Analyzing The Business Model of Hostel Canteen

A Mid-Term report for the BDM Capstone Project

Submitted by

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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 offers a wide variety of food options tailored to the diverse preferences of the students residing in the hostel.

This analysis presents a detailed overview of the hostel canteen's sales performance over a 74-day period, aiming to identify key trends, address challenges, and propose strategies for enhanced profitability and operational efficiency. The analysis of sales trends through line charts revealed significant fluctuations, Pie charts identified the top-selling items, such as Chai and Paratha, which significantly contribute to overall revenue. Conversely, bar graphs highlighted the least-sold items, indicating opportunities for inventory and menu adjustments.

To address these challenges, several strategic recommendations are proposed. Optimizing inventory management is crucial to prevent stockouts, particularly for high-demand items. Revising menu offerings by discontinuing or promoting underperforming items can better align with customer preferences and enhance profitability. Implementing targeted marketing campaigns will boost awareness and sales, ensuring a balanced sales distribution. Leveraging the insights from descriptive statistics and visualizations will enable informed decisions, optimizing product offerings and inventory levels. By utilizing detailed data analysis and strategic initiatives, the hostel canteen can improve operational efficiency, increase sales, and enhance overall customer satisfaction, ensuring sustained growth and profitability for the business.

2. Proof of Originality: -

a) Letter head: -

The data is provided by Mr. Santokh Singh who is the owner/Contractor of the Boys hostel No. 6 Panjab University sector 14 Chandigarh. Please have a look of the letter head signed by the owner of the Hostel canteen boys' hostel 6

Link to the letter: -

https://drive.google.com/drive/folders/19fcKG5Qwy3aZnB4kuZAmAlSyeHj3Ny51

Link to the Pic: -

https://drive.google.com/drive/folders/19fcKG5Qwy3aZnB4kuZAmAlSyeHj3Ny51

b) Recorded video with the founder in the organization:

Link to the video: -

https://drive.google.com/drive/folders/1V5w0B24YKD_9pYdxpTkzzpiNoAffRiH3

In this video the owner of hostel canteen "Santokh Singh" tells when the canteen had started and gives the full proof of that the data has been collected by Parveen Student in IIT Madras for the BDM project.

3.1. Metadata: -

This section describes the metadata obtained from the pre-processed data.

The data shown below is the data I collected every day from January 2, 2024, to March 15, 2024. I updated the data daily in Excel. The link I provided contains the data for each day

1	ate	Item's Name	Price per item	Qty	Amount
2	10/02/2024	Paneer roll	₹ 50.00	22	₹ 1,100.00
3	10/02/2024	Noodles	₹ 30.00	5	₹ 150.00
4	10/02/2024	Macaroni	₹ 30.00	3	₹ 90.00
5	10/02/2024	Samosa	₹ 10.00	33	₹ 330.00
6	10/02/2024	White sause pasta	₹ 50.00	11	₹ 550.00
7	10/02/2024	Maggi	₹ 25.00	39	₹ 975.00
8	10/02/2024	Boiled egg	₹ 8.00	90	₹ 720.00
9	10/02/2024	Paratha	₹ 13.00	250	₹ 3,250.00
10	10/02/2024	Sandwich	₹ 25.00	8	₹ 200.00
11	10/02/2024	Allu paties	₹ 15.00	18	₹ 270.00
12	10/02/2024	Omelette	₹ 30.00	13	₹ 390.00
13	10/02/2024	Chana chola	₹ 35.00	18	₹ 630.00
14	10/02/2024	Paneer paties	₹ 25.00	4	₹ 100.00
15	10/02/2024	Chilla	₹ 45.00	3	₹ 135.00
16	10/02/2024	Gulab jamun	₹ 13.00	18	₹ 234.00
17	10/02/2024	Milk	₹ 30.00	155	₹ 4,650.00
18	10/02/2024	Chai	₹ 10.00	256	₹ 2,560.00
19	10/02/2024	Hot coffee	₹ 25.00	12	₹ 300.00

a. Link of Metadata: - **https://drive.google.com/drive/folders/1D4QkNpn7mVMh-MXaO7Aa8dHGDmJpouoX**

b. Contents of Metadata data: -

S.NO	Variables/Columns	Description
1	Date	Date for daily data representation.
2	Item's Name	Name of the items sold in hostel canteen.
3	Price per item	Price of each item.
4	Qty	This shows the total quantity of items sold in a day.
5	Amount	Represents the total revenue generated from the sale of each item on a specific date.

c. Link to the Primary Data: -

The upward screen shots are not the complete data for the complete data I'm providing the link.

