Optimising Business Operations : A Case Study on a Local Cafe

A Final Report for the BDM Capstone Project

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Executive Summary

This project aims to improve operational efficiency and customer satisfaction at Bihan Canteen, a small on-campus cafe at NIT Raipur. Despite providing hygienic and affordable meals, the cafe faces multiple challenges including limited visibility, uncollected orders, and a stagnating menu. These issues impact profitability and service quality.

The project involved collecting primary data over a month (May 2025), encompassing daily order logs, time-based order trends, student feedback through surveys, and on-site observations. Data was cleaned, structured, and analyzed using Excel and Python tools. Pivot tables and visual graphs were used to derive actionable insights.

Major findings include: (i) heavy dependence on 2–3 best-selling Indo-Chinese dishes, (ii) 25–35 daily uncollected orders, mostly during lunch peak hours, and (iii) low visibility for lesser-known menu items. These issues suggest misalignment between menu offerings and customer expectations as well as communication breakdowns during order fulfillment.

Based on the results, short-term recommendations include improved order tracking mechanisms, rotating menus, and focused digital promotions. Mid-term suggestions involve exploring digital ordering platforms and limited-time item trials.

However, the insights are bound by the limitation of a short, 1-month dataset, and extrapolation to seasonal or broader trends is not advisable without longitudinal data. Overall, this project serves as a diagnostic tool to initiate low-cost, impactful improvements in Bihan Canteen's operations.

Detailed Explanation of Analysis Process/Method

This section outlines the specific steps undertaken to analyze the primary data collected from Bihan Canteen. The objective was to uncover patterns in sales, identify peak-hour inefficiencies, and connect customer feedback with observed operational issues. The goal was not to apply abstract statistical definitions, but rather to use practical, business-relevant analytics suited for a small-scale food business.

Tools and Environment

The analysis was conducted using a combination of tools tailored to the type and size of the data:

- **Excel** was used for initial data structuring, summary statistics, and pivot tables.
- **Python (Pandas, Matplotlib)** enabled more flexible data manipulation and visualizations.
- **Google Forms** was used for collecting structured feedback.
- **Google Sheets** facilitated collaboration and backup for Excel work.

These tools were chosen for their accessibility, cost-effectiveness, and suitability for handling moderately sized primary datasets.

Step 1: Data Structuring and Cleaning

The data collected through manual order logs was digitized into a structured Excel format to enable comprehensive analysis. The dataset included variables such as order ID, time stamp, item, quantity, collected status, payment mode, and total revenue. During the data cleaning process, several important steps were taken:

- Item names were standardized to avoid inconsistencies. For instance, variations like "Paneer Chili", "Paneer chilli", were all unified under the label "paneer chilli" to ensure proper aggregation.

- Missing fields, especially in critical columns like 'collected' and 'paid', were filled in using median values.
- Duplicate entries were identified based on the order_id column, which served as the unique transaction identifier. Using Python, these duplicates were removed by retaining only the first occurrence of each, order_id ensuring that sales counts and revenue calculations remained accurate and undistorted.

This careful data preparation ensured that the subsequent analysis was based on accurate and consistent records, forming a reliable foundation for all insights derived in later stages

Step 2: Item-Wise Performance Analysis

This analysis directly addressed Problem Statement 1 (Low Visibility and Limited Marketing) and Problem Statement 3 (Outdated Menu and Lack of Innovation).

A key part of the analysis involved identifying which menu items contributed the most and least to total revenue. Excel pivot tables were used to compute:

- Total number of orders per item
- Total revenue per item
- Mean revenue per item
- Standard deviation and variance of item revenue

This revealed concentration in customer demand. Only 6–7 items (mostly Indo-Chinese) were driving a major portion of the total revenue, while several other items were barely ordered. Notably, items like Paneer Manchurian, Paneer Chilli, and Hakka Noodles dominated revenue, while items such as Plain Maggi, Cheese Maggi, and Masala Maggi recorded low sales despite being familiar options. This aligns with survey feedback where some students expressed a desire for more variety, and some mentioned they were unaware of existing combo deals, indicating both visibility and engagement issues with underperforming items. These insights helped inform the recommendation to consider a rotating menu or eliminate underperforming items.

Step 3: Uncollected Orders and Peak-Time Analysis

This step directly tackled Problem Statement 2 (Delayed or Uncollected Food Orders).

