

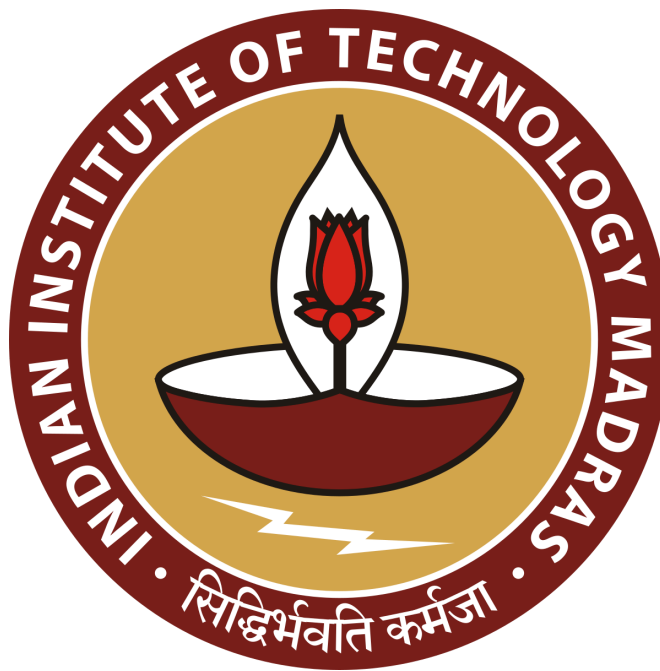
Operational Excellence in the Food Industry

An End-Term report for the BDM capstone Project

Submitted by

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Executive Summary

Maharaja Bhojnalaya, started in 2001 by Ravi Shankar Gupta, is a well-known restaurant that serves both vegetarian and non-vegetarian food. Although the restaurant is popular, it faces two main problems: managing food stock properly and organizing staff to prepare veg and non-veg meals separately. These issues mostly happen because customer demand changes from day to day, and there is no proper system in place to track and plan food and staff needs.

To solve this, we used a data-based approach. We studied the restaurant's past sales to understand which dishes are more popular on different days. This helped us predict demand better, so the right amount of food can be bought and stored, reducing waste and avoiding shortages. We also looked at how the kitchen staff is assigned and found that some staff members were overworked while others were underused, especially during busy times.

From the data, we found clear patterns in daily food demand and staff usage. Charts in the report show these trends. Based on this, we made some important suggestions:

- **Buy food based on daily demand patterns to avoid overstocking or running out.**
- **Change the menu slightly to focus on popular dishes and reduce waste.**
- **Check how well suppliers are performing to ensure timely delivery and good quality.**

These steps will help the restaurant run more smoothly, reduce costs, and make customers happier.

Detailed Explanation of Analysis Process/Method

Achieving operational excellence in the food industry requires a data-driven approach to streamline processes, enhance quality, and reduce waste. In this study, the focus is on optimizing the storage and inventory of vegetarian and non-vegetarian food items in a restaurant setting based on day-wise demand trends. To support this objective, a structured data analysis methodology has been adopted using a 12-week dataset, leveraging time-series techniques to uncover consumption patterns and demand fluctuations.

The analysis is carried out through the following four major analytical approaches:

- 1. Pre-Processing:**

This stage lays the foundation by cleaning and organizing historical sales data to identify consumption trends of vegetarian and non-vegetarian items across different days. The raw data, including food names, types, prices, and daily quantities sold, was structured in Excel with added fields like revenue and sale dates. Data validation was applied to ensure accuracy and consistency, while time-based columns (day of the week, week number) enabled trend analysis.

- 2. Descriptive Analysis:**

This stage lays the foundation by examining historical sales data to determine what has occurred. It helps identify consumption trends of vegetarian and non-vegetarian items across different days of the week. This insight supports better decision-making and is documented under the "Results and Findings" section of this report.

- 3. Diagnostic Analysis**

To uncover the reasons behind the observed trends, this phase delves into why certain days experience higher or lower demand. Utilizing MS Excel tools such as pivot tables, formulas, and visualizations, the analysis reveals contributing factors

to demand variability. These findings are elaborated in the "Interpretation of Results" section.

