Overcoming Financial Hurdles: Data Driven Strategies in the Vegetable Business

A Mid-Term report for the BDM capstone Project

Submitted by

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1 Executive Summary

'Vishnu Kumar and Sons' is a relatively new vegetable selling business with 3-4 years of experience, located at a distance from the nearest Subji Mandi in Ramadevi, Kanpur. Primarily serving retail customers, the shop caters to individual consumers and small vendors in the area, offering fresh, high-quality produce.

Despite its steady growth and loyal customer base, the business faces challenges in transaction recording, pricing strategies, and inventory management, which impact its financial stability and growth potential. As a newer business, **'Vishnu Kumar and Sons'** lacks detailed insights into its financial health, making it difficult to set accurate pricing margins or determine the daily turnover required to achieve desired income levels.

Furthermore, the absence of structured inventory management practices has led to issues with waste management, as unsold stock often results in losses. Without proper data on stock levels and customer demand patterns, managing waste effectively becomes a challenge, impacting overall profitability.

To address these issues, I propose a comprehensive analytical approach. By examining past transaction data and working closely with the business owner, I aim to identify pricing trends and gain a clearer financial overview of the shop's performance. Implementing a structured inventory management system will help track stock levels more accurately, reduce waste, and optimize profits. This approach will empower **'Vishnu Kumar and Sons'** to make more informed business decisions and build a sustainable foundation for future growth.

2 Proof of originality of the Data

- Business Name: Vishnu Kumar and Sons
- Address: Jareeb Chowki G.T. Road, Kanpur
- Owner’s Name: Vishnu Kumar

Video of Interaction with Business Owner: Video

Letter: Letter

Fig 1. Me along with the Business Owner at the Business place.

The business owner utilises two primary methods for Recording Data:

1. **Khata Book**: Used at the owner's residence for recording detailed vegetable data every few days. This included fixed costs (e.g., transportation from Ramadevi Sabzi Mandi) and variable costs.
2. **Daily Notepad**: Used to record daily vegetable purchase quantities.

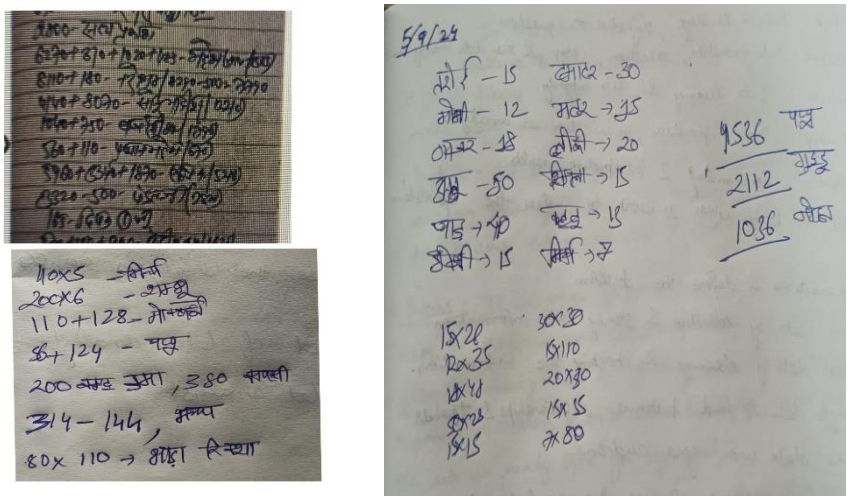

Fig 2. Snapshot of various Data Recordings

3 Metadata

- Data Format: CSV (Comma-Separated Values) and Excel/Sheets (XLSX)
- Range: September 01, 2024, to October 14, 2024
- Business Closed: The business was closed on September 19, 2024, and October 01, 2024.
- Units of Measurement for Features involving Quantity: Kilogram (Kg)
- Units of Measurement for Features involving Money: Indian Rupee (₹)

Information about the Vegetable Data

Link: Vegetables Data

Features Collected about each vegetable:

- Vegetable Name: The name of the vegetable.
- Cost Price: Cost Price incurred while purchasing vegetables.
- Sell Price: The selling price for the initial 60% of the quantity sold at the beginning of the day.
- Quantity Bought: The total quantity of vegetables bought on a particular day.
- Quantity Sold: The total quantity of vegetables sold on a particular day.
- Profit: Calculated as (Sell Price – Cost Price) * Quantity Sold
- Date: The specific date for each day's record.

