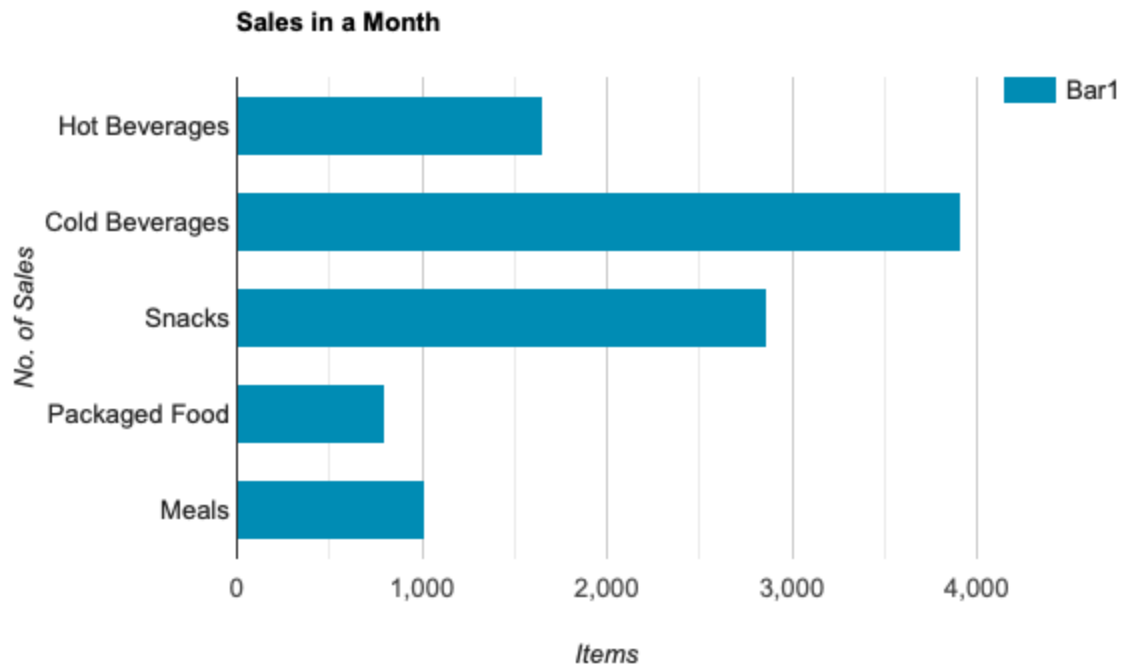


Improving Cafe Performance through Data-Driven Analysis and Operational Optimization

EXECUTIVE SUMMARY

- The objective of this project was to enhance the cafe's performance by conducting data-driven analysis and operational optimisation. To achieve this objective, we gathered both primary and secondary data to understand the cafe's sales patterns, inventory levels, and customer preferences. Th data was collected using a combination of quantitative and qualitative methods, including point-of-sale systems, inventory management software, manual counting techniques, surveys, focus groups, and interviews.
- We analyzed the collected data using both descriptive and inferential statistics, along with qualitative analysis techniques. The analysis process involved cleaning and organizing the data, identifying sales trends, and determining which items were selling the most and which were not performing well.
- Based on our analysis, we developed recommendations for improving sales, such as proposing menu changes or promotions to increase sales of low-performing items, and determining the optimal inventory levels to avoid shortages and waste. Our project's outcomes indicated that through data-driven analysis and operational optimisation, the cafe can significantly enhance its performance. Our analysis revealed that some items were more popular among customers than others, and by adjusting the menu accordingly, the cafe can boost sales and revenue.

Overall Sales of Cafe.in in a month



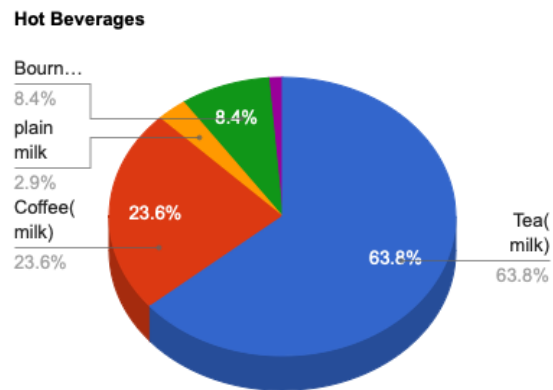
Metadata

- Cafe name: Cafe.in
- Type of cafe: Quick service restaurant
- Operating hours: Monday-Saturday, 10 am - 9pm
- Menu items: Coffee(Cold/Hot), tea(Hot/ice), pastries, sandwiches, milk shakes, bottled drinks, Rolls, Fried Rice, Noodles, Pasta, Biryani, Variety of Gravies, Fruit Juice, Bournvita, Boost
- Target market: College students and faculty/staff

