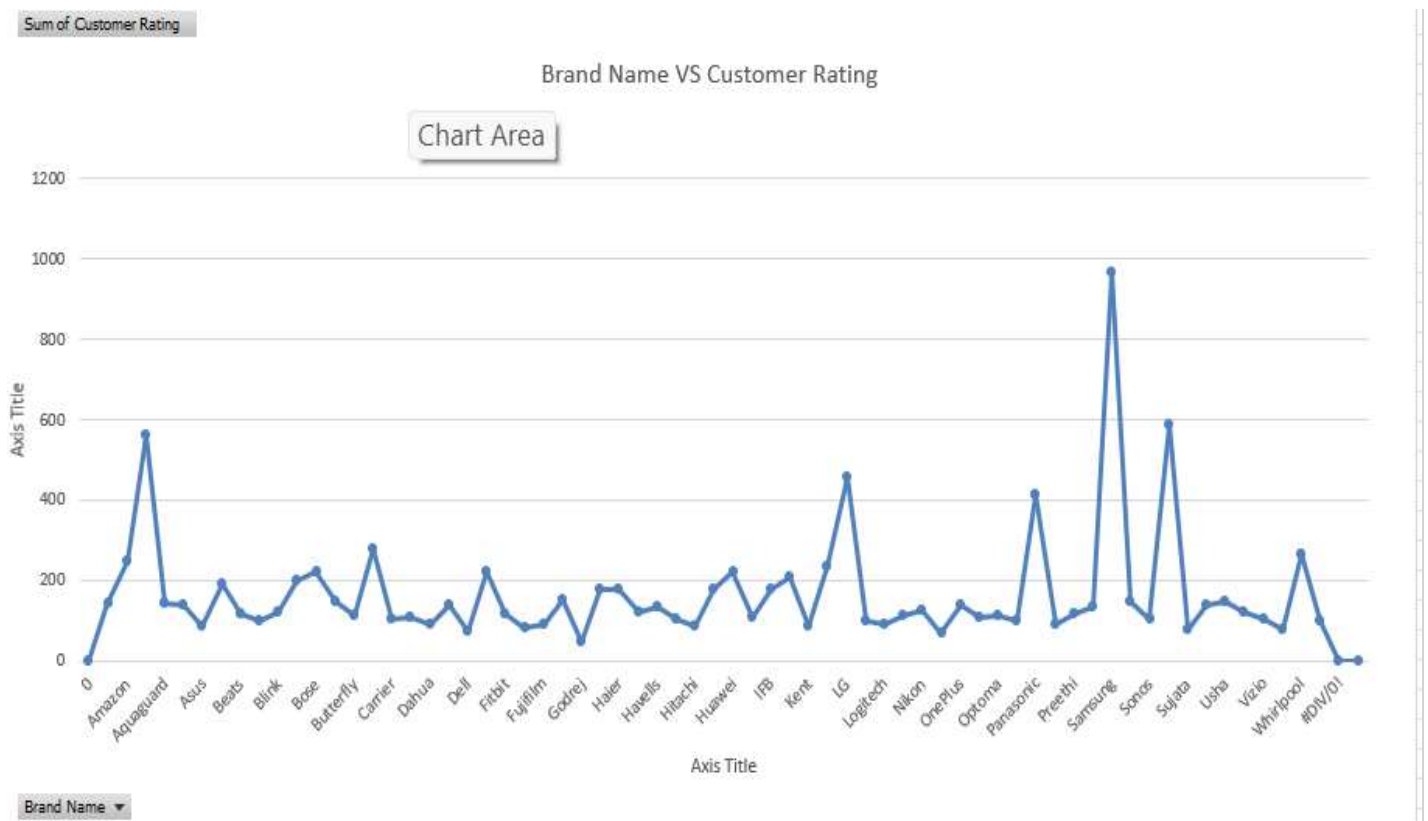
Graph-9: Top Revenue-Generating Products

3.5 Inventory Management Analysis:

- ❖ **Customer Rating vs. Stock Levels:** The analysis of inventory management for various brands like Samsung, Apple, Sony, Asus, and Philips reveals significant variations between customer ratings and stock levels. **Samsung** and **Apple** show the highest customer ratings, with Samsung leading at 800 ratings and Apple closely behind at 700. However, stock levels do not consistently align with customer demand
- ❖ While Samsung has the highest customer ratings, its stock levels are slightly lower compared to brands like Apple, which exhibits higher stock levels but similar customer interest. This indicates a potential misalignment between supply and demand for Samsung products.
- ❖ **Brand Performance Analysis:** In terms of **brand performance**, **Samsung** and **Apple** outperform other brands in terms of customer satisfaction, but stock levels fluctuate significantly for less popular brands such as **Asus** and **Philips**.
- ❖ **Seasonal and Trend-Based Adjustments:** Brands like **Samsung** and **Apple**, which receive high customer ratings, should prioritize frequent stock adjustments, particularly during peak sales periods or promotional events



Graph-10: Inventory Management Analysis



Graph-11: Brand Name vs Total Customer Rating

4 Interpretation of Results and Recommendation

The examination of the sales data from January 2022 to January 2024 reveals important trends that can guide strategic decision-making and provide insightful information about the operation of the business.

