BDM CAPSTONE FINAL REPORT

Analyzing The Business Model of Hostel Canteen

Submitted by

Name: Parveen

Roll number: 21f3001560

IITM Online BS Degree Program,

Indian Institute of Technology, Madras, Chennai

Tamil Nadu, India, 600036

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1. EXECUTIVE SUMMARY: -

This project examines the business model of the hostel canteen at Boy's Hostel 6 (Teja Singh Hostel) at Panjab University, Chandigarh. Operating on a B2C basis, the canteen caters to the diverse preferences of the hostel's students.

Analysis of 74 days of data reveals that high-selling items like milk, paratha, and chai generate significant revenue, with milk being the top revenue generator despite moderate sales. In contrast, items like banana shake and cold coffee show low sales, indicating a need for better marketing strategies. Correlation analysis suggests bundling opportunities for these low-selling items, and seasonal variations highlight the demand for cold beverages.

Effective inventory management is crucial, as frequent stockouts of popular items like milk and biscuits suggest. Recommendations include enhancing promotional efforts for high-revenue items, adjusting pricing strategies for low-margin items, and improving inventory management to prevent stockouts. Additionally, addressing operational issues such as the lack of a proper menu card and limited seating can enhance the customer experience, driving higher sales and satisfaction. These strategic actions are essential for optimizing the canteen's performance and profitability.

2. Detailed Explanation of Analysis Process/Method: -

After collecting 74 days' worth of data, I added the data into Google Sheets, Zoho Sheet, and Excel to observe any missing values, visualize which variables needed to be considered, clean the data for efficient processing, organize the data for deeper insights, and analyze it using various graphs and charts. The usage of these charts provided a clear and concise way to understand the performance and distribution of various metrics within the business, helping to identify trends, patterns, and areas of focus crucial for decision-making. Utilizing different types of charts offered a comprehensive understanding of various aspects of the shop's operations, sales, profit, inventory management and scalability. This analysis aids in improved decision-making and optimizing business strategies for enhanced profitability. The following charts were used to highlight key insights: Line Chart, Bar Graphs (Top 10 Items Sold, Bar Graph for Total Sales amount for Each Item), Pie Chart, Heatmap, and Dual Bar Graphs (Percent of Total Quantity Sold vs. Percent of Total Revenue Generated for Least 10 Items, Percent of Total Quantity Sold vs. Percent of Total Revenue Generated for Top 10 Items).

Using these different types of visualizations provided a comprehensive analysis of the sales data, allowing for various perspectives and insights into the business performance. The analysis can help guide inventory management, menu adjustments, and promotional strategies to enhance overall sales and customer satisfaction

Visualization and Analysis

Various charts and graphs were used to visually represent the data, which provided insights into the business performance and highlighted potential areas for improvement. Below are the detailed descriptions of the graphs used:

In Fig 3.1: Line Chart for Sales Trends Over Time

- **Purpose**: To analyze sales trends over the 74-day period, identifying top-selling and least-selling items.
- **Reason for Choosing**: Line charts effectively reveal patterns over time, such as seasonal variations or the impact of promotions.
- **Explanation**: This line chart shows the quantities sold over time, helping visualize daily sales trends and variations for quantities over the given period.

In Fig 3.2: Bar Graph for Top 10 Items Sold

- **Purpose**: To highlight the 10 items with the highest sales.
- **Reason for Choosing**: Bar graphs are excellent for detailed comparisons, making it easy to see which items are performing well.
- **Explanation**: This bar chart compares the daily quantities of the top 10 items sold, providing a clear comparison of daily sales quantities.

In Fig 3.3: Pie Chart for Revenue Generated by Top 5 Items

- **Purpose**: To show the revenue contribution of the top 5 items.
- **Reason for Choosing**: Pie charts are ideal for showing revenue distribution among a small number of items, providing a quick snapshot of their financial impact.
- **Explanation**: The pie chart displays the revenue distribution among the top 5 revenue-generating items, highlighting their financial contribution to the total revenue.

In Fig 3.4: Bar Graph for Total Sales amount for Each Item

- **Purpose**: To visualize the quantity sold for each item over the 74-day period.
- **Reason for Choosing**: Bar graphs clearly show which items have the highest, lowest, and moderate sales, making it easier to analyze overall sales performance.
- **Explanation**: This bar graph shows the total sales amount for each item over the 74 days, helping to identify which items are the most and least popular.

In Fig 3.5: Heatmap for Correlation of Sales for Least 10 Sold Items

- **Purpose**: To identify correlations between the sales of the least 10 sold items.
- **Reason for Choosing**: Heatmaps effectively display relationships between multiple variables in a compact form, making it easy to identify items whose sales are positively or negatively correlated.
- **Explanation**: The heatmap shows the correlation coefficients between the sales of the least 10 sold items, with positive correlations indicating that the sales of two items move in the same direction and negative correlations indicating they move in opposite directions.

In Fig 3.6: Dual Bar Graph for Percent of Total Quantity Sold vs. Percent of Total Revenue Generated for Least 10 Items

- **Purpose**: To compare the percentage of total quantity sold with the percentage of total revenue generated for the least sold items.
- **Reason for Choosing**: This dual bar graph format allows for an easy comparison of two related metrics, highlighting discrepancies between quantity sold and revenue generated.
- **Explanation**: The graph shows that items like "Poha" and "Bread Omelette" generate a higher percentage of revenue compared to their sales quantity, indicating higher profit margins or pricing.

