ENHANCING OPERATIONAL EFFICIENCY, SPACE AND INVENTORY MANAGEMENT AT 'JJ BEAUTY SALON'

A Mid-Term Report for the BDM Capstone Project

KALAVAGUNTA SAI SRI LEKHA
23f2003461
Jan 2025 TERM

INDIAN INSTITUTE OF TECHNOLOGY, MADRAS, CHENNAI
TAMIL NADU, INDIA, 600036

(BS) DEGREE IN DATA SCIENCE AND APPLICATIONS

INDEX	
TOPIC	**Page No.**

Executive Summary

JJ Beauty Salon, established on August 1, 2024, operates in Hyderabad, offering a range of beauty services, including eyebrow threading, facials, hair care, and makeup. Despite a growing customer base, the salon faces operational inefficiencies that impact productivity and customer experience. Key challenges include space constraints, manual inventory tracking, and paper-based appointment scheduling, leading to stockouts, wastage, and unstructured bookings.

To address these challenges, a data-driven approach was implemented. Service data, inventory usage, and financial records were collected and analysed to optimize operations. ABC analysis and demand forecasting techniques were applied to improve inventory management, ensuring essential products are stocked efficiently while minimizing waste. Appointment and service data were used to analyze customer demand patterns, allowing for better scheduling and reduced wait times.

The findings from the analysis highlight key trends, such as eyebrow threading being the most frequent service and seasonal demand variations impacting product consumption. Inventory tracking improvements help reduce stockouts and enhance cost management. The transition to digital record-keeping using Excel streamlines financial tracking, making revenue and expenditure analysis more accurate.

By integrating these data-driven solutions, JJ Beauty Salon can enhance efficiency, improve customer satisfaction, and optimize resource allocation. These efforts will lead to better business decision-making and long-term sustainability, ultimately contributing to the salon's growth and profitability.

Proof of Originality

To establish the authenticity of the data, the supporting evidence as listed below:

1. **Letter from the Organization:** Access to the letter can be obtained through the G-Drive link: [https://drive.google.com/file/d/1n0dswCJO0rr1KO3Qb9iIQ2P2fo0lpq1Y/view?usp=drive_link]

Note: As this is a small-scale business, they don’t have a business stamp.

2. **Images of Organisation:**

3. **Video of interaction with the business owner/ managers:**

[https://drive.google.com/file/d/18_Ft6zN9_waGbNEkKt91pT6BTQt6XJNQ/view?usp=sharing]

Metadata and Descriptive Statistics

METADATA:

My data consists of the following elements:

1. Date

- **Type**: Date
- **Format**: YYYY-MM-DD
- **Range**: 2025-02-01 to 2025-03-04 (February 2025)
- **Description**: The calendar date when the service was performed.
- **Business Use**: Track seasonal trends and daily demand patterns.

2. Day
   - **Type**: Categorical (String)
   - **Allowed Values**: Mon, Tue, Wed, Thu, Fri, Sat, Sun
   - **Description**: Day of the week derived from the Date field.
   - **Business Use**: Analyze weekday vs. weekend demand for staffing.

3. Service
   - **Type**: Categorical (String)
   - **Examples**: "Eyebrow Threading", "Keratin Treatment", "Bridal Makeup"
   - **Description**: The type of beauty service provided.
   - **Business Use**: Identify popular services and optimize service menus.

4. Clients
   - **Type**: Integer
   - **Range**: 1 (individual services) to 12 (group appointments)
   - **Description**: Number of clients served for the given service.
   - **Business Use**: Measure service capacity and client volume.

5. Start Time
   - **Type**: Time
   - **Format**: HH:MM (24-hour clock)
   - **Description**: When the service began.
   - **Business Use**: Calculate peak hours and staff scheduling.

6. End Time
   - **Type**: Time
   - **Format**: HH:MM (24-hour clock)
   - **Description**: When the service concluded.
   - **Business Use**: Calculate peak hours and staff scheduling.

7. Duration (mins)
   - **Type**: Integer
   - **Range**: 30 (quick services) to 120 (long treatments)
   - **Description**: Length of the service in minutes.
   - **Business Use**: Optimize appointment slot durations.

8. Revenue
   - **Type**: Numeric (Currency)
   - **Unit**: Indian Rupees (₹)
   - **Range**: ₹200 (basic) to ₹3,500 (premium)
   - **Description**: Income generated per service.
   - **Business Use**: Profitability analysis and pricing strategy.

9. Cost
    - **Type**: Numeric (Currency)
    - **Unit**: Indian Rupees (₹)
    - **Description**: Expenses incurred per service (materials/staff).
    - **Business Use**: Calculate profit margins.