Explanation:

The main sales period for the shop is between 6 pm and 9 pm, as this is when offices close and many people purchase vegetables on their way home. The shop initially sells vegetables at a standard selling price, but towards the end of the day, any remaining stock is sold at a reduced price to encourage quick turnover.

By tracking these metrics, the shop can easily calculate its daily profit. This data allows for better financial analysis, providing insights into the profitability of each type of vegetable and helping the shop to make informed pricing and purchasing decisions.

However, due to inventory management challenges, the shop sometimes faces issues with excess stock. To address this, the business could benefit from an improved inventory tracking system that aligns stock levels with demand patterns. By anticipating peak demand times and adjusting stock accordingly, the shop can reduce waste, avoid shortages, and ensure that fresh produce is available when most customers are buying.

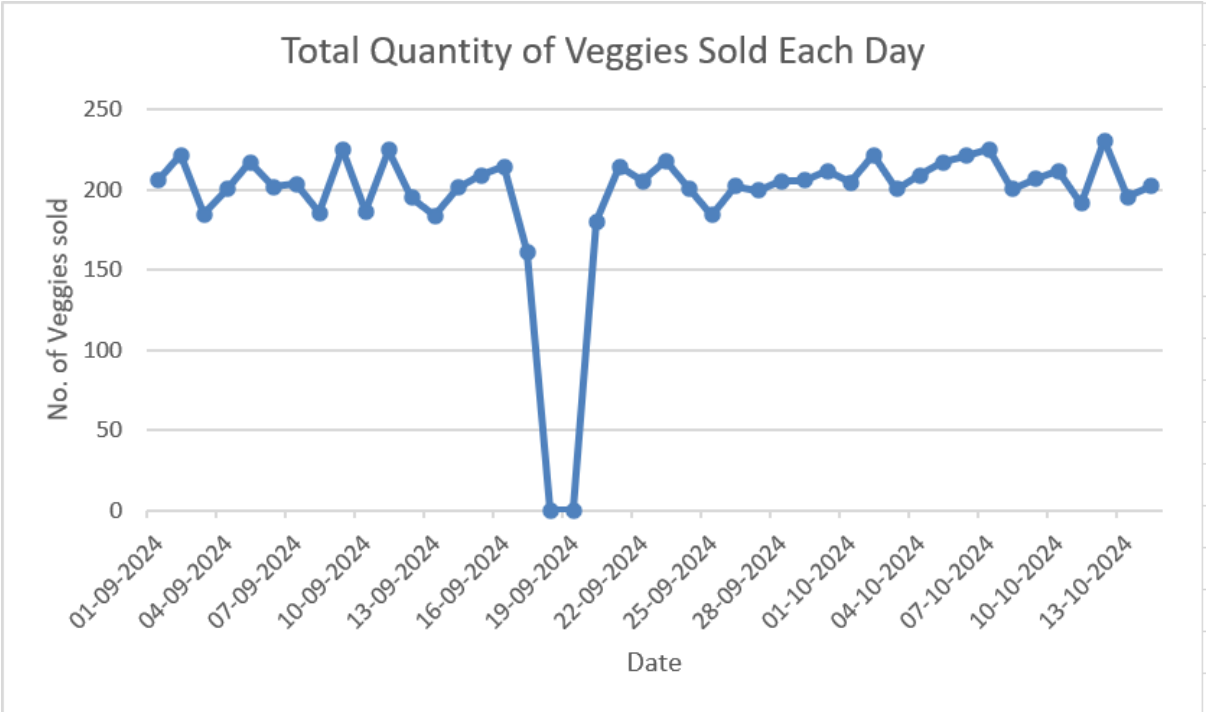

Fig 3. Plot of Number of Different Vegetables Sold Each Day

We can observe a steady trend in the sales of various vegetables, with a peak value reaching 230.5 and a low of 161(excluding 0).

Information about the Inventory Data

Link: Inventory Data

Features Collected:

- Vegetable Name: The name of the vegetable.
- Quantity Left: The total quantity of each vegetable remaining at the end of a day.
- Waste: The total quantity of vegetables wasted on a particular day.
- Date: The date corresponding to each day's recorded data.