4.1 Interpretation and Recommendations on Sales Trend Analysis:

Analysing the sales data for electronic appliances revealed significant trends in quantity sold and profit across various product categories. High-demand items like TVs and air conditioners experienced seasonal sales spikes, particularly in the summer and during major shopping events. In contrast, lower sales figures for products such as blenders and toasters suggest challenges in these categories.

Recommendations:

1. **Capitalize on Seasonal Peaks:** Increase inventory of high-demand products before peak seasons and run promotional campaigns to drive sales.

2. **Ongoing Trend Monitoring:** Establish a monitoring system to track sales trends and adjust inventory and marketing strategies accordingly.
3. **Maintain Profitability Through Seasonal Promotions:** For products with consistent but lower sales, such as blenders and toasters, running seasonal promotions or bundling them with more popular items can help maintain profitability. This approach can also drive-up sales for slower-moving products while keeping overall stock levels optimized.

4.2 Interpretation and Recommendations on Product Performance Analysis:

The product performance analysis revealed key insights into consumer preferences and purchasing behaviour. Notably, **TVs** and **Washing Machines** emerged as top performers, contributing significantly to overall revenue. Seasonal demand patterns were observed, indicating that certain products perform better during specific times of the year.

Recommendations:

1. **Focus on Best-Sellers:** Maintain optimal inventory levels for high-performing products and consider expanding their range with complementary items to enhance customer offerings.
2. **Monitor Underperformers:** Analyse low-performing products to identify reasons for poor sales, and consider targeted marketing strategies or promotional offers to boost interest.

4.3 Interpretation and Recommendations on Time Series Analysis:

The time sales analysis highlighted significant fluctuations in sales volume over different periods. Key trends showed peaks during specific months and holidays, suggesting that consumer buying behaviour is influenced by external factors like seasonal changes and promotional events.

Recommendations:

1. **Automate Price Updates and Stock Information:** To save time during busy periods, automate price and stock information updates, providing real-time notifications to customers via SMS or email for high-demand items like TVs and Air Conditioners.
2. **Prioritize Stock for Peak Demand Products:** Use sales data to forecast peak demand for popular items like Washing Machines and Refrigerators, scheduling stock replenishment in advance to ensure key products are always available.
3. **Streamline Customer Communication:** Often, staff spends a considerable amount of time informing customers about stock availability and pricing for various electronic appliances. To streamline this process, regularly updating product prices and stock levels

on a digital display or an online platform can save valuable time for both staff and customers.

4.4 Interpretation and Recommendations on Top Revenue-Generating Products:

The analysis of top revenue-generating products revealed that a small selection of appliances drives a substantial portion of overall sales. **TVs** and **air conditioners** were identified as leading contributors, emphasizing their importance in the product lineup.

Recommendations:

1. **Optimize Marketing for Top Products:** Enhance promotional efforts and marketing strategies focused on these high-revenue products to further increase market share and sales.
2. **Leverage Cross-Selling Opportunities:** Identify complementary products that can be marketed alongside top revenue generators to maximize sales potential and improve customer satisfaction.

4.5 Interpretation and Recommendations on Inventory Management Analysis:

- ❖ **High-Demand Brands:** Samsung and Apple show strong customer ratings but inconsistent stock levels. Samsung, despite being a top performer, may face stockouts due to lower inventory, while Apple appears overstocked.
- ❖ **Low-Demand Brands:** Sony, Asus, and Philips have lower customer ratings and stock levels, indicating weaker demand and potential overstock issues.

Recommendations:

1. **Demand-Driven Stocking:** Prioritize stock for high-demand brands like Samsung and Apple, ensuring frequent replenishment to avoid stockouts.
2. **Reduce Overstock:** Minimize inventory for low-performing brands to reduce holding costs.
3. **Seasonal Adjustments:** Align stock with seasonal demand, increasing levels for products like air conditioners during peak months.

Projected Business Impact: Optimizing stock levels and promotions is expected to reduce costs from stockouts and overstock. Maintaining sufficient stock for high-demand items could boost peak season revenue by 10-15%, while targeted promotions for underperforming products may cut holding costs by 8-12%. These strategies should improve profitability and operational efficiency.

In **conclusion**, this project will help Reliance Digital achieve its key objectives of analysing customer behaviour and optimizing stock levels. The analysis provided clear insights into how seasonal trends, product performance, and purchasing patterns impact inventory management. By focusing on these areas, the project highlighted the importance of aligning stock levels with real-time demand to minimize stockouts and overstock situations, ultimately enhancing both profitability and customer satisfaction.

Actionable recommendations from the analysis include maintaining adequate stock for top-performing products like mobile phones and air conditioners, while implementing more aggressive sales strategies, such as bundling or targeted promotions for underperforming products. Additionally, the analysis suggests a pricing adjustment strategy for products with high sales but low profit margins to improve overall profitability. Adopting real-time inventory tracking and demand forecasting based on these insights will allow Reliance Digital to better meet customer needs and enhance its operational efficiency.