In Fig 3.7: Dual Bar Graph for Percent of Total Quantity Sold vs. Percent of Total Revenue Generated for Top 10 Items

- **Purpose**: To compare the percentage of total quantity sold with the percentage of total revenue generated for the top sold items.
- **Reason for Choosing**: This dual bar graph format provides a clear comparison between quantity sold and revenue generated, helping to identify items that are either high in demand or high in revenue or both.

- **Explanation**: The graph shows that items like "Chai" and "Paratha" not only have high sales quantities but also contribute significantly to the revenue, making them key products for the business.

In Fig 3.8: Line Graph of Milk and Biscuit Sales Over Time

- **Purpose:** To analyze and compare the sales trends of milk and biscuits over a 74-day period.
- **Reason for Choosing:** Line charts are effective for visualizing trends and changes over time. They allow us to observe the sales patterns of both milk and biscuits, identifying periods of high and low sales, and any seasonal variations or anomalies.
- **Explanation:** The line graph shows the quantity of milk and biscuits sold each day over the 74-day period. This visualization helps in identifying trends, such as consistent sales patterns, spikes in sales, or any drops. Overall, this graph helps in understanding how the sales of these two items fluctuate over time, providing insights into customer preferences and potential factors influencing sales.

By analyzing the sales data using these visualizations, the business can make informed decisions to optimize sales strategies, manage inventory effectively, and enhance overall profitability.

3. Results and Findings: -

Let's analyze the business model of the hostel canteen using various charts, such as line charts, bar graphs, pie charts, Heatmap, and Dual Bar Graphs and more. We will identify trends in the business, uncover potential problems, and explore solutions through graph analysis. By studying each graph, we aim to understand why these trends are happening and gain insights into how these visualizations can help to solve our business problems.

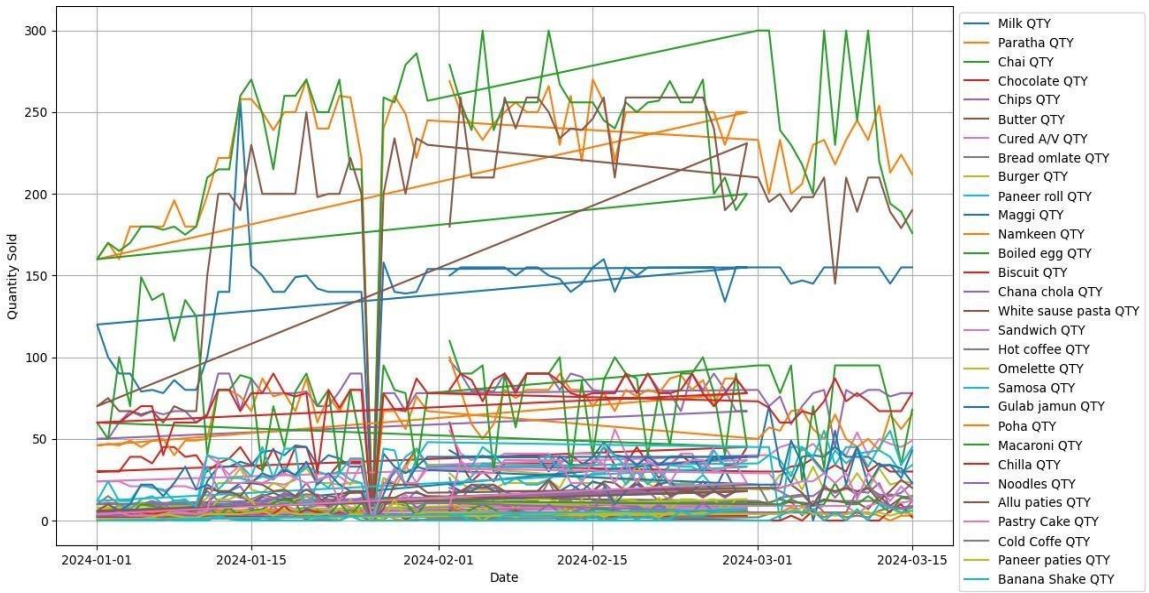

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Fig 3.1: Daily sales of items VS Quantity sold of each item

Top-selling Items:

- **Milk QTY:** The quantity sold of milk remains consistently high throughout the period, indicating that it is one of the most popular items.
- **Paratha QTY:** Paratha also shows high and consistent sales, with some fluctuations. It is another top selling item.
- **Chai QTY:** The sales of chai are consistently high, making it a popular item as well.
- **Butter QTY**: The sales of Butter are consistently high
- **Moderate-Selling Items:**
- **Paneer Roll QTY, and Maggi QTY:** These items show moderate sales with some fluctuations. They have periods of higher sales but are not as consistently high as the top-selling items.

Low-Selling Items:

- **Banana shake QTY, Cold Coffee QTY, Chilla QTY, Paneer Patties QTY:** These items have very low sales compared to others. They may need promotional efforts or adjustments in pricing.
- **Specialty Items:** Items like Sandwich, Noodles, and Macaroni also have lower sales, indicating they might be less popular or have a niche audience