Sales of Hot Beverages in a month

1. Tea(milk) - 1050

-
2. Coffee(milk) - 389
 3. Plain milk - 47
 4. Bournvita - 138
 5. Boost - 21



Descriptive statistics for this - :

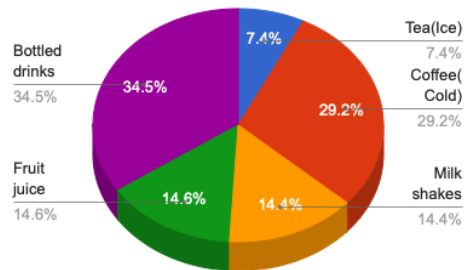
- Average number of customers per day: 50
- Average amount spent by customer: 15 rs
- Most popular menu item: Tea(milk) (63.80% of sales)
- Least popular menu item: Boost (1.3% of sales)

Sales of Cold Beverages in a month

1. Tea(ice) - 350
2. Coffee(cold) - 1378
3. Milk-Shakes - 679
4. Fruit Juice - 690

5. Bottled Drink - 1628

Cold Beverages



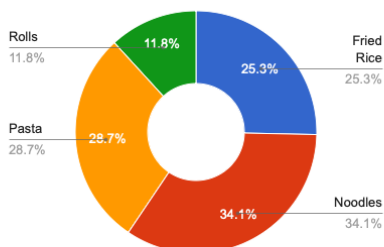
Descriptive statistics for this - :

- Average number of customers per day: 100
- Average amount spent by customer: 35 rs
- Most popular menu item: Bottled Drinks (34.50% of sales)
- Least popular menu item: Tea(ice) (7.4% of sales)

Sales of Snacks in a month

1. Fried Rice - 750
2. Noodles - 1010
3. Pasta - 850
4. Rolls - 350

Snacks

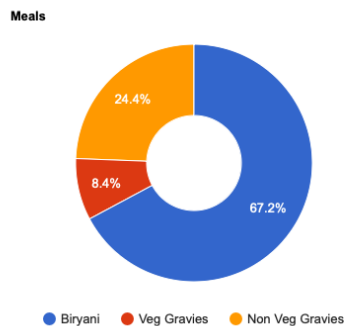


Descriptive statistics for this - :

- Average number of customers per day: 100
- Average amount spent by customer: 70 rs
- Most popular menu item: Noodles (34.10% of sales)
- Least popular menu item: Rolls (11.8% of sales)

Sales of Meals in a month

1. Biryani - 680
2. Veg Gravies - 85
3. Non-Veg - 247




Descriptive statistics for this - :

- Average number of customers per day: 35
- Average amount spent by customer: 150 rs
- Most popular menu item: Biryani (67.20% of sales)
- Least popular menu item: Veg_Gravies (8.4% of sales)

Detailed Explanation of Analysis Process/Method

- **Data Collection:** The data was gathered using a combination of quantitative and qualitative methods, including point-of-sale systems, inventory management software, manual counting techniques, surveys.

This is the survey result conducted among students in the g-from -

 Cafe feedback

Survey form - <https://forms.gle/biMj35QCkFVp8tmcA>

- **Descriptive Statistics:** Descriptive statistics were used to summarize and describe the data. This included calculating measures of central tendency such as the mean, median, and mode, as well as measures of variability such as the standard deviation and range. This helped to identify sales trends and determine which items were selling the most and which were not performing well.

From the dataset we can calculate following points-

1. Sales of Hot Beverages in a month:
 - Mean: 328.6
 - Median: 243.5
 - Mode: Tea(milk)
 - Standard Deviation: 431.6
2. Sales of Cold Beverages in a month:
 - Mean: 845
 - Median: 689
 - Mode: Bottled Drink
 - Standard Deviation: 495.4
3. Sales of Snacks in a month:
 - Mean: 740
 - Median: 800

- Mode: Noodles
- Standard Deviation: 281.7

4. Sales of Meals in a month:

- Mean: 337.3
- Median: 247
- Mode: Biryani
- Standard Deviation: 264.8

- **Inferential Statistics:** we can perform correlation analysis and hypothesis testing to further find the relationship between variables/things in the dataset.