4. Predictive Analysis

Anticipating future demand is essential for efficient storage planning. This stage employs historical data to forecast consumption patterns using seasonal and weekly trends. The predictions serve as a critical input for inventory control and planning.

Pre-Processing

- The data had only the Name of the Food with their Price, Types. Number of plates sold Per Day.
- The sales data was entered into an Excel spreadsheet with key details such as food category, price, quantity sold, and date of sale. **DATA VALIDATION** was applied to ensure uniqueness and to prevent spelling mistakes as **table 1**.

Date2	Day	Food	Veg/Non-veg	Price	Number of Plates	Total Cost	Order Type
01-12-2024	Sunday	Thali	Veg	80	5	400	Delivery
01-12-2024	Sunday	Thali	Veg	5	25	125	Delivery
01-12-2024	Sunday	Roti	Veg	25	3	75	Delivery
01-12-2024	Sunday	Chicken	Veg	200	1	200	In-place
01-12-2024	Sunday	Paneer	Veg	200	1	200	Delivery
01-12-2024	Sunday	Mutter Paneer	Non-Veg	210	2	420	In-place
01-12-2024	Sunday	Musrum Curi	Veg	80	1	80	In-place
01-12-2024	Sunday	Allu-Pratta	Non-Veg	60	5	300	Delivery
01-12-2024	Sunday	Paneer Bhujija	Veg	140	2	280	In-place
01-12-2024	Sunday	Veg-fried rice					
01-12-2024	Sunday	Egg-Roll					
01-12-2024	Sunday	Paneer					

Table 1: Data Validation In 3rd Columns

- The **Vlookup** function was used to fetch the price of each food item from a predefined price list, allowing for accurate cost calculations without manual entry. In **Table 2t**

Date2	Day	Food	Veg/Non-veg	Price	Number of Plates	Total Cost	Order Type
01-12-2024	Sunday	Thali		=VLOOKUP(D2,'Menu_of_Food'!A:C,2,0)		400	Delivery
01-12-2024	Sunday	Roti		VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])			Delivery

Table 2: Vlookup In 4th Columns

- Cell references were used to link sales quantities with their respective prices, ensuring automatic total sales calculations for each item, as in **Table 3**.
- Total Cost = Price * Number of plates

Day	Food	Veg/Non-veg	Price	Number of Plates	Total Cost	Order Type
Sunday	Thali	Veg	80	5	=F2*G2	Delivery

Table 3: Data Validation In 3rd Columns

- Extracting the day from the date was crucial for analyzing daily sales patterns. Excel's **TEXT** function was used to retrieve the day name, helping in trend identification.
- The data was structured into table format to allow easy sorting, filtering, and further analysis. Pivot tables were used to summarize weekly sales trends for both vegetarian and non-vegetarian food items.
- The cleaned and structured dataset helped in deriving meaningful insights, enabling better decision-making for managing food availability and sales strategies.

Descriptive Analysis

- **Align inventory purchasing** with identified demand patterns to minimize waste and avoid shortages.
- **Optimize staff scheduling** based on peak sales periods for different food types, ensuring workload balance and timely service.
- **Launch promotions** on slower days to boost sales and smoothen demand fluctuations.
- **Focus on top-contributing dishes** for marketing, inventory, and preparation, ensuring availability and maximizing revenue.

- **Leverage sales forecasts** generated from historical data for better procurement and staffing decisions.

Diagnostic Analysis

A diagnostic analysis of Maharaja Bhojnalaya's sales data revealed key operational challenges. Sales trends showed that non-veg items peaked on Monday, Saturday, and Sunday, while veg items were more consistent midweek, highlighting the need for demand-based inventory planning. Staffing mismatches were found, with high-demand days like Thursday lacking adequate kitchen support. Pareto analysis showed that a small group of items generated most revenue, while others like Roti and Chilli Paneer, underperformed, suggesting the need for menu optimization. Heatmaps exposed inconsistent inventory practices, with frequent overstocking or shortages due to lack of data-driven planning.