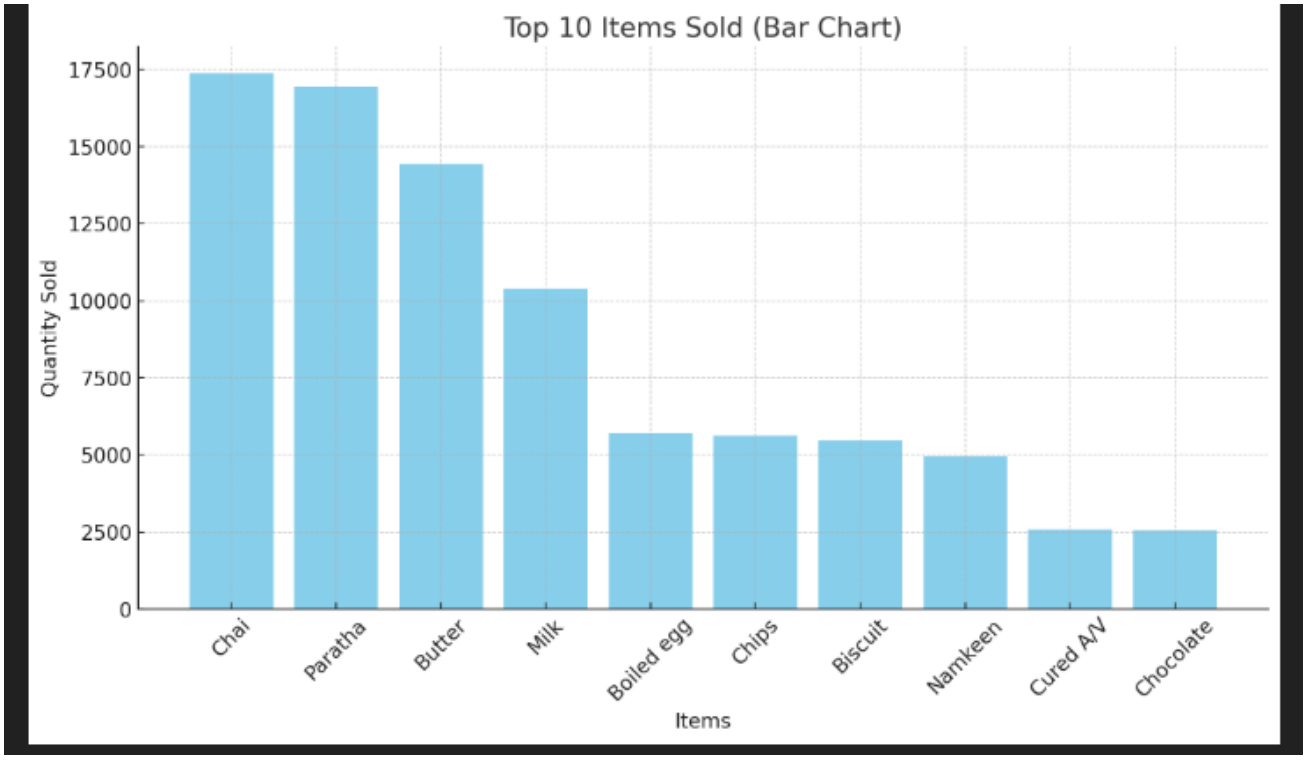


Fig 3.2: Bar Graph for Top 10 Items Sold

Analysis:

Popular Items:

- The high sales of **Chai** and **Paratha** reflect their cultural significance and daily consumption patterns in the region. These items are likely consumed multiple times a day, driving up their sales numbers.

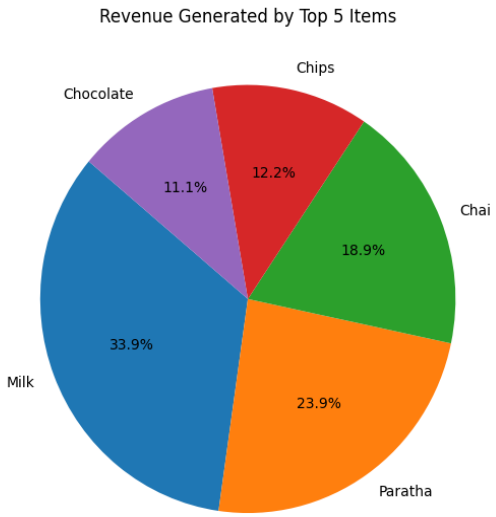
Staples and Essentials:

- **Butter and Milk** are everyday essentials, explaining their high sales figures. Their consistent demand highlights their importance in the customers' shopping lists.

Snacks and Convenience Foods: Items like **Boiled egg, Chips, and Biscuit** show moderate sales, indicating their role as convenient and quick snack options. Their steady demand suggests they are popular choices for casual consumption.

Less Frequent Purchases:

- **Namkeen, Cured A/V, and Chocolate** have lower sales quantities, which could be due to their less frequent consumption or being more niche items. Despite this, they still make it into the top 10, signifying a reasonable level of demand.



In Fig 3.3: A pie chart showing Revenue Generated by Top 5 Items

Analysis:

Milk: This category generates the highest revenue, accounting for 33.9% of the total revenue. Additionally, milk is the 4th highest-selling item, and is the first-highest revenue generator

Paratha: This item is the second-largest revenue generator, contributing 23.9% to the total revenue. Paratha is the 2nd most sold item and is the second-highest revenue generator.

Chai: With 18.9% of the total revenue, this item ranks third on the list. Despite being the most sold item, chai does not generate the highest revenue due to its low price, placing it third in overall revenue generation.

Chips: This item generates 12.2% of the total revenue, making it the fourth highest revenue contributor. Chips are the 6th most sold item, yet they generate the 4th highest revenue.

Chocolate: The smallest revenue generator among the top five, contributing 11.1% of the total revenue. Chocolate is the 10th most sold item but ranks 5th in revenue generation.