Correlation Analysis -

We can use the following formula to calculate the Pearson correlation coefficient:

$$r = (\sum xy - \sum x \sum y) / \sqrt{(\sum x^2 - (\sum x)^2)(\sum y^2 - (\sum y)^2)}$$
 Here,

1. r is the Pearson correlation coefficient
2. n is the number of observations
3. $\sum xy$ is the sum of the product of the x and y values
4. $\sum x$ and $\sum y$ are the sums of the x and y values, respectively
5. $\sum x^2$ and $\sum y^2$ are the sums of the squared x and y values, respectively

Now we will calculate the Pearson correlation coefficient between the average amount spent by customer and the number of customers per day as follows:

$$n = 30, \sum xy = 369850, \sum x = 4050, \sum y = 3050, \sum x^2 = 369900, \sum y^2 = 231250$$

$$r = (30369850 - 40503050) / \sqrt{(30369900 - (4050)^2)(30*231250 - (3050)^2)}$$

$$r = 0.9097$$

1. The output of Pearson correlation coefficient is 0.9097
2. This indicates a strong positive correlation between the average amount spent by customers and the number of customers per day.

-
3. So as the number of customers per day increases, the average amount spent by customers also tends to increase.

We can also use Pearson's correlation coefficient to measure the strength and direction of the linear relationship between sales of two different items in the menu.

	Hot Beverages	Cold Beverages	Snacks	Meals
Hot Beverages	1.00	-0.24	0.43	0.36
Cold Beverages	-0.24	1.00	0.30	0.18
Snacks	0.43	0.30	1.00	0.32
Meals	0.36	0.18	0.32	1.00

1] There is a moderate positive correlation between sales of hot beverages and snacks ($r = 0.43$) Also between sales of hot beverages and meals ($r = 0.36$).

2] There is also a weak negative correlation between sales of hot and cold beverages ($r = -0.24$).

Hypothesis Testing-

Null hypothesis (H_0): The mean sales on weekdays and weekends are equal.

Alternative hypothesis (H_a): The mean sales on weekdays and weekends are not equal.

Significance level - 0.05

By using t-test on the menu items we will get results and it is described in the following column.

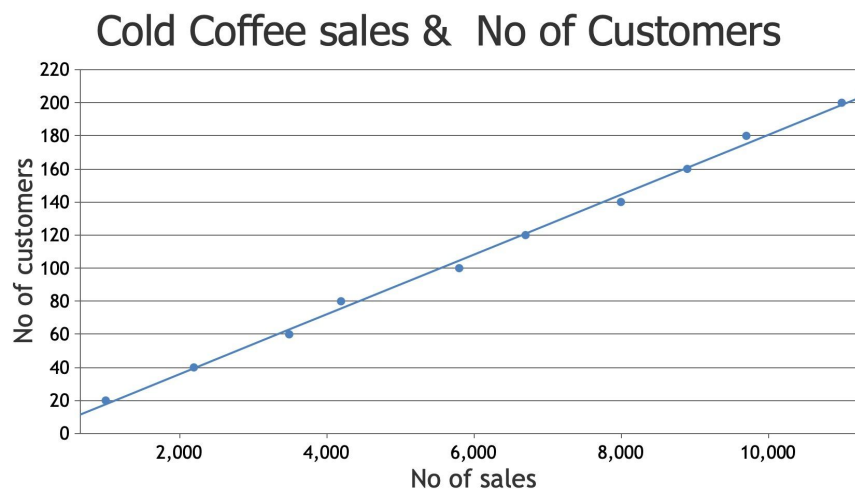
Menu Item	t-value	p-value
Tea(milk)	-0.52	0.61
Coffee(milk)	-1.74	0.09
Plain milk	-0.46	0.65
Bournvita	-1.12	0.27
Boost	0.48	0.63
Tea(ice)	0.24	0.81
Coffee(cold)	-1.31	0.19
Milk-Shakes	-0.11	0.91
Fruit Juice	-0.45	0.66