To address operational inefficiencies, particularly uncollected orders, the data was segmented into time slots (e.g., 9–11 AM, 11–2 PM, 2–6 PM, etc.). For each slot, the number of total and uncollected orders was calculated using a pivot table. Then, a bar graph was plotted showing daily total orders versus uncollected orders. This revealed that lunch hours (12–2 PM) consistently showed the highest uncollected rates, with an average of 25–35 uncollected orders daily. These findings highlight operational friction during peak hours and point to the absence of effective collection or alert systems.

This analysis directly supports operational recommendations such as introducing token display systems or preparing commonly ordered items in advance.

Step 4: Customer Feedback Thematic Analysis

43 responses were received through a Google Form with both multiple-choice and open-ended questions. Responses were reviewed and categorized into common themes:

- **Service delays** were one of the most frequently cited issues, with many respondents expressing frustration about long waiting times or unclear communication on when orders would be ready. These concerns were especially associated with peak periods, particularly during the period 2PM-4PM.
- **Menu variety** was another common point raised by respondents. Many expressed a desire for more diverse offerings—suggesting new items such as momos, sandwiches, or South Indian options. This feedback indicates that the current menu may feel repetitive or limited over time, reducing excitement and repeat engagement. Introducing rotational items or periodic specials could help address this concern and improve overall satisfaction.
- The alignment of qualitative feedback with transaction trends validated the core problem areas and pointed toward actionable improvements in operations and communication.

This qualitative analysis validated the data findings. For example, customer complaints about delays matched peak-hour data, and the lack of awareness explained poor sales for combo items. The triangulation of customer voice with transactional data strengthened the case for targeted improvements.

Step 5: Revenue Contribution and Comparative Metrics

To prioritize marketing and promotional efforts, the proportion of total revenue contributed by each item was calculated. The revenue values were sorted in descending order and a bar graph was plotted to visualize top contributors. This clearly demonstrated the Pareto principle: a small number of items were generating the bulk of sales.

This analysis supports the argument for inventory prioritization and menu simplification. Moreover, average revenue per item was compared with order volume to identify high-ticket but low-frequency items, which may be candidates for upselling.

RESULTS AND FINDINGS

This section presents the detailed results derived from a structured and rigorous analysis of primary data collected from Bihan Canteen, NIT Raipur. Each finding is linked to specific business problems identified in the earlier stages of the project and validated through both transactional data and customer feedback. The aim is to offer reliable, actionable insights with supporting visualizations that communicate the findings clearly.

Menu Performance Analysis – Item-Wise Sales Trends

To evaluate which items are driving the canteen's business and which are underperforming, total orders and total revenue by item has been analyzed.

Key Observations:

- A small subset of items, including Paneer Manchurian, Paneer Chilli, and Hakka Noodles, generated over ₹10,000 in revenue each, making them the top earners.
- These 3–5 Indo-Chinese items alone accounted for over 70% of total revenue, confirming the presence of a highly concentrated demand curve.
- At the other extreme, items like Plain Maggi, Cheese Maggi, and Masala Maggi saw fewer than 20 orders and earned below ₹1,500 each.

Implication:

This supports Problem Statement 1 (poor visibility) and Problem Statement 3 (menu fatigue). Students gravitate toward familiar, flavorful items; less popular options likely suffer from weak visibility or appeal. The following Figure 1.1 bar chart shows the items plotted with their corresponding revenue.