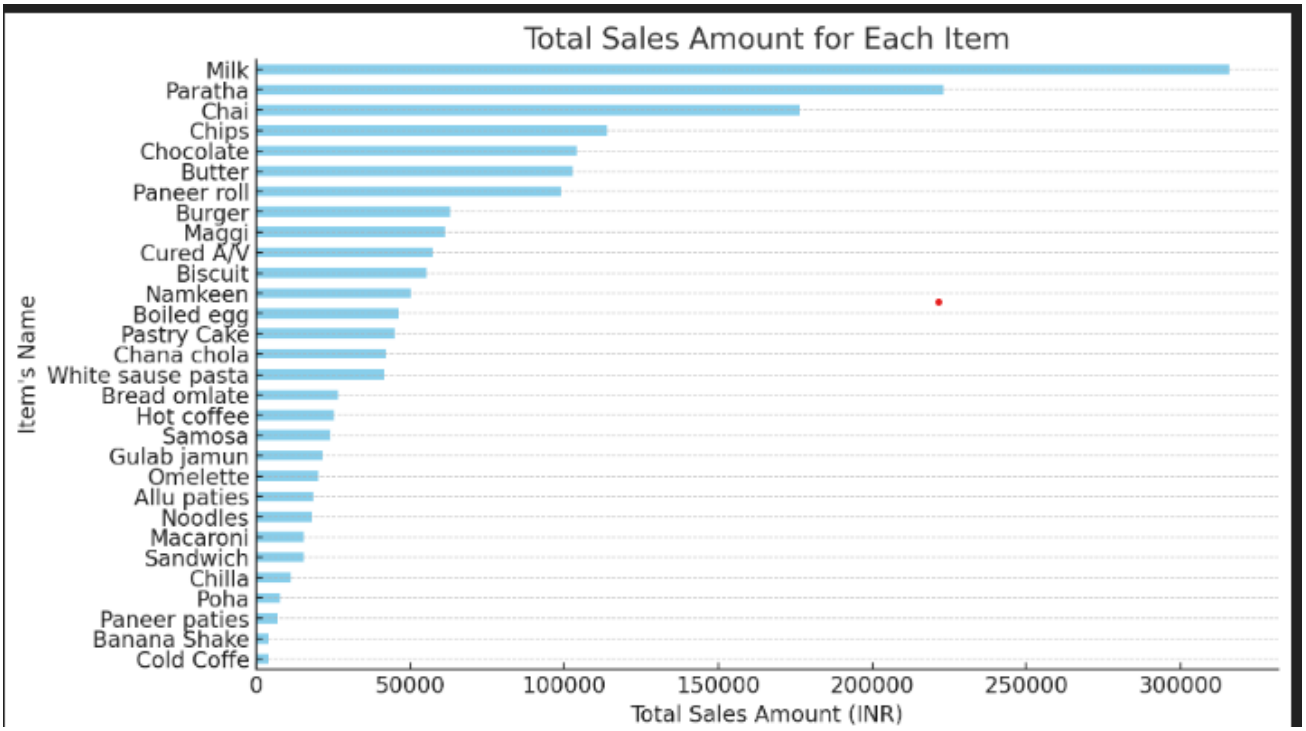


Fig. 3.4: A bar chart of Total sales amount.

Overall Analysis:

Milk stands out as a clear leader in revenue, indicating its high demand and possibly a high price point. This suggests that Milk is a staple product that significantly contributes to overall revenue, making it a critical item for inventory and sales strategies.

- **Traditional items like Paratha, Chai, and Chips** also show strong revenue figures. This suggests a high preference for these items among customers, either because of their frequent purchase or because they are sold at a profitable price point. Their consistent performance makes them essential for maintaining steady revenue streams.
- **Snack items and convenience foods (e.g., Burger, Maggi, Biscuit)** show decent revenue figures, reflecting their steady demand. These items are likely popular for their convenience and quick consumption, contributing reliably to overall revenue. Ensuring their availability and possibly expanding their variety could further enhance revenue.
- **Low revenue items** might indicate niche preferences or areas with potential for marketing improvement. These items, which include Gulab jamun, Omelette, Allu patties, Noodles,

Macaroni, Sandwich, Chilla, Poha, Paneer patties, Banana Shake, and Cold Coffee, contribute the least to total revenue. This could be due to lower sales volume, lower price points, or both. There might be an opportunity to increase their visibility, offer promotions, or adjust pricing strategies to boost their revenue.