Results and Findings

- **Financial Overview of the Restaurant**

Food	Min of Total C	Max of Total C	StdDev of Total C	Average of Total Co
Allu-Pratta	25	75	18.90	50.00
Aloo-Dum	100	400	152.75	266.67
Chicken	210	630	140.00	373.33
Chicken Roll	120	300	84.85	180.00
Chilli Paneer	200	400	115.47	300.00
Egg-Curry	140	420	98.09	267.27
Egg-Roll	120	300	90.00	195.00
Musrum Curi	150	450	125.50	270.00
Mutter Paneer	200	400	106.90	314.29
Paneer	140	560	148.49	227.50
Paneer Bhujiya	200	600	167.33	440.00
Rajma	130	260	58.14	156.00
Roti	125	290	52.03	212.00
Thali	160	880	231.36	465.45
Veg-fried rice	80	160	32.66	93.33

Table 4: Max, Min, Avg, Stdev of food

In the pursuit of operational excellence, understanding the financial structure of menu pricing is essential. The following insights were drawn from a descriptive statistical analysis of the dataset, which includes the **price of food items**, the **number of plates sold**, and **total revenue generated**. These metrics offer valuable input for evaluating pricing strategies and understanding income distribution across different dishes.

Table 4: Price of Foods Trend summarizes the key findings:

- **Mean Price of Foods: ₹114.55**
Reflects the average price of all dishes, offering a baseline for pricing decisions.
- **Median Price of Foods: ₹130**
Indicates that 50% of the menu items are priced below ₹130, highlighting the central pricing trend.
- **Standard Deviation: ₹67.02**
Suggests moderate variability in dish prices, which can influence customer perceptions and purchasing behavior.

Non-Veg Vs Veg

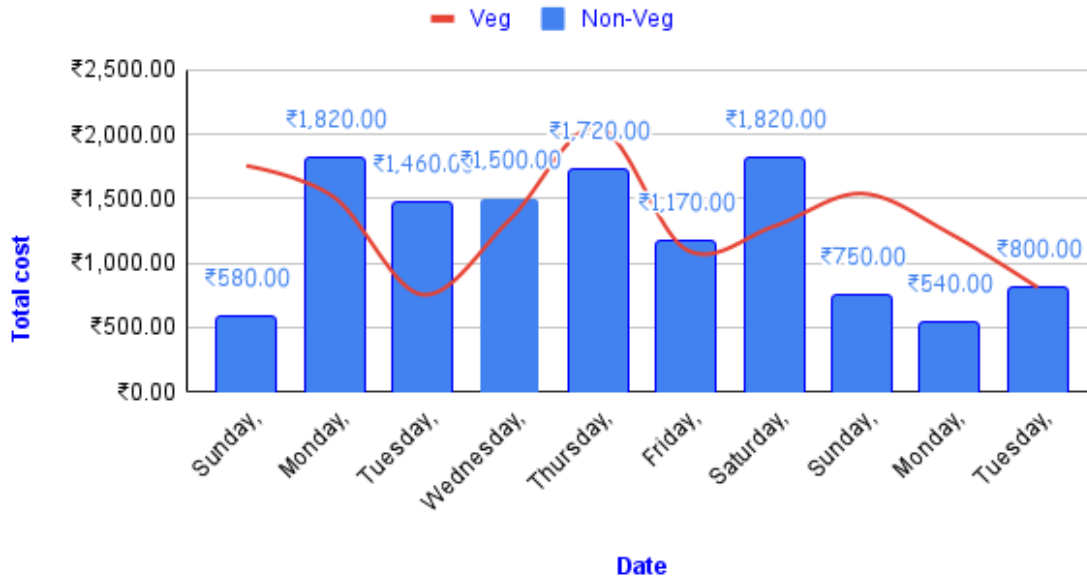


Figure 1: Total Cost of food in dayswise

Figure 1 presents a detailed comparison of the costs associated with Non-Veg and Veg items over time. The chart uses **blue bars** to represent Non-Veg costs and a **red line** to show Veg costs, with the y-axis indicating the total cost (in ₹) and the x-axis representing days of the week.