Link: - **https://drive.google.com/drive/folders/1D4QkNpn7mVMh-MXaO7Aa8dHGDmJpouoX**

d. Cleaned Data: - The Data provided by the merchant has been cleaned. The data in Fig. A: contains cleaned data.

Price			₹30.00		₹13.00		₹10.00
Date	Total Number of Items sold	Total Amount/Revenue =Item QTY*Item Price	Milk QTY	Milk Amount	Paratha QTY	Paratha Amount	Chai QTY
02/02/24	1705	₹29,742.00	150	₹4,500.00	269	₹3,497.00	279
03/02/24	1633	₹26,783.00	155	₹4,650.00	250	₹3,250.00	256
04/02/24	1519	₹25,487.00	155	₹4,650.00	243	₹3,159.00	239
05/02/24	1579	₹26,475.00	155	₹4,650.00	233	₹3,029.00	300
06/02/24	1473	₹25,427.00	155	₹4,650.00	243	₹3,159.00	239
07/02/24	1633	₹26,783.00	155	₹4,650.00	250	₹3,250.00	256
08/02/24	1555	₹25,994.00	150	₹4,500.00	256	₹3,328.00	256
09/02/24	1633	₹26,783.00	155	₹4,650.00	250	₹3,250.00	256
10/02/24	1633	₹26,783.00	155	₹4,650.00	250	₹3,250.00	256
11/02/24	1715	₹28,143.00	150	₹4,500.00	266	₹3,458.00	300
12/02/24	3172	₹52,232.00	148	₹4,440.00	230	₹2,990.00	267
13/2/2024	1532	₹25,816.00	140	₹4,200.00	260	₹3,380.00	256
14/2/2024	1549	₹25,774.00	145	₹4,350.00	220	₹2,860.00	256
15/2/2024	1564	₹26,270.00	155	₹4,650.00	270	₹3,510.00	256
16/2/2024	1675	₹28,758.00	160	₹4,800.00	256	₹3,328.00	245
17/2/2024	1506	₹25,360.00	140	₹4,200.00	220	₹2,860.00	240
18/2/2024	1633	₹26,783.00	155	₹4,650.00	250	₹3,250.00	256
19/2/2024	1596	₹26,956.00	150	₹4,500.00	250	₹3,250.00	250
20/2/2024	1572	₹25,993.00	155	₹4,650.00	250	₹3,250.00	256
21/2/2024	1567	₹25,656.00	155	₹4,650.00	250	₹3,250.00	257
22/2/2024	1540	₹24,704.00	155	₹4,650.00	250	₹3,250.00	269
23/2/2024	1614	₹26,522.00	155	₹4,650.00	250	₹3,250.00	256
24/2/2024	1633	₹26,783.00	155	₹4,650.00	250	₹3,250.00	256
25/2/2024	1624	₹26,443.00	155	₹4,650.00	250	₹3,250.00	270