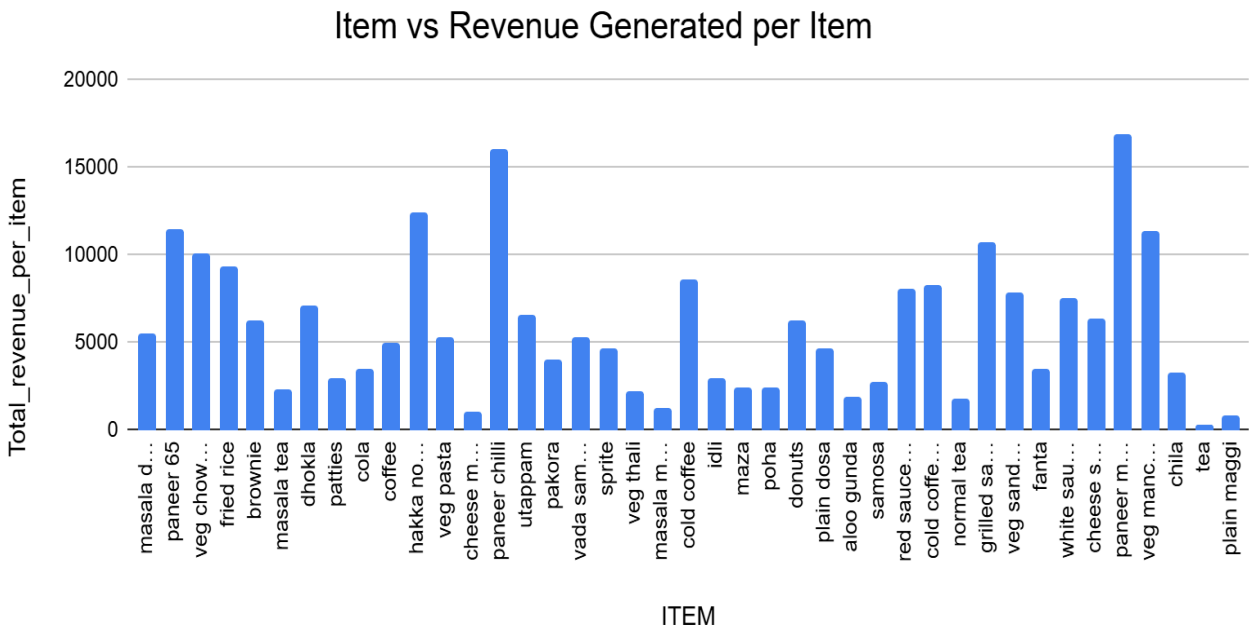

Figure 1.1

Revenue vs Quantity: Strategic Positioning of Menu Items

An analysis of each menu item's total quantity sold and total revenue generated revealed three distinct performance categories. This categorization helped identify how individual items contribute to the canteen’s financial and operational footprint, based solely on factual performance

1. High Quantity, High Revenue – Core Performers

These items were frequently ordered and contributed significantly to overall revenue. They form the core of Bihan Canteen’s daily operations and drive the bulk of customer demand.

- Paneer Manchurian: 129 orders, ₹16,895
- Paneer Chilli: 122 orders, ₹16,080
- Hakka Noodles: 116 orders, ₹12,400
- Veg Chowmein: 114 orders, ₹10,050

These items consistently topped both sales volume and revenue charts.

2.High Quantity, Low Revenue – Volume Drivers

Certain low-cost items sold in high quantities but produced relatively low total revenue. These tend to be affordable everyday choices preferred by regular visitors, especially for breakfast or snacks.

- Poha: 77 orders, ₹2,475
- Tea (Normal): 83 orders, ₹6,360
- Samosa: 63 orders, ₹1,575

They show high transaction frequency but limited monetary contribution per sale.

3.Low Quantity, Low Revenue – Underperformers

A group of items recorded low sales and low overall revenue, indicating weak customer interest or possible visibility issues.

- Plain Maggi: 17 orders, ₹840
- Masala Maggi: 21 orders, ₹1,300
- Cheese Maggi: 12, below ₹1,080

These items appear underutilized by the customer base and had limited engagement throughout the data period.

This dual-metric classification provides insight into the actual contribution of each item, going beyond revenue alone. It reveals which items drive footfall, which offer high transaction value, and which may require further observation due to weak performance.

Peak-Hour Analysis and Operational Bottlenecks

By segmenting the data into time slots, we identified major inefficiencies during peak hours (especially 2PM-4PM):

Observations:

- 2 PM to 4 PM showed the highest number of total and uncollected orders, with the latter ranging from 25 to 35 orders per day, around 25% of daily volume.
- These uncollected orders correlated strongly with high-volume menu items, suggesting kitchen overload during peak demand.

The following line chart (Figure 1.2) and heatmap (Figure 1.3) demonstrates the relationship between total orders and uncollected orders with specific time slots.