Key Observations:

- **Non-Veg Cost Spikes:**
 - **Monday and Saturday** show significantly high Non-Veg costs (₹1,820), indicating increased demand or higher expenditure on Non-Veg items at the start and end of the week.
 - **Midweek Variation (Tuesday–Friday):**
Costs fluctuate moderately between ₹1,170 and ₹1,720, but remain higher than the lower levels observed on Sunday/Monday during the second week.

- **Veg Cost Pattern:**

- The **red line** shows Veg costs peaking around **Wednesday and Thursday**, suggesting midweek preference for Veg dishes in some instances.
- A noticeable dip is observed on the **second Monday** (₹540), followed by a slight rebound on **Tuesday** (₹800).

Possible Explanations & Actions:

- **Inventory Management:**

- Stock more Non-Veg ingredients in preparation for higher demand on **Monday and Saturday**.
- Monitor Veg inventory for midweek surges in demand.

- **Staff Scheduling:**

- Allocate more staff to Non-Veg preparation on high-demand days (Monday and Saturday).
- Ensure sufficient Veg preparation staff are available during midweek peaks.

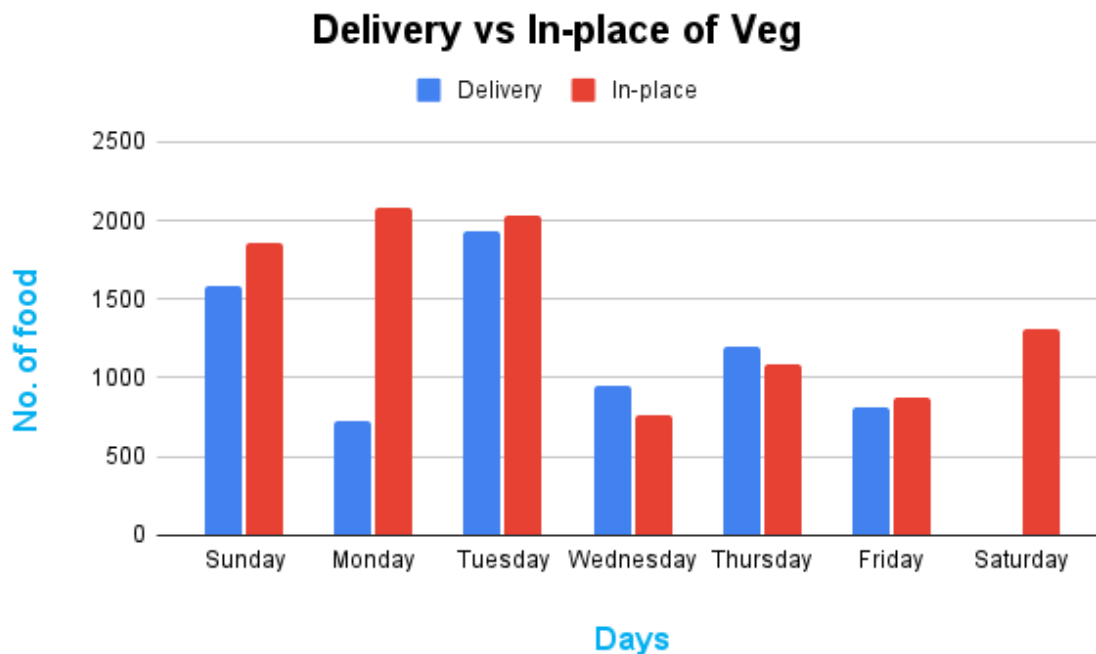


Figure 2a: Revenue on order type of Veg

"I utilized these insights to analyze the revenue generation for both **Veg** and **Non-Veg** items. **Figure 2a** illustrates the comparison of revenue generation for Veg order types, revealing key patterns.

Highest Days for Veg Orders:

- **Monday** stands out with the largest number of In-place Veg orders, surpassing all other days.
- **Tuesday** sees peak delivery orders for Veg, slightly exceeding in-place orders for that day.

Weekend Patterns:

- Both **Sunday** and **Saturday** have relatively high in-place and delivery Veg orders, though not as high as Monday (in-place) or Tuesday (delivery), indicating that weekends remain popular for dining out. However, Monday is the standout for in-place meals, while Tuesday leads in deliveries.