₹40.00		₹20.00		₹7.00		₹22.00		₹45.00	
Chocolate QTY	Chocolate Amount	Chips QTY	Chips Amount	Butter QTY	Butter Amount	Cured A/V QTY	Cured A/V Amount	Bread omlate QTY	Bread omlate Amoun
60	₹2,400.00	98	₹1,960.00	180	₹1,260.00	55	₹1,210.00	26	₹1,170.00
35	₹1,400.00	90	₹1,800.00	259	₹1,813.00	41	₹902.00	9	₹405.00
24	₹960.00	79	₹1,580.00	210	₹1,470.00	37	₹814.00	9	₹405.00
30	₹1,200.00	80	₹1,600.00	210	₹1,470.00	40	₹880.00	12	₹540.00
24	₹960.00	79	₹1,580.00	210	₹1,470.00	37	₹814.00	9	₹405.00
35	₹1,400.00	90	₹1,800.00	259	₹1,813.00	41	₹902.00	9	₹405.00
35	₹1,400.00	80	₹1,600.00	240	₹1,680.00	41	₹902.00	5	₹225.00
35	₹1,400.00	90	₹1,800.00	259	₹1,813.00	41	₹902.00	9	₹405.00
35	₹1,400.00	90	₹1,800.00	259	₹1,813.00	41	₹902.00	9	₹405.00
35	₹1,400.00	90	₹1,800.00	250	₹1,750.00	41	₹902.00	9	₹405.00
35	₹1,400.00	80	₹1,600.00	234	₹1,638.00	34	₹748.00	9	₹405.00
40	₹1,600.00	90	₹1,800.00	240	₹1,680.00	41	₹902.00	4	₹180.00
35	₹1,400.00	88	₹1,760.00	239	₹1,673.00	41	₹902.00	9	₹405.00
35	₹1,400.00	80	₹1,600.00	246	₹1,722.00	41	₹902.00	4	₹180.00
45	₹1,800.00	79	₹1,580.00	259	₹1,813.00	34	₹748.00	20	₹900.00
34	₹1,360.00	78	₹1,560.00	210	₹1,470.00	56	₹1,232.00	9	₹405.00
35	₹1,400.00	90	₹1,800.00	259	₹1,813.00	41	₹902.00	9	₹405.00
45	₹1,800.00	78	₹1,560.00	259	₹1,813.00	34	₹748.00	9	₹405.00
35	₹1,400.00	90	₹1,800.00	259	₹1,813.00	41	₹902.00	5	₹225.00
26	₹1,040.00	80	₹1,600.00	259	₹1,813.00	34	₹748.00	9	₹405.00
34	₹1,360.00	78	₹1,560.00	259	₹1,813.00	34	₹748.00	5	₹225.00
40	₹1,600.00	67	₹1,340.00	259	₹1,813.00	41	₹902.00	9	₹405.00
35	₹1,400.00	90	₹1,800.00	259	₹1,813.00	41	₹902.00	9	₹405.00
35	₹1,400.00	80	₹1,600.00	259	₹1,813.00	32	₹704.00	10	₹450.00

Fig. A: Cleaned Data in excel file.

e. Link to the cleaned data: https://drive.google.com/drive/folders/1D4QkNpn7mVMh-MXaO7Aa8dHGDmJpouoX

f. Contents of cleaned data -

S.NO	Variables/Columns	Description
1	Date	This column indicates the date when the data was collected. The date range starts from January 2, 2024, and goes until March 15, 2024.
2	Total Number of	This column provides the total quantity of items sold on a particular date.

	Items sold	
3	Total Amount	This column indicates the total revenue generated on a particular date.
4	Item's QTY	This column contains information about the quantity sold for each specific item on a given day.
5	Item's Amount	This column contains information about the total revenue generated from each specific item on a given day.
6	Price	This column indicates the price of each item per quantity.

3.2. Descriptive Statistics: -

Descriptive statistics provide a summary of the main features of a dataset, offering a simple yet powerful way to understand and interpret data. They typically include measures such as mean, median, standard deviation, minimum, maximum, and percentiles. These statistics are crucial in the initial stages of data analysis as they help to summarize the data's central tendency, variability, and overall distribution.

For the given hostel canteen dataset, I have chosen the column **Total Amount/Revenue = Item QTY * Item Price** for my descriptive statistics. This column is essential as it directly reflects the revenue generated by the sale of each item, making it a critical measure for understanding the financial performance of the canteen.

Descriptive Statistics:

- **Mean:** The average value of the data, calculated as the sum of all values divided by the count of values (24557.66).
- **Median:** The middle value in the sorted data, which separates the higher half from the lower half (25604.5).
- **Mode:** The value that appears most frequently in the data (None, indicating no mode).
- **Range:** The difference between the maximum and minimum values in the data (52232).
- **Variance: A** measure of how much the data points differ from the mean, calculated as the average of the squared differences from the mean (32919962.56).
- **Standard Deviation:** The square root of the variance, indicating how much the data points typically deviate from the mean (5737.59).
- **Interquartile Range (IQR):** The range between the first quartile (25th percentile) and the third quartile (75th percentile) of the data (1878.0).
- **Skewness: A** measure of the asymmetry of the data distribution around the mean (-0.0036).