10. Profit
    - **Type**: Numeric (Currency)
    - **Calculation**: Revenue - Cost
    - **Description**: Net earnings per service.
    - **Business Use**: Identify high-margin services.

11. Inventory Used
    - **Type**: Categorical (String)
    - **Examples**: "Thread", "Keratin Kit", "Makeup Palette"
    - **Description**: Materials consumed for the service.
    - **Business Use**: Track stock levels and reorder triggers.

12. Cost Spent on Inventory
    - **Type**: Numeric (Currency)
    - **Description**: Cost of materials used per service.
    - **Business Use**: ABC analysis for inventory prioritization.

Sample view of the Service Data:

Date	Day	Service	Clients	Start Time	End Time	Duration (mins)	Cost per client	Revenue	Profit	Cost Spent On Inventory	Inventory Used
2025-02-01	Sat	Eyebrow Threading	5	5:30:00 PM	6:10:00 PM	40	50	250	200	50	Thread
2025-02-01	Sat	Keratin Treatment	1	6:30:00 PM	8:30:00 PM	120	1400	3500	2100	1400	Keratin Kit
2025-02-02	Sun	Eyebrow Threading	6	5:00:00 PM	6:00:00 PM	60	50	300	250	60	Thread
2025-02-02	Sun	Bridal Makeup	1	6:30:00 PM	8:00:00 PM	90	1200	3000	1800	1200	Makeup Kit
2025-02-03	Mon	Eyebrow Threading	3	5:45:00 PM	6:15:00 PM	30	50	150	100	30	Thread
2025-02-04	Tue	Eyebrow Threading	4	5:30:00 PM	6:10:00 PM	40	50	200	150	40	Thread
2025-02-05	Wed	Nail Extensions	1	2:00:00 PM	3:30:00 PM	90	600	1500	900	600	Nail Kit

Click here for full dataset

DESCRIPTIVE STATISTICS:

After data processing and cleansing, the following is a concise overview of the dataset using descriptive statistics. I have attempted to condense the information by highlighting the descriptive stats below relevant for service data

index	Clients	Duration (mins)	Cost per client	Revenue	Profit	Cost Spent on Inventory
count	42	42	42	42	42	42
mean	2.833333333	58.57142857	378.0952381	1011.904762	633.8095238	382.3809524
std	1.94956739	30.44959278	515.2372794	1246.938178	732.7427672	513.266961
min	1	30	50	150	100	30
25%	1	40	50	212.5	162.5	50
50%	2	42.5	80	300	250	80
75%	5	90	600	1500	900	600
max	6	120	1400	3500	2100	1400

This table summarizes key metrics across 42 salon services. On average, each service serves about 3 clients (mean=2.83) lasting 59 minutes, generating ₹1,012 revenue with ₹634 profit per service. The wide standard deviations in cost (₹515) and revenue (₹1,247) highlight significant variation - while basic services like threading (min ₹150 revenue) attract volume, premium treatments like Keratin (max ₹3,500 revenue) drive profitability despite fewer clients. The data reveals how high-value services (75th percentile at ₹1,500 revenue) disproportionately impact earnings compared to high-volume, low-cost options (median ₹300 revenue).

Analysis processes and methods

The process of data analysis encompasses defining the problem, data collection, organization, cleaning, transformation, applying analysis techniques, and drawing conclusions.

1. Business Selection

I chose this salon business for my project because I'm a regular client, which gave me a unique

advantage. The owner already knew and trusted me, making it easier to access her records without hesitation.

2. Data Collection Process

The salon owner maintained all her records manually in a ledger, noting daily appointments, services, and payments. To digitize this, I took photos of each page and meticulously entered the data into Excel. This included details like service names, client counts, timings, and revenue for each day. The process was time-consuming but ensured accuracy, as I cross-verified entries with the owner whenever discrepancies arose.