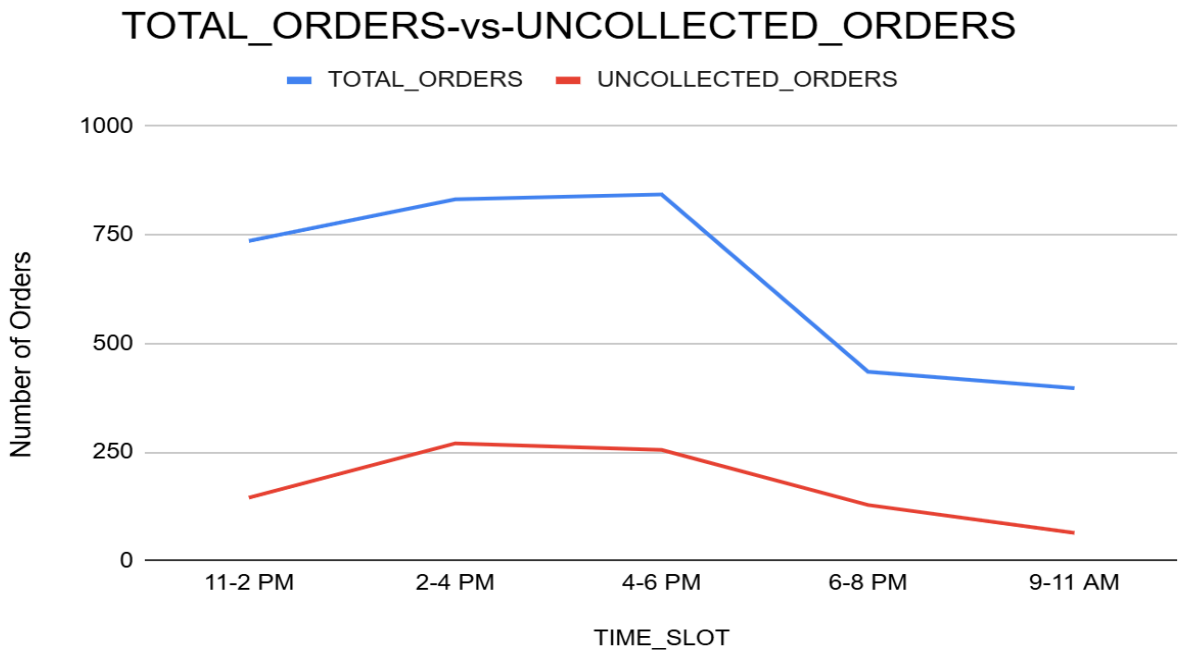

Figure 1.2

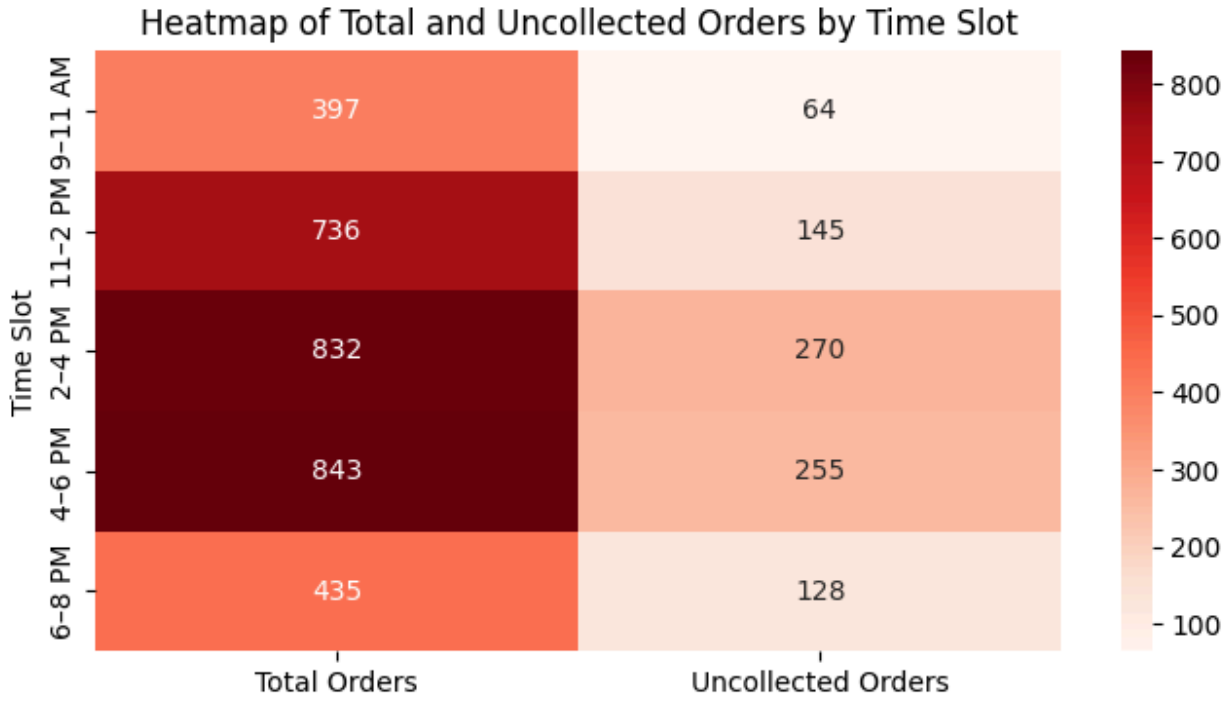

Figure 1.3

The highest number of total and uncollected orders occurs between 2–4 PM and 4–6 PM, indicating peak demand and operational strain. Uncollected orders significantly drop in the morning (9–11 AM) and evening (6–8 PM), reflecting smoother workflows during off-peak hours.

Variance and Standard Deviation in Order Values

An analysis of the standard deviation in order revenue was conducted to understand how consistently each item contributes to sales and whether their order patterns are stable or unpredictable.

Key Findings:

- Paneer Manchurian and Grilled Sandwich exhibited high standard deviation in revenue, which suggests that this item was purchased in widely varying quantities — sometimes as a single plate, other times as part of large, group orders. This variation could stem from its popularity among group diners or combo deals, making it less predictable in terms of inventory and prep.
- In contrast, items like Poha, Aloo Gunda, Normal Tea etc. had very low standard deviation, indicating that they were almost always ordered in consistent, small quantities, likely by individual students during breakfast or short breaks. Their price and portion size do not vary, leading to highly stable revenue per transaction.
- Other items such as Veg Thali,Red Sauce Pasta showed moderate variation, indicating some diversity in order combinations but not enough to create large swings in total order value.

Interpretation:

- High variance items reflect irregular demand — they may be profitable but require more flexible preparation and stock planning.

- Low variance items are predictable and reliable, suitable for batch preparation and fixed forecasting.