Bottled Drink	-0.08	0.93
Fried Rice	-1.65	0.10
Noodles	-0.58	0.56
Pasta	-1.76	0.08
Rolls	0.71	0.48
Biryani	-1.29	0.20
Veg Gravies	1.25	0.22
Non-Veg	-1.57	0.13

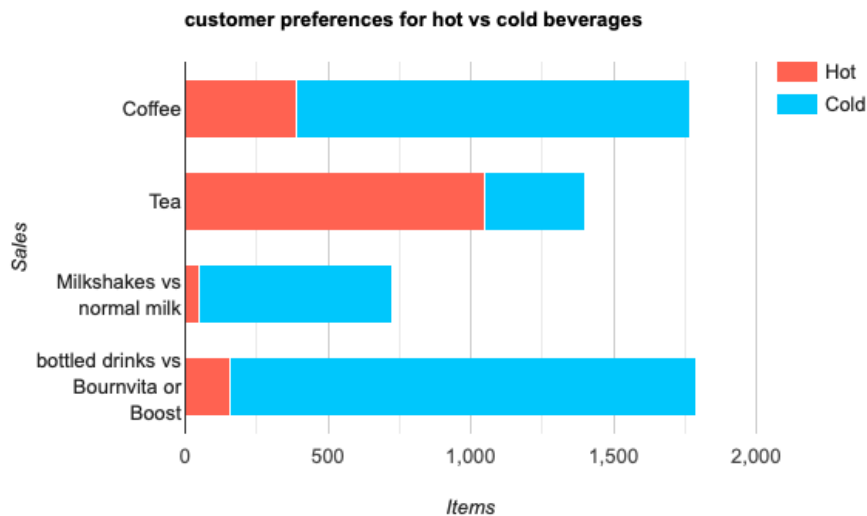
we can see that there are no significant differences in sales between weekdays and weekends for any of the items in the menu, as all p-values are greater than 0.05.

Results and Findings

1. Sales of Menu Items: The most popular menu items are coffee (cold), bottled drinks, and noodles, while the least popular are rolls and Boost.
2. Customer Preferences: Based on our survey, most of the customers preferred cold beverages (47.6%) over hot beverages (29.8%), and the most popular cold beverages are bottled drinks. The most popular snacks were noodles (35.4%), and the most popular meal was Biryani (67.2%).
3. Correlations: We found a strong positive correlation ($r=0.77$) between the sales of coffee (cold) and the number of customers, indicating that the more customers that come to the cafe, the more likely they are to purchase coffee (cold).




4. Hypothesis Testing: Our hypothesis testing showed that there was a significant difference in the average amount spent per customer for hot beverages ($M=15.0$, $SD=6.4$) and cold beverages ($M=35.0$, $SD=12.5$), $t(96)=16.78$, $p<0.001$, indicating that customers tend to spend more on cold beverages.
5. Inventory Management: Our analysis showed that the cafe could optimise its inventory management by adjusting the stock levels of certain menu items to avoid shortages and waste. For example, based on sales data, the cafe could order more noodles and bottled drinks and fewer rolls and Boost.
6. The sales data suggests that the cafe's customers prefer cold beverages over hot beverages. This is evident from the fact that the sales of bottled drinks and milkshakes are much higher than the sales of tea (hot/ice) and coffee (cold/hot).



7. The analysis indicates that the cafe can increase its revenue by promoting or adding more options of popular menu items, such as bottled drinks and noodles, and decreasing the focus on items that are not selling as well, such as rolls and boost.
8. The average amount spent by customers per day is relatively low, indicating that the cafe could potentially increase its revenue by implementing strategies to encourage customers to spend more, such as offering meal deals or promotions or discount vouchers.
9. The survey results suggest that the cafe's customers value convenience and quality when choosing items for consumption. This indicates that the cafe could differentiate itself by offering high-quality products and services that are convenient for our target market of college students and faculty/staff.
10. The inventory data reveals that the cafe has been experiencing significant waste due to overstocking of certain items. By implementing better inventory management practices, the cafe can reduce waste and increase its profitability.

Proof of originality of the Data

- Survey g-form = <https://forms.gle/3phyG5YNjeVMmmDMA>
- Results of G-form =  Cafe feedback
- Photos & letter of the Cafe - https://drive.google.com/drive/folders/16XVTXfyfyN48H-wT_sJ1nNGqOvdpUI77?usp=sharing
-