By monitoring the **Quantity Left** and **Waste** for each vegetable, we can gain valuable insights into sales patterns, allowing us to identify which vegetables are overstocked or understocked. This analysis will enable better inventory planning, helping to reduce waste, avoid shortages, and ensure that stock levels are optimized to meet daily demand.

Fig 4. Shows the distribution of Total Waste of vegetables each day.

4 Descriptive Statistics

Index	Total Cost
Count	13
Mean	2319
Std. Dev	1695.79
Median	1715
Minimum	961
Maximum	7142

Fig 5. Shows the trend of Total Cost of all Vegetables and its respective Descriptive Statistics

Index	Net
Count	13
Mean	2724.46
Std. Dev	1791.66
Median	2125
Minimum	1265
Maximum	7940

Fig 6. Shows the trend of Total Selling Value of all Vegetables and its respective Descriptive Statistics

Index	Total Waste
Count	13
Mean	5.92
Std. Dev	3.1
Median	5.5
Minimum	0.7
Maximum	11.25

Fig 7. Shows the trend of Total Waste Over Time and its respective Descriptive Statistics

The data collected is directly linked to the problem statements as follows:

- Transaction Records: The data on vegetable transactions, including cost price, sell price, and quantity, address the first problem statement by providing a thorough financial overview of the business and basis for analysing and setting the right margins to achieve the desired monthly income.

- Inventory Management: The inventory data, with details on quantity bought, quantity sold, waste, transaction dates help in establishing a clear inventory management system, tackling the second problem statement.

5 Detailed Explanation of Analysis Process & Methods

The analysis process for this project integrates both quantitative and qualitative methods, strategically selected to address the unique challenges of the business.

- **Extensive Use of Spreadsheets**: Spreadsheets and their powerful functionalities played a central role in the analysis. Key tasks, such as calculating daily inventory levels, tracking waste, and determining the total cost of vegetables, were effectively managed through spreadsheet tools. The intuitive and accessible interface of spreadsheets enabled efficient handling of the datasets and allowed for complex calculations with ease.

- **Streamlined Calculations and Data Aggregation**: By leveraging functions like SUM, AVERAGE, and others, the spreadsheet provided a streamlined approach to summarizing and analysing data. This process helped to quickly identify trends and metrics essential for inventory control, waste reduction, and cost management, offering a comprehensive view of the business's operational performance.

• **Time-Series Analysis**: This approach is especially valuable for analysing financial data, as it captures trends, patterns, and variations over time, offering deep insights into the business's financial health and performance. By examining historical data, time-series analysis enables a clearer understanding of seasonal trends and recurring patterns, which are crucial for setting optimal pricing margins and making informed business decisions.

• **Enhanced Profitability and Inventory Management**: Through time-series analysis, I was able to identify key periods of high demand, helping to adjust stock levels accordingly and reduce instances of overstocking. This improved inventory management not only minimized waste but also contributed to a more profitable operation by aligning supply with demand patterns.

• **Conversations with the Business Owner**: Engaging in discussions with the business owner provided essential qualitative insights that go beyond the numbers. By understanding the owner's perspective on inventory and waste management, as well as preferred margins, I could tailor recommendations that are both practical and actionable. These conversations offered a ground-level view of operations, highlighting challenges that data alone may not reveal.

• **Holistic and Balanced Approach**: This method of combining time-series analysis, statistical computations, and personal conversations offers a comprehensive understanding of the business. Unlike purely quantitative methods, this approach captures both the hard data and the owner's hands-on experience, ensuring that solutions are grounded in the realities of the business environment.

• **Decision-Making Advantage**: Insights from these conversations were particularly valuable for making informed decisions to address the core business challenges. The owner's deep understanding of day-to-day operations and ground-level issues was instrumental in shaping recommendations that directly target the business's most pressing concerns, such as inventory management and waste reduction. This blend of data-driven analysis with real-world experience ensures that proposed solutions are both effective and feasible.

The selected methods provide a uniquely comprehensive view of the business's operations by blending quantitative data with the owner's practical insights. This holistic approach ensures that our recommendations are not only grounded in robust data analysis but also aligned with the realities and nuances of the business environment. By integrating time-series analysis, statistical modelling, and in-depth conversations, we achieve a well-rounded perspective that captures both the objective trends and the owner's on-the-ground experiences. This balanced approach enhances our understanding of the business's challenges and reveals opportunities for sustainable improvement.

6 Results and Findings

One of the Key Observations is the Daily Profit Trend over the month.