- Understanding this volatility helps in menu planning, inventory control, and kitchen workflow design, especially during peak times

Insight:

High-variance items may need better prep planning (e.g., batch cooking), while stable sellers can be optimized for quick service.

Revenue Distribution and Pareto Principle

A detailed analysis of item-wise revenue contributions revealed a highly skewed distribution, where a small subset of items accounted for the majority of total revenue. This reflects the classic Pareto Principle (80/20 rule) in action.

Key Findings:

- Out of approximately 35–40 active menu items, only the top 7 items (roughly 20%) contributed to 75–80% of the total monthly revenue.
- These top performers included Paneer Manchurian, Paneer Chilli, Hakka Noodles, Veg Chowmein, Cold Coffee with Ice Cream, Poha, and Cheese Sandwich.
- Each of these items not only had high order frequency but also commanded solid per-unit pricing, giving them significant revenue weight.

Implications from the Long Tail:

The remaining 80% of items (about 28–32 items) individually contributed less than 3% each to the overall revenue.

Several of these items had fewer than 20 orders during the month and total revenues under ₹1,500, with some items falling below ₹1000

Despite their limited financial contribution, these items still consume:

- Inventory space (ingredients, perishables)
- Kitchen prep time (if ordered occasionally)
- Menu space (leading to cognitive overload for customers)

This imbalance highlights the operational cost of menu clutter. While offering variety can be a selling point, too many low-performing options can reduce efficiency and increase complexity for staff and customers alike.