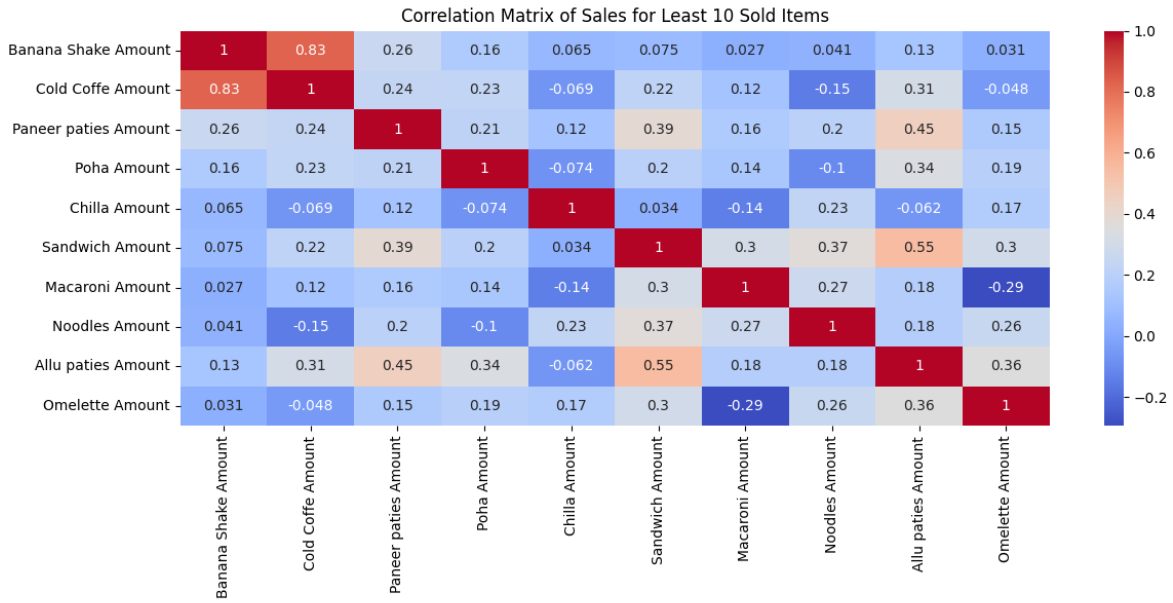


Fig 3.5: Heatmap for Correlation of Sales for Least 10 Sold Items

Understanding the Heatmap

Color Gradient

- **Color Spectrum**: The color gradient ranges from red to blue.
  - **Red** indicates a strong positive correlation (values close to +1).
  - **Blue** indicates a strong negative correlation (values close to -1).
  - **Neutral (white or light shades)** indicates no correlation (values close to 0).

Correlation Values

- Each cell in the matrix represents the correlation coefficient between the item on the Y-axis and the item on the X-axis.
- The correlation coefficient measures the strength and direction of a linear relationship between two variables.

Key Observations

Strong Positive Correlation:

- **Banana Shake Amount and Cold Coffee Amount**: The correlation coefficient is 0.83, indicated by a dark red color. This suggests that when the sales of Banana Shakes increase, the sales of Cold Coffee also tend to increase significantly, and vice versa.
- **Paneer Patties Amount and Allu Patties Amount**: The correlation coefficient is 0.45, also suggesting a positive relationship, although less strong compared to Banana Shake and Cold Coffee.

Weak or No Correlation:

- **Banana Shake Amount and Noodles Amount**: The correlation coefficient is 0.041, indicated by a very light color. This suggests almost no correlation between the sales of Banana Shakes and Noodles.
- **Chilla Amount and Allu Patties Amount**: The correlation coefficient is -0.062, indicating a very weak negative correlation.

Negative Correlation:

- **Macaroni Amount and Sandwich Amount**: The correlation coefficient is -0.29, indicated by a shade of blue. This suggests that when the sales of Macaroni increase, the sales of Sandwiches tend to decrease, and vice versa, although the relationship is not very strong.

Specific Item Relationships

Sandwich Amount:

- Positively correlated with Paneer Patties Amount (0.39), indicating that higher sales of sandwiches are associated with higher sales of Paneer Patties.
- Negatively correlated with Macaroni Amount (-0.29), indicating an inverse relationship between these two items.

Allu Patties Amount:

- Shows a moderate positive correlation with Paneer Patties Amount (0.45) and Sandwich Amount (0.55), suggesting these items often sell together.

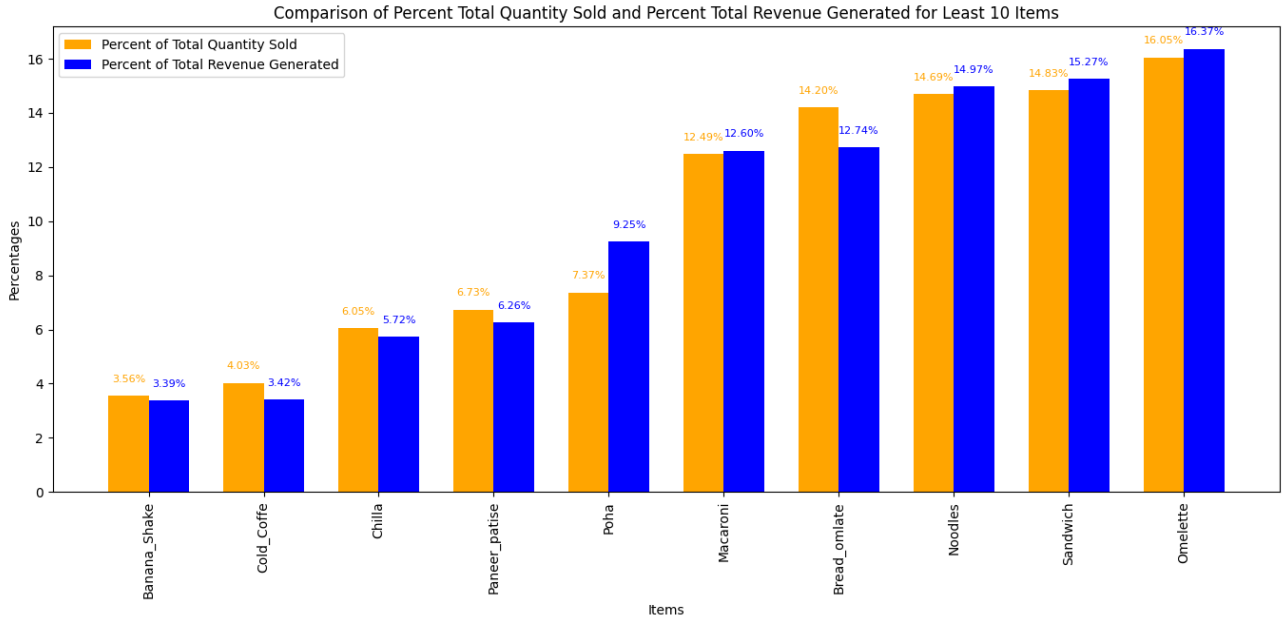


Fig 3.6: Dual Bar Graph for Percent of Total Quantity Sold vs. Percent of Total Revenue Generated for Least 10 Items

Key Observations

Banana Shake:

- Observation: The quantity sold and revenue generated percentages are very close, indicating that the pricing of Banana Shakes is relatively consistent with its sales volume.