- **Kurtosis: A** measure of the "tailed Ness" of the data distribution, indicating the presence of outliers (10.04).
- **Minimum:** The smallest value in the data (0).
- **Maximum:** The largest value in the data (52232).
- **Count:** The total number of data points (74).

4. Detailed Explanation of Analysis Process/Method: -

I gathered data spanning 74 days (about 2 and a half months) for the business. This data was compiled in Google Sheets, then cleaned, organized, and analyzed. Various descriptive statistical techniques were applied to closely examine and summarize the data. Here's a detailed explanation of the process and why specific charts and graphs were chosen to analyze the business problems:

Data collection and preparation:

1. Data Collection:

1. Collected data on various metrics such as the number of items sold, revenue generated, and individual item sales over 74 days (about 2 and a half months).

2. Data Cleaning:

1. Organized the data into a structured format.
2. Handled missing values, removed duplicates, and ensured consistency in the dataset.

3. Descriptive Statistics:

1. Applied statistical techniques to summarize the data.
2. Calculated mean, median, mode, range, variance, standard deviation, interquartile range (IQR), skewness, kurtosis, minimum, maximum, and count.

Visualization and Analysis:

I used various charts and graphs to visually represent the data, which provided insights into the business performance and highlighted potential areas for improvement.

Fig. 1: Line Chart for Sales Trends Over Time

- **Purpose:** To analyze sales trends over the 74-day period, allowing us to clearly identify the 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, helping to identify periods of high and low sales and understand how external factors (e.g., holidays, exams) affect sales.

Fig. 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.

Fig. 3: Bar Graph for Least 10 Items Sold

- **Purpose:** To highlight the 10 items with the lowest sales.
- **Reason for Choosing:** Bar graphs are excellent for detailed comparisons, making it easy to see which items are underperforming.

Fig. 4: 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.

Fig. 5: Bar Graph for Total Quantity Sold for Each Item

- **Purpose:** To visualize the quantity sold for each item from January 2nd to March 15th
- **Reason for Choosing:** Bar graphs clearly show which items have the highest, lowest, and moderate sales, making it easier to analyze overall sales performance.

5. Results and Findings: -

Let's analyze the business model of the hostel canteen using various charts, such as line charts, bar graphs, pie charts, 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.

By analyzing these graphs, we can gain a comprehensive understanding of the business trends in the hostel canteen. This analysis helps us identify areas for improvement and develop strategies to enhance business performance. Graphical analysis not only highlights existing problems but also provides actionable insights for solving them. Let's dive into each graph to explore the trends, understand the underlying factors, and devise effective solutions for a more successful business