Midweek Dip:

- **Wednesday and Thursday** show a significant drop in both in-place and delivery Veg orders compared to the earlier part of the week, with **Friday** seeing a modest rebound, although still below Monday/Tuesday levels.

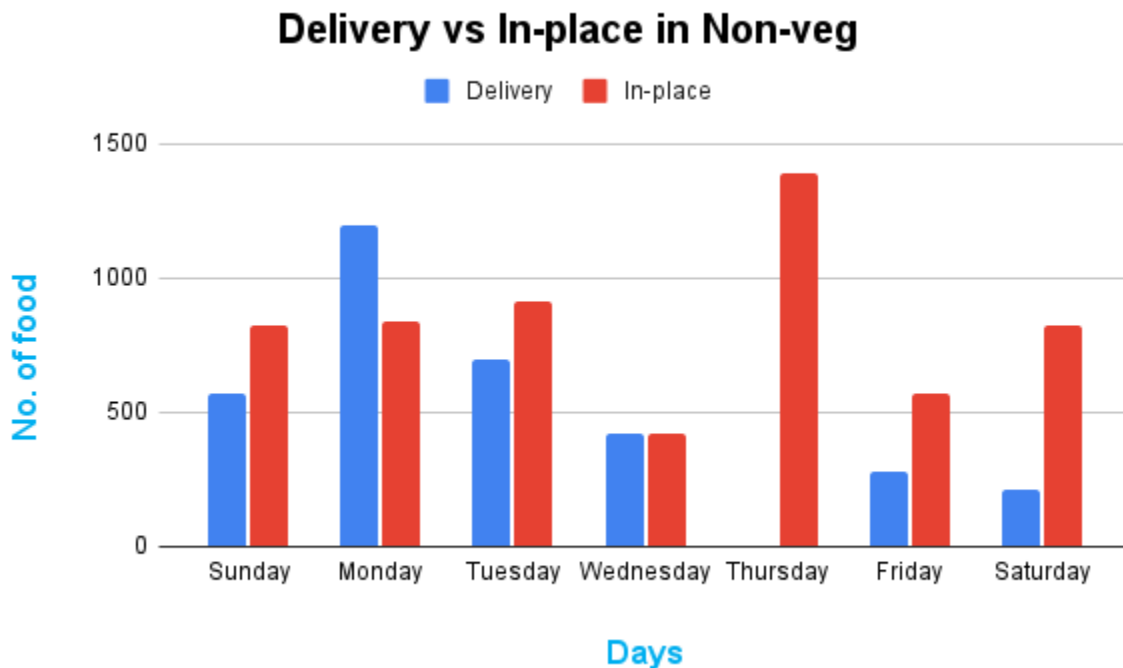


Figure 2b: Revenue on order type of Non-Veg

Below are key observations and insights drawn from the “**Delivery vs. In-place (Non-Veg)**” bar chart (**Figure 2b**):

Overall Pattern: In-place orders consistently exceed delivery orders across all days of the week, with the largest gap occurring on Wednesday and Thursday, indicating significantly higher in-place dining on those days.

Delivery Insights:

- Most Popular Delivery Day on Tuesday leads with the highest delivery count, around 800 orders.
- The Least Popular Delivery Day on Friday, sees the lowest delivery count, at about 300 orders.

In-Place Insights:

- Peak In-Place Day on Thursday has the highest in-place orders, reaching approximately 1,500.
- Smallest Gap with Delivery on Tuesday and Saturday show the smallest gap, with in-place orders only slightly higher than delivery.