Cold Coffee:

- Observation: The revenue percentage is slightly lower than the quantity sold percentage, suggesting a lower price point or possibly discounts impacting revenue.

Chilla:

- Observation: Similar to Cold Coffee, Chilla has a slightly lower revenue percentage compared to its quantity sold, indicating potential pricing strategies or promotions.

Paneer Patties:

- Observation: The difference is minimal, showing a close alignment between sales volume and revenue.

Poha:

- Observation: Poha generates a higher percentage of revenue compared to its quantity sold, suggesting a higher price point or high profitability.

Macaroni:

- Observation: The percentages are almost identical, indicating a balanced relationship between sales volume and revenue.

Bread Omelette:

- Observation: Although Bread Omelette has a higher sales volume, its revenue percentage is slightly lower, which might suggest lower pricing or discounts.

Noodles:

- Observation: Noodles have a very close alignment between the percentage of total quantity sold and revenue generated.

Sandwich:

- Observation: Sandwiches have a slightly higher revenue percentage, indicating a relatively higher price or effective sales strategies.

Omelette:

- Observation: The highest in both categories, with a very close match between quantity sold and revenue, indicating strong sales and consistent pricing.

Overall Insights

- **Price Consistency**: Items like Macaroni, Noodles, Sandwich, and Omelette show a close alignment between quantity sold and revenue generated percentages, indicating consistent pricing strategies.
- **Higher Revenue vs. Quantity Sold**: Items like Poha show a higher percentage of revenue generated compared to the quantity sold, suggesting higher profitability or premium pricing.
- **Lower Revenue vs. Quantity Sold**: Items like Cold Coffee and Bread Omelette have lower revenue percentages compared to their sales volume, which could indicate lower pricing or frequent discounts/promotions

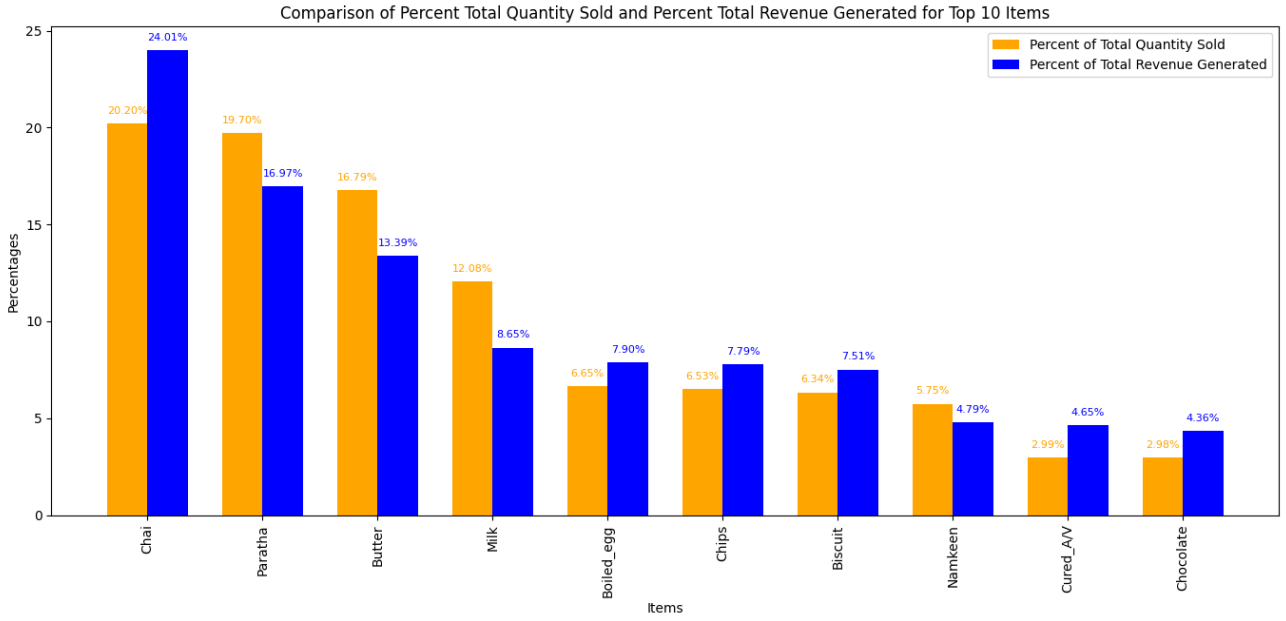


Fig 3.7: Dual Bar Graph for Percent of Total Quantity Sold vs. Percent of Total Revenue Generated for Top 10 Items

Key Observations

Chai:

- Observation: Chai generates a higher percentage of revenue compared to its quantity sold, indicating it is a high-revenue item.