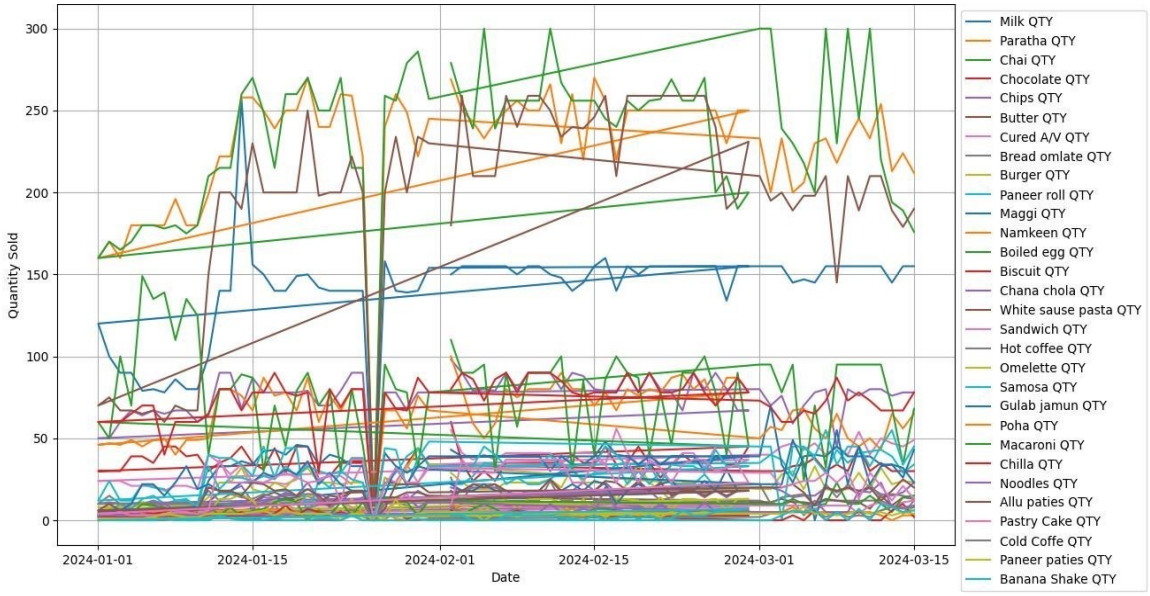


Fig. 1: Daily sales of items VS Quantity sold of each item

Key Insights:

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

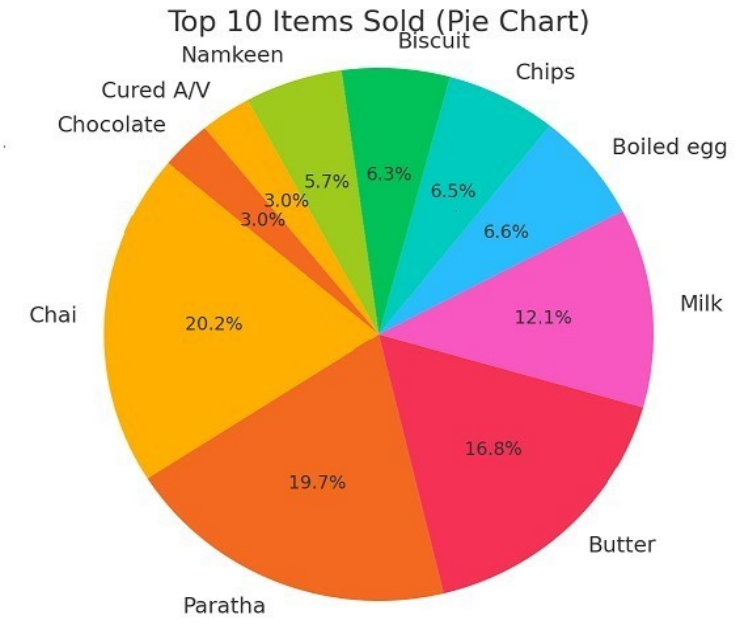
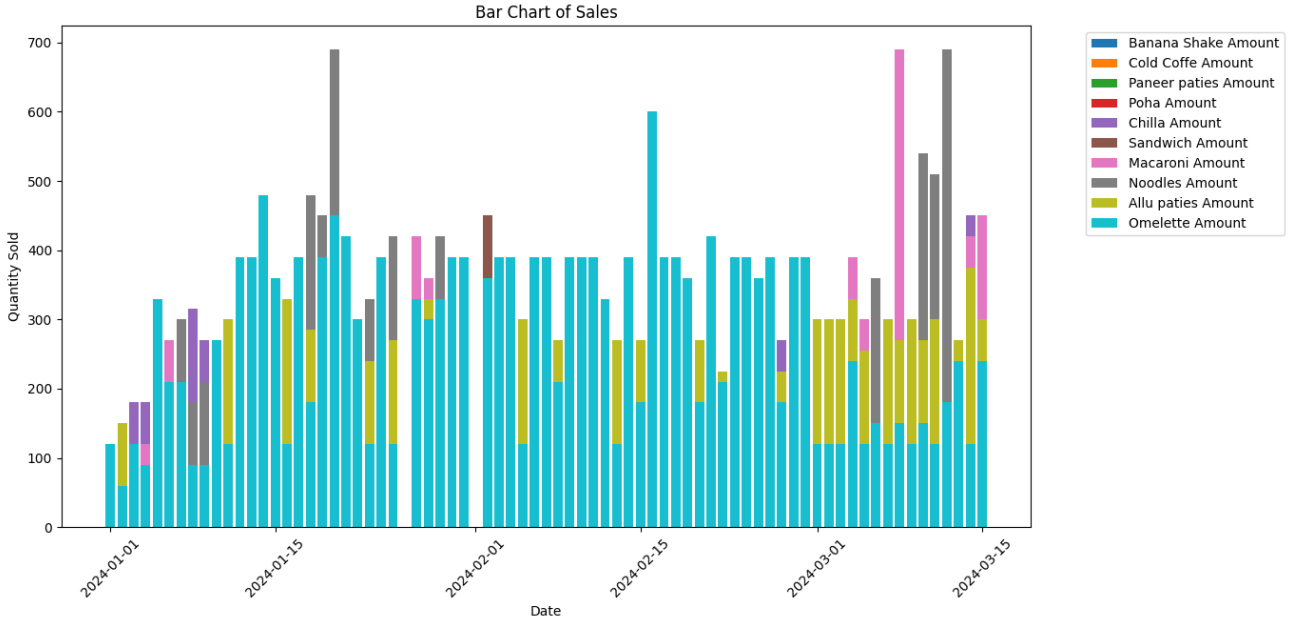