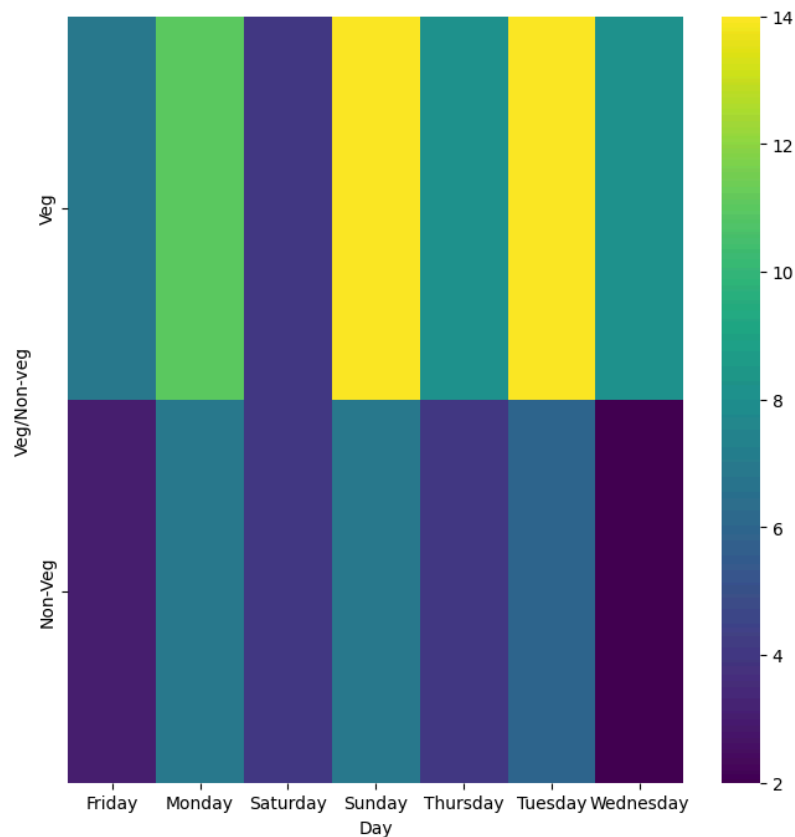


Figure 3: heatmap on Veg/Non-veg vs Days

Demand Patterns (in Figure 3)

- **Veg vs. Non-Veg by Day:** The radial/spider chart suggests that on some days (e.g., Monday, Tuesday), Veg consumption appears higher, while on others (e.g., weekend days like Saturday or Sunday), Non-Veg might be higher.
- **Peak Days:** The stacked bar chart can help confirm which days have the highest overall demand for Veg or Non-Veg. For instance, if you see taller bars (or a larger colored section) on the weekend for Non-Veg, it indicates a higher demand.

Inventory and Ordering

- **Adjust Stock Accordingly:** If the data shows Non-Veg spikes on Saturday and Sunday, stock more meat/fish on weekends. Conversely, if Monday or Tuesday is heavier on Veg orders, increase fresh produce for those days.
- **Avoid Excess Waste:** By tracking these trends, you can fine-tune your daily orders to reduce leftover food or stock-outs.

Staffing and Prep

- **Kitchen Prep:** If Monday is a “Veg-heavy” day, have more kitchen staff trained and ready for vegetarian meal prep on Mondays, and shift to more Non-Veg prep staff on weekends.
- **Front-of-House:** If a day is likely to be busier with a specific type of order (e.g., Non-Veg), ensure servers are well-informed about those menu items and can handle questions or upsell effectively.