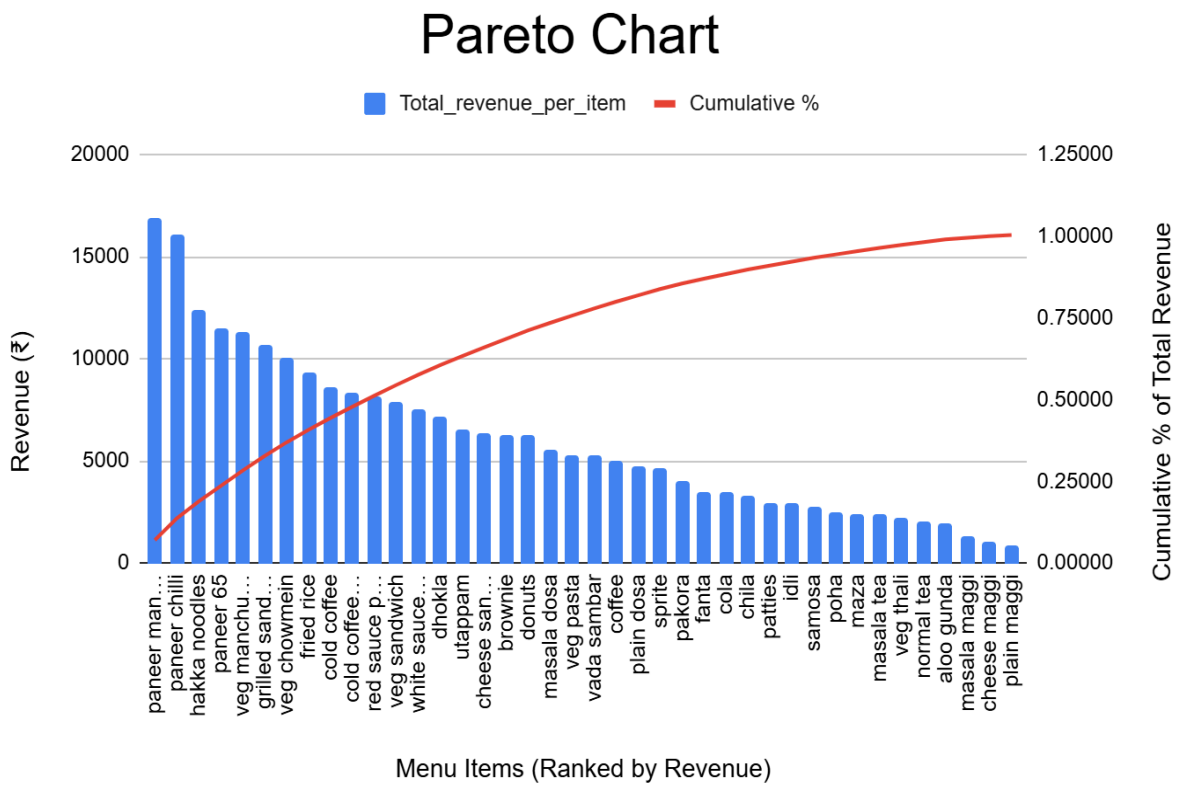

Figure 2.4

Insights from Pareto Chart: Cumulative Revenue by Item Rank

1. Top Performers Dominate Revenue
   The first 6–8 items (e.g., Paneer Manchurian, Paneer Chilli, Hakka Noodles) account for the majority of the canteen's revenue. This validates the Pareto Principle — a small portion of the menu (≈20%) contributes to nearly 80% of total revenue.

2. Long Tail of Low-Contribution Items
   Beyond the top 10–12 items, the bars flatten out sharply. Over 30+ items contribute less than 5% each to total revenue. Despite taking up menu space, these items offer minimal financial return, which may impact kitchen efficiency and customer decision-making.

3. Cumulative % Reaches 80% Quickly
   The red cumulative line rises steeply and begins to level off after the first few items. By the 10th item, the curve is already approaching 80–85%, confirming a strong revenue concentration in a handful of menu items.

4. Operational and Inventory Implication
   The wide gap between top and bottom performers suggests that resources (e.g., ingredient stock, staff effort) may not be optimally aligned with actual customer demand. Items with low revenue but complex preparation could be reviewed or rotated out.

Customer Feedback Synthesis

Quantitative Findings (Survey Results):

The feedback survey revealed clear patterns in student experiences and expectations. A significant portion of respondents reported experiencing delays in order delivery, particularly

during peak lunch and evening hours, highlighting operational stress during high-demand periods.

Many students expressed that the menu felt repetitive, with a strong preference for new or seasonal items that add variety and freshness to the offerings. Additionally, quality concerns were commonly mentioned, indicating a gap between expectations and the current standard of food served.

The data indicates that customers are not only looking for timely service but also actively seeking better culinary experiences in terms of innovation and consistency.