Fig. 2: Pie chart of Sales of Top 10 Items

key Insights:

- **High Sales Volume**: Chai and Paratha are the top-selling items, together accounting for nearly 40% of total sales.
- **Significant Revenue Contribution**: Butter and Milk also contributed significantly, making up nearly 29% of sales.
- **Diverse Product Range**: There is a balanced demand across multiple products.



In Fig. 3: Bar Chart of Sales of 10 least sold items.

Key Insights:

January (2024-01-01 to 2024-01-31):

- **Early January**: There are smaller quantities of various items sold. Notably, Omelette (cyan) and Banana Shake (light blue) show up consistently on most days.
- **Mid to Late January**: There is an increase in the sales quantities. Around 2024-01-15, there is a notable peak in the quantity of items sold, especially Omelette (cyan), Banana Shake (light blue), and Cold Coffee (orange).

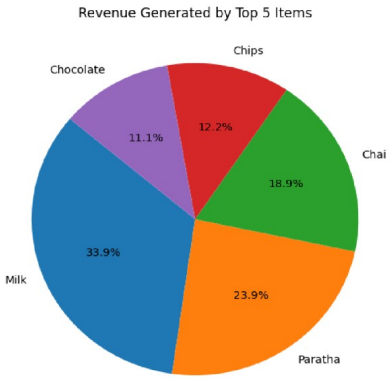
February (2024-02-01 to 2024-02-28):

- **Early February**: Sales dip slightly but pick up again, with consistent high quantities for items like Omellette (cyan) and Banana Shake (light blue).
- **Mid-February**: Around 2024-02-15, there is another peak in sales. Significant contributors to this peak include Omelette (cyan), Cold Coffee (orange), and Noodles (gray).
- **Late February**: Sales are steady, with another small peak observed towards the end of the month. Main items contributing to sales include Omelette (cyan) and Banana Shake (light blue).

March (2024-03-01 to 2024-03-15):

- **Early March**: Sales continue from the previous month, with a small dip initially but picking up soon after.

- **Mid-March**: There is a peak around mid-March, with Omelette (cyan), Banana Shake (light blue), and Sandwich (pink) showing significant quantities.



In Fig. 4: A pie chart showing Revenue Generated by Top 5 Items

Key Insights:

- **Milk**: This category generates the highest revenue, accounting for 33.9% of the total revenue.
- **Paratha**: This item is the second-largest revenue generator, contributing 23.9% to the total revenue.
- **Chai**: With 18.9% of the total revenue, this item is the third on the list.
- **Chips**: This item generates 12.2% of the total revenue, making it the fourth highest revenue contributor.
- **Chocolate**: The smallest revenue generator among the top five, contributing 11.1% of the total revenue.