Volume Pereto chart for food

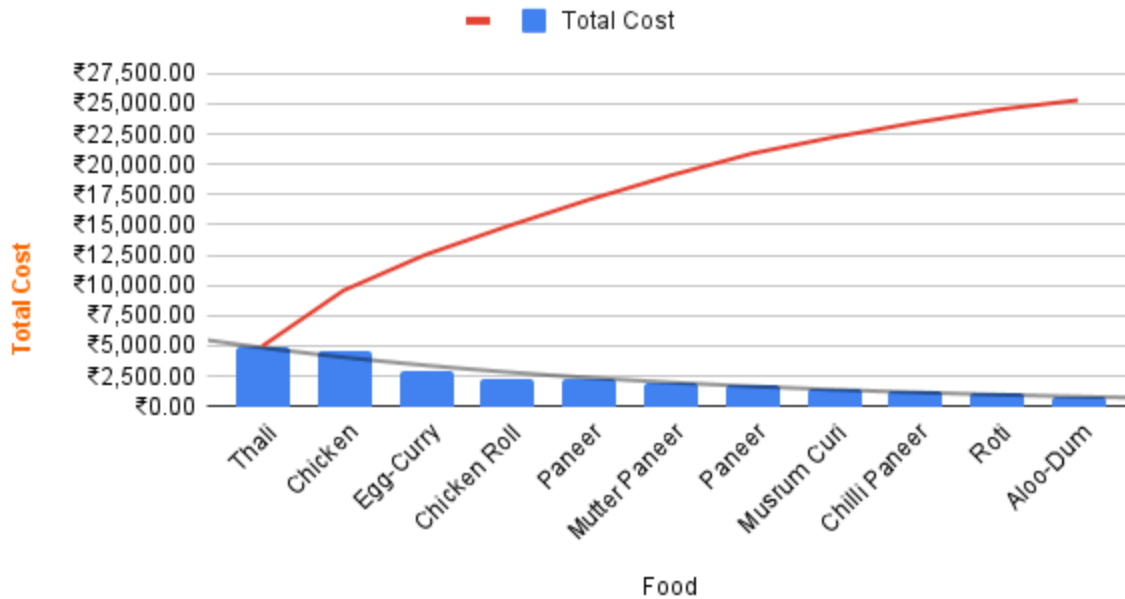


Figure 4 : Volume pereto

Top-Contributing Items:

The **Thali** generates the highest total cost contribution, followed by **Chicken**, **Egg Curry**, and **Chicken Roll**. These items account for a significant portion of the restaurant's overall sales revenue, making them key drivers of profitability.

80/20 Rule (Pareto Principle): (Figure 3)

A small number of items are responsible for the majority of total costs, with the top 4-5 items contributing to a large share of revenue. This highlights that these popular and profitable items should be the focus of operational strategies.

Focus Areas for Management:

- Prioritize inventory management for these high-contributing items to ensure consistent availability and avoid stockouts.
- Optimizing promotions and pricing for these items could further boost sales and revenue, driving profitability.

Low-Contributing Items:

Items like Chilli Paneer, Roti, and Aloo-Dum have a relatively lower total cost impact. The restaurant could evaluate whether these items should be promoted more to increase demand or reconsidered based on their low contribution.

High-demand items should be prioritized for stock management, while low-selling items may require strategic promotion or re-evaluation of their place on the menu.