Paratha:

- Observation: Paratha's revenue percentage is slightly lower than its quantity sold percentage, suggesting it might be sold at a lower price or with discounts.

Butter:

- Observation: Butter also has a lower revenue percentage compared to its quantity sold, indicating a lower price point or promotions.

Milk:

- Observation: Milk shows a significant drop in revenue percentage compared to quantity sold, suggesting a lower profit margin.

Boiled Egg:

- Observation: The boiled egg has a slightly lower revenue percentage than quantity sold, indicating a lower price or frequent promotions.

Chips:

- Observation: Chips also have a lower revenue percentage compared to the quantity sold, suggesting a lower price point.

Biscuit:

- Observation: Biscuits generate a higher percentage of revenue compared to their quantity sold, indicating higher profitability or premium pricing.

Namkeen:

- Observation: Namkeen has a lower revenue percentage compared to its quantity sold, indicating lower pricing or promotions.

Curd (A/V):

- Observation: This item generates a higher percentage of revenue compared to its quantity sold, suggesting higher profitability.

Chocolate:

- Observation: Chocolates also generate a higher percentage of revenue compared to their quantity sold, indicating they are sold at a higher price point.

Overall Insights

- **High Revenue Items**: Items like Chai, Biscuit, Curd(A/Y), and Chocolate have higher revenue percentages compared to their quantity sold, indicating they are sold at higher prices or have higher profit margins.
- **High Quantity, Lower Revenue**: Items like Milk, Paratha, and Butter have higher quantities sold but generate lower revenue percentages, suggesting they might be sold at lower prices or frequently discounted.
- **Balanced Items**: Items like Boiled Egg and Chips have relatively balanced percentages, indicating a consistent relationship between quantity sold and revenue generated.

Strategic Implications

- **Focus on High Revenue Items**: Emphasizing and promoting high-revenue items like Chai, Biscuit, Curd(A/V), and Chocolate can maximize profitability.
- **Revisit Pricing**: Reviewing the pricing strategies for items with lower revenue percentages compared to quantity sold (e.g., Milk, Paratha, Butter) could help in increasing their profitability.

- **Promotions and Discounts**: Understanding the impact of promotions on items with lower revenue percentages can help in optimizing discount strategies to ensure profitability.

By analyzing the relationship between the quantity sold and revenue generated, businesses can make informed decisions on pricing, promotions, and product focus to enhance overall performance.

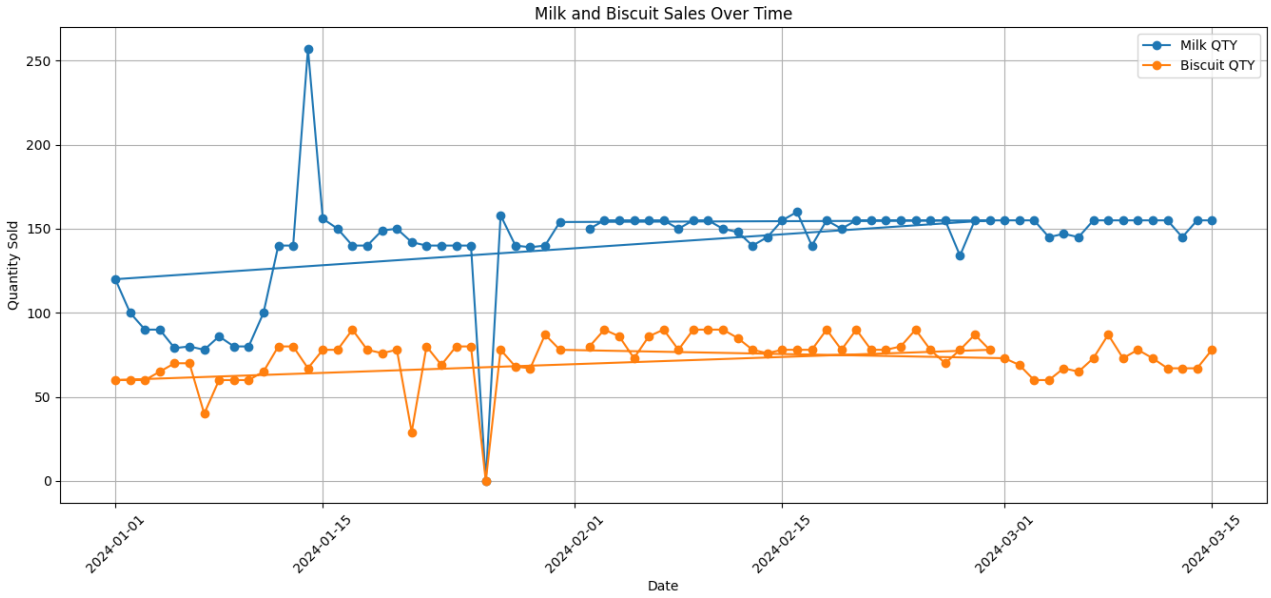


Fig 3.8: Line Graph of Milk and Biscuit Sales Over Time

Milk QTY:

- **Trend**: There is an initial decrease in sales followed by a sharp increase around mid-January, peaking around the end of January. After this peak, sales drop but then stabilize at a higher level compared to the beginning.
- **Trend Line**: The blue trend line indicates a slight overall increase in milk sales over the period.

Biscuit QTY:

- **Trend**: Biscuit sales show fluctuations but remain relatively stable with some dips and peaks. The quantity sold is consistently lower than milk sales.
- **Trend Line**: The orange trend line indicates a slight overall increase in biscuit sales over the period.