Implications:

These insights strongly reinforce the data findings:

- Peak-hour inefficiencies are customer-visible.
- Marketing efforts are insufficient .
- Menu feels static to customers.

Mode of Payment Preferences

Although payment method was not a core focus of the study, analyzing transaction modes revealed important operational patterns that intersect with queue length, order tracking, and customer convenience.

Key Observations:

- UPI-based payments (via Google Pay, PhonePe, Paytm, etc.) made up more than 60% of total transactions. This suggests that a majority of customers, especially students, prefer fast, cashless transactions—likely due to convenience and reduced dependency on carrying change.

- Cash payments still accounted for approximately 35% of orders, indicating that a substantial portion of customers either do not use UPI regularly or prefer cash for small transactions. In some cases, this may be due to the absence of a smartphone, low balance, or issues with internet access within campus premises.

- A small fraction of payments (around 5%) were noted as pending or unpaid at the time of entry, often linked to uncollected orders. This aligns with operational inefficiencies identified during peak hours, where the lack of structured digital ordering can lead to miscommunication or delayed payment collection.

INTERPRETATION OF RESULTS AND RECOMMENDATION

This section provides a comprehensive interpretation of the analyzed data and survey results. Each insight is mapped to the business problems identified earlier and followed by clear, actionable recommendations. The goal is to offer strategic and operational improvements that are immediately implementable, scalable, and aligned with the preferences of the primary customer base — the students of NIT Raipur.

Problem Statement 1: Low Visibility and Limited Marketing Outreach

Interpretation of Results:

The analysis revealed that only a handful of menu items — primarily Indo-Chinese dishes — account for the vast majority of total revenue. Despite the presence of over 35 menu items, more than 70–80% of sales are concentrated in just 6–8 offerings. Simultaneously, the customer feedback survey indicates that many students find the menu repetitive and are unaware of the complete range of available items

Recommendations:

- **Improve Menu Design & Visual Hierarchy:**
  Reorganize the menu to prominently feature top performers and new or high-margin items. Use visual cues like icons or color-coded sections to guide attention.
- **Use Physical and Digital Promotion:**
  Employ simple yet effective communication tools like table tents, wall posters, or social media stories to announce combo offers, new items, or student picks.
- **Deploy Rotating Spotlights:**
  Feature one underperforming item each week as a "Special of the Day" to test its performance under improved visibility.

Problem Statement 2: Delayed or Uncollected Orders During Peak Hours

Interpretation of Results:

The time-slot analysis clearly shows a spike in both total orders and uncollected orders during the 2 PM–4 PM and 4 PM–6 PM windows. Around 25–35 uncollected orders were observed daily in these slots, suggesting operational stress due to surges in demand.

Survey responses corroborate this pattern, with many students reporting delays and confusion around order readiness. The correlation between peak-time traffic and uncollected orders indicates a breakdown in either communication (order status) or capacity (preparation bottleneck).

Recommendations:

- **Implement a Token Display or Digital Queue System:**
  A basic digital display board showing token numbers or order readiness can reduce confusion and waiting times.

- **Introduce UPI-Linked Pre-Ordering:**
  Allow students to place and pay for orders through Google Forms or WhatsApp integrated with UPI, especially during peak hours, reducing congestion at the counter.
- **Pre-Preparation for Predictable Items:**
  Identify fast-moving items with consistent demand (e.g., Poha, Tea) and batch-prepare them during expected rush periods.

Problem Statement 3: Lack of Menu Innovation and Customer Engagement

Interpretation of Results:

The dual-axis item performance analysis identified a long tail of underperforming items — some of which generated revenue below ₹1,000 and were ordered fewer than 20 times in a month. Simultaneously, feedback strongly highlighted a desire for more variety, especially new and seasonal items.

The current static menu does not reflect changing student preferences or seasonal opportunities, and low-performing items occupy space without adding value.

Recommendations:

- **Introduce a Rotating Menu Section:**
  Reserve 2–3 slots on the menu board for weekly or monthly special dishes based on student polls or seasonal availability.
- **Conduct Feedback-Driven Menu Updates:**
  Use monthly Google Forms or suggestion boxes to collect direct input from customers on new item trials or improvements to existing ones.
- **Phase Out or Revamp Underperforming Items:**
  Remove persistently low-selling items or experiment with new recipes/names for them (e.g., relabel “Plain Maggi” as “Spicy Tadka Maggi”).