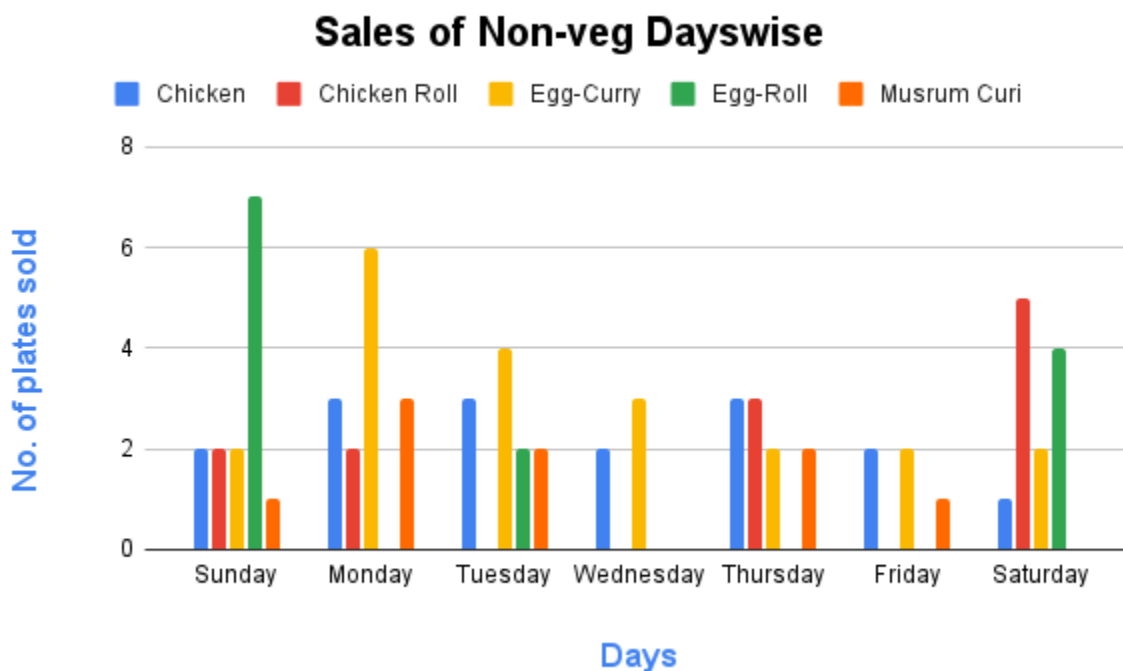


Figure 5: Number of Non-veg plates sold.

To analyze **revenue trends** for different food items, we examined **Figure 5**, which shows the number of plates sold and highlights the top-performing dishes over time.

Insights from the Sales of Non-Veg Items (Day-wise Chart):

- **Sunday and Monday** show the highest sales for certain items like **Egg Roll** and **Egg Curry**, indicating a strong preference for these dishes at the start of the week.

- **Saturday** also sees a significant spike in sales, particularly for **Chicken Roll** and **Egg Roll**, suggesting a weekend dining trend.

Popular Items by Demand:

- **Egg Roll** has the highest sales on **Sunday**, making it a key item to focus on for weekend promotions.
- **Egg Curry** is consistently in high demand on **Monday and Tuesday**, reflecting customer preferences at the start of the week.
- **Chicken Roll** experiences a surge in sales on **Saturday and Thursday**, showing patterns related to midweek and weekend dining.

Low Sales Days & Items:

- **Wednesday and Friday** exhibit relatively lower sales across all items, suggesting these days might require targeted promotions or alternative offerings.
- **Mushroom Curry** shows consistently lower sales throughout the week, indicating it might be a low-demand item that could benefit from re-promotion or reconsideration in the menu.

Interpretation of Results and Recommendations

Finding (Figure 1):

Non-Veg items show peak costs of ₹1,820 on Monday and Saturday, indicating higher sales on these days. Veg item costs rise midweek, especially on Wednesday and Thursday.

Recommendation:

Increase inventory for Non-Veg items on Monday and Saturday; monitor and adjust Veg inventory for midweek peaks. Allocate more staff for Non-Veg prep on weekends and Veg prep during midweek.

Finding (Figure 2a):

Monday has the highest in-place Veg orders, while Tuesday shows peak Veg delivery orders. Weekends also show consistently high Veg orders.

Recommendation:

Introduce delivery-focused Veg promotions on Tuesdays to sustain momentum. Run in-place dining offers on Mondays. Consider weekend Veg specials to attract more traffic.

Finding (Figure 2b):

In-place Non-Veg orders consistently surpass delivery orders, with

Thursday showing the highest total (about 1,900 orders). Tuesday has the highest delivery count, while Friday is the lowest-performing day.

Recommendation:

Strengthen dine-in operations on high-demand days like Thursday and Monday. Consider promoting delivery deals on Tuesday and creating offers to boost sales on Friday.

Finding (Figure 3):

Wednesday and Friday show noticeably lower total revenue from both Veg and Non-Veg items.

Recommendation:

Implement midweek discount campaigns or combo deals targeting Wednesday and Friday to increase footfall and online orders.

Finding (Figure 3 - Heatmap):

The heatmap highlights clear demand patterns across days and dishes, showing strong correlations between certain weekdays and specific food preferences.

Recommendation:

Use this data to forecast weekly demand more accurately, align purchasing, and reduce food waste by stocking according to trends.

Finding (Figure 4 - Volume Pareto charts):

Top-selling items like Thali, Chicken Roll, Egg Curry, and Chicken account for a majority of the restaurant's revenue, following the 80/20 principle.

Recommendation:

Prioritize these high-revenue items in procurement, ensure constant availability, and build promotions around them to maximize revenue efficiency.

Finding (Figure 5):

Non-Veg sales spike on weekends, particularly Saturday and Sunday. These days also show strong customer engagement and footfall.

Recommendation:

Prepare by increasing Non-Veg stock before weekends, extending operating hours, and deploying additional kitchen and service staff to handle the surge.