Observations:

Milk Sales:

- The milk sales start around 100 units per day and drop slightly before sharply increasing to a peak of over 250 units. After peaking, there is a significant drop, but the sales stabilize at around 150 units per day. There are some fluctuations around early February, but the trend remains stable afterward. The initial low sales from January 1 to January 15 can be attributed to the winter holiday, which affects the usual sales pattern.

Biscuit Sales:

- Biscuit sales start at around 50 units per day and show minor fluctuations throughout the period. There are occasional dips below 25 units and some peaks around 75 units, but overall, the sales remain consistent. The trend line shows a slight increase over time. The initial low sales from January 1 to January 15 can be attributed to the winter holiday, which affects the usual sales pattern.

Trend Analysis:

- Both milk and biscuit sales exhibit a general upward trend.
- The spike in milk sales could be due to specific events, promotions, or increased demand during that period.
- Biscuit sales are less volatile compared to milk, indicating a steadier consumption pattern.

Conclusion:

- The graph highlights the varying sales patterns of milk and biscuits, showing that milk sales are more volatile with higher peaks and troughs, while biscuit sales are more stable with minor fluctuations.
- Understanding these trends can help in inventory management and planning for future demand in the hostel canteen.

4. Interpretation of Results and Recommendation: -

The analysis of the sales data from the hostel canteen over a period of 74 days has provided several key insights into the business performance:

Sales Trends Over Time:

- **Milk Sales**: Initially decreased but sharply increased mid-January, peaking at the end of January, and then stabilizing at a higher level.

- **Biscuit Sales**: Showed minor fluctuations but remained relatively stable, with a slight overall increase.
- **General Trend:** Both milk and biscuit sales exhibited an upward trend, with milk sales being more volatile. Given that both milk and biscuits experienced periods where they went out of stock, this analysis highlights the importance of better inventory management. By understanding these sales patterns, the canteen can ensure adequate stock levels to meet demand and avoid stockouts

Item Performance:

- **Top-Selling Items**: Milk, Paratha, Chai, and Butter were consistently high in sales, indicating their popularity.
- **Moderate-Selling Items**: Paneer Roll and Maggi had moderate sales with some fluctuations.
- **Low-Selling Items**: Banana Shake, Cold Coffee, Chilla, and Paneer Patties had very low sales, suggesting the need for promotional efforts or pricing adjustments.

Revenue Generation:

- **Top Revenue Generators**: Milk, Paratha, and Chai were the highest revenue generators, with milk contributing the most despite being the fourth highest in sales quantity.
- **Revenue vs. Quantity Sold**: Items like Poha and Bread Omelette generated higher revenue percentages compared to their sales quantity, indicating higher profit margins or pricing.

Correlation Analysis:

- Items like Banana Shake and Cold Coffee showed a high positive correlation, indicating they are often sold together. While these items are currently selling very well, it is important to note that this data reflects a winter season, during which sales of cold beverages like Cold Coffee and Banana Shake are lower. The current high sales are likely due to the change in season, which should be taken into account when planning inventory and promotions.

Relation between high price and low sales of items:

- The items with the highest prices in the hostel canteen are White Sauce Pasta (50), Paneer Roll (50), Chilla (45), Bread Omelette (45), Chocolate (40), Burger (40), Chana Chola (35), Noodles (35), Macaroni (30), and Omelette (30)

The comparison between high prices and low sales for several items. Specifically, items like Bread Omlatte (average price: 45, sales: 500 units), Noodles (average price: 35, sales: 500 units), Macaroni (average price: 30, sales: 400 units), and Chilla (average price: 50, sales: 300 units) appear in both the "Items with Highest Prices" and "Items with Lowest Sales". This trend suggests that their high prices are likely contributing to their low sales volumes. Conversely, some high-priced items like Paneer Roll (average price: 50) do not appear in the lowest sales chart, indicating that other factors may also be influencing sales. Overall, the data indicates that re-evaluating the pricing strategy for these high-priced items could potentially improve their sales. Adjustments such as lowering prices, offering promotions, or enhancing the value proposition might help increase the sales volumes for these items.

Recommendations: -

Based on the interpretation of the results, the following recommendations can be made:

Focus on High-Revenue Items:

- Emphasize and promote high-revenue items like Milk, Paratha, and Chai to maximize profitability.

Revisit Pricing Strategies:

- Review the pricing strategies for items with lower revenue percentages compared to quantity sold, such as Milk, Paratha, and Butter, to increase their profitability.

Promotional Efforts:

- Implement promotional strategies for low-selling items like Banana Shake and Cold Coffee to boost their sales.

Inventory Management:

- Use the sales trends to better manage inventory, ensuring that high-demand items are always in stock while minimizing waste from low-selling items. For example, since Milk and Biscuits often go out of stock at night, we need to optimize our inventory management to prevent shortages.

Proper Menu Card:

- The absence of a proper menu card in the hostel canteen can be attributed to various factors such as lack of resources, oversight, or a focus on other operational priorities. Without a clear and informative menu card, customers may struggle to make informed choices, leading to potential dissatisfaction and confusion. This can impact the overall customer experience and may result in lost sales opportunities for the canteen.

Limited Seating Space

- Limited seating space in the hostel canteen could be due to physical constraints or inefficient space utilization. It may also result from poor planning or inadequate consideration for customer comfort. Limited seating can lead to crowded conditions, discomfort for customers, and potential loss of business during peak hours.

Menu Adjustments:

- Consider adjusting the menu based on the popularity of items, possibly introducing new items similar to the high-selling ones.