3. Dataset Overview

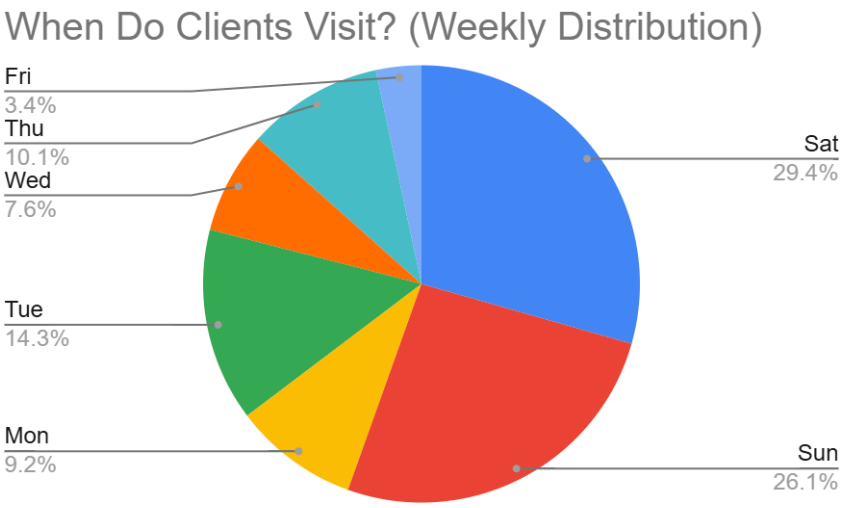
The dataset covers more than a month of operations, from **February 1 to March 4, 2025**, capturing every service provided during this period. It includes columns like *date, day of the week, service type, number of clients, duration, revenue, costs, and profit*. Additional field like *inventory used* was added to analyse operational efficiency and resource allocation. This comprehensive snapshot allowed me to explore trends across weekdays, weekends, and peak hours.

4. Analysis Approach

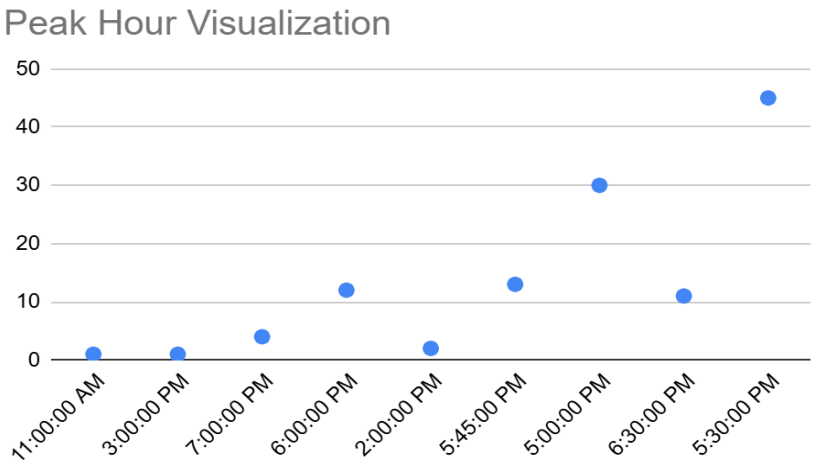
Using the cleaned dataset, I performed multiple analyses to uncover actionable insights. First, I categorized services by profitability (ABC analysis) to identify high-value offerings. Next, I examined peak hours to optimize staff scheduling. Finally, I calculated inventory usage patterns to minimize waste. Tools like PivotTables, conditional formatting, and basic statistical measures (mean, median, etc.) helped structure the data for clarity. Visualizations like bar charts and scatterplots were also created to highlight key patterns for the owner.

Results and Findings

Some insights gained from service data:

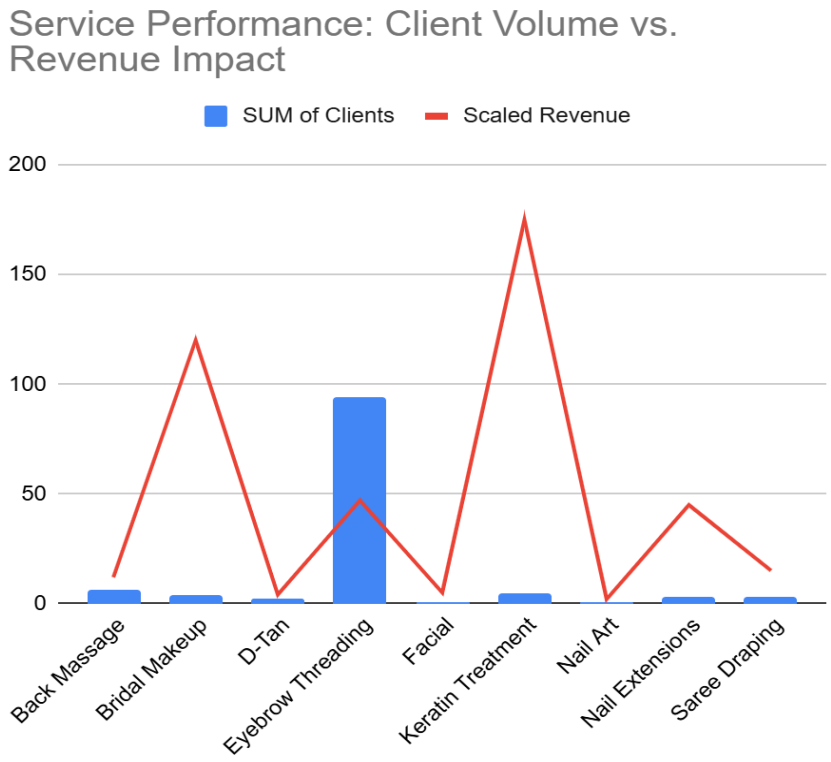


The pie chart shows client visits by day, with weekends being busiest (Saturday 29.4%, Sunday 26.1%). Tuesday sees moderate traffic (14.3%), while Friday is slowest (3.4%). Weekdays average 7-10% of visits. This pattern suggests adjusting staffing - more workers on weekends, fewer on Fridays - and possibly offering weekday promotions to boost slower days. The data clearly highlights when the salon is busiest, helping optimize operations.



The visualization shows key time slots when client visits peak at the salon. The busiest periods cluster in the late afternoon and evening, with **6:00-8:30 PM** being particularly prominent (6:00 PM, 6:30 PM, 7:00 PM, and 8:30 PM all appearing). A secondary peak occurs in the mid-afternoon (2:00-3:00 PM), while the early morning (1:00 AM) time stands as an outlier, possibly representing

either late-night services or data entry irregularities. The concentration of visits after 5:45 PM suggests most clients prefer post-work appointments, highlighting the importance of adequate evening staffing to handle this predictable surge in demand.



The visualization clearly demonstrates a key business insight: **high client volume doesn't always equal high revenue**. While Eyebrow Threading attracts the most clients (shown by the tallest bar), it generates significantly less revenue compared to Bridal Makeup and Keratin Treatment (shown by the higher revenue line points for these services). This occurs because Bridal and Keratin services command much higher prices per client, despite serving fewer customers.

The graph effectively shows how premium services (Bridal Makeup, Keratin) deliver disproportionate revenue impact, while high-volume, low-cost services (Eyebrow Threading) drive customer traffic but contribute less financially. This highlights an important strategic balance - the salon needs both types of services: high-volume offerings to maintain client flow and frequency, and premium services to maximize profitability. The data suggests opportunities to upsell premium add-ons to threading clients or strategically schedule more high-value appointments during peak times.

ABC ANALYSIS				
index	Inventory Used	Cost Spent On Inventory	Cumulative_Pct	ABC
1	Keratin Kit	7000	43.60%	A
2	Makeup Kit	4800	73.50%	B
4	Nail Kit	1800	84.70%	C
8	Thread	940	90.50%	C
6	Saree Accessories	600	94.30%	C
3	Massage Oil	480	97.30%	C
0	Facial Products	200	98.50%	C
7	Tan Removal Cream	160	99.50%	C
5	Nail Polish	80	100.00%	C

ABC analysis helps prioritize inventory management by classifying items based on their cost contribution. It follows the Pareto principle (80/20 rule), identifying which items deserve tight control (A), moderate attention (B), or minimal oversight (C).

Process:

1. **Data Preparation**: Listed all inventory items and their total costs.
2. **Sorting**: Ranked items by descending cost (Keratin Kit ₹7,000 → Nail Polish ₹80).
3. **Cumulative % Calculation**:
    - Example: Keratin Kit (₹7,000) = 43.6% of total costs (₹16,060).
    - Makeup Kit added (₹4,800) → Cumulative 73.5% (₹11,800/₹16,060).
4. **Classification**:
    - **A**: Top ~20% items (Keratin Kit, 43.6%).
    - **B**: Next ~30% (Makeup Kit, 73.5%).
    - **C**: Remaining ~50% (all others).

Key Findings:

1. **A Items (High-Impact)**:
    - Just **1 item (Keratin Kit)** consumes **43.6% of costs**.
    - *Action*: Negotiate bulk discounts, monitor stock weekly.
2. **B Items (Moderate)**:

- **Makeup Kit** (29.9% cumulative jump) is secondary priority.
- *Action*: Monthly reviews, standard reorder points.

3. **C Items (Low-Cost)**:
   - **7 items** (e.g., Thread, Nail Polish) contribute just **26.5% of costs** combined.
   - *Action*: Order quarterly in bulk to reduce procurement effort.

Visual Insight:
The steep initial slope (Keratin → Makeup Kit) flattens for C items, emphasizing how few items drive most costs.

Strategic Impact:
Focus 80% of inventory management effort on **Keratin/Makeup Kits** (A+B), while automating orders for low-value C items.