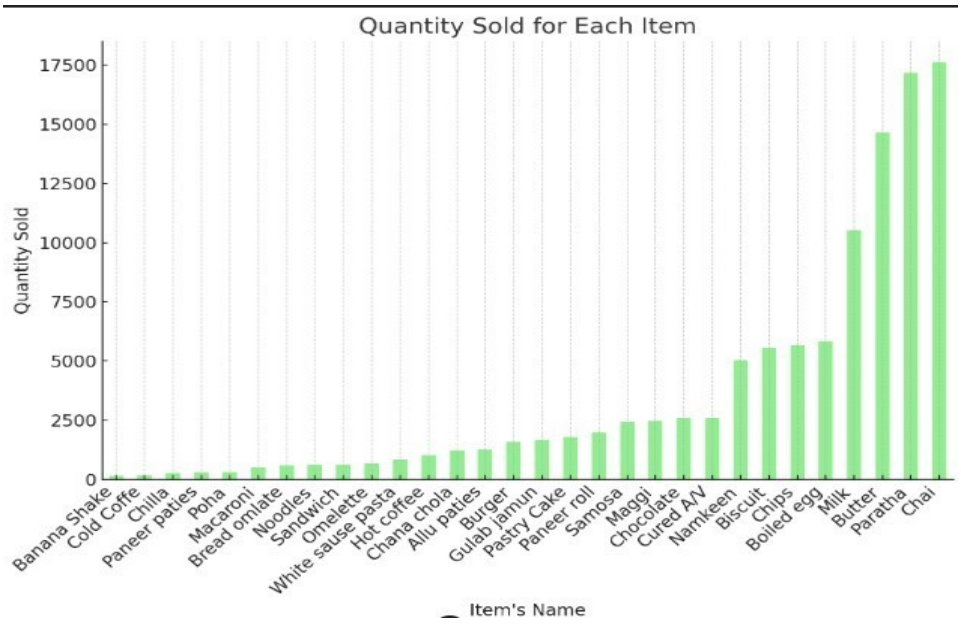


Fig. 5: A bar chart of Quantity sold.

Result 1:

The top 10 items sold in the bar chart/Pie chart are Chai, Paratha, Butter, Milk, Boiled Egg, Chips, Biscuit, Namkeen, Cured A/V, and Chocolate. Chai is the most popular item sold, while Paratha is the second most popular item sold. Butter is the third most popular item sold, and Milk is the fourth most popular item sold. The chart suggests a relationship between some of these top-selling items. For example, customers who buy Paratha often also buy Butter and Milk, perhaps indicating these items are commonly bought together for breakfast. Similarly, Chai is often purchased with Biscuits or Namkeen, suggesting these items are popular together as well. It's also possible that some customers buy Cured A/V (Amul or Verka brand) along with Paratha. Overall, the chart suggests that some of the top-selling items are complementary products that customers often buy together. This insight can be valuable for businesses to understand customer buying patterns and potentially promote these items together in future marketing efforts.

In Fig. 5, we see that the most sold items are also generating high revenue, following the order: Milk, Paratha, Chai, Chips, Chocolate, Butter, Paneer Roll, Burger, and Maggi. In the top 10 revenue list, Paneer Roll, Burger, and Maggi are included due to their higher prices compared to Biscuit, Namkeen, and Curd. Despite lower sales volumes, the higher prices of these items result in higher revenue.
By understanding these patterns, businesses can better strategize their inventory and marketing efforts to maximize sales and profitability.

Result 2:

During the winter season (January to March), the sales of cold beverages like cold coffee and banana shake were very low, reflecting customers' preference for hot drinks in colder weather. Paneer patties also had low sales, likely due to their taste, which many customers, including yourself, did not find appealing. Additionally, chilla had minimal sales because many customers were unaware of its availability, and its high price further discouraged purchases. Other items such as macaroni, noodles, omelette, white sauce pasta, and bread omelette also experienced low sales, possibly due to a combination of taste preferences, pricing issues, and lack of promotion. To address these issues, consider focusing on hot beverages and winter-friendly foods during colder months, improving the taste of paneer patties, increasing awareness of items like chilla, and reevaluating the pricing strategy for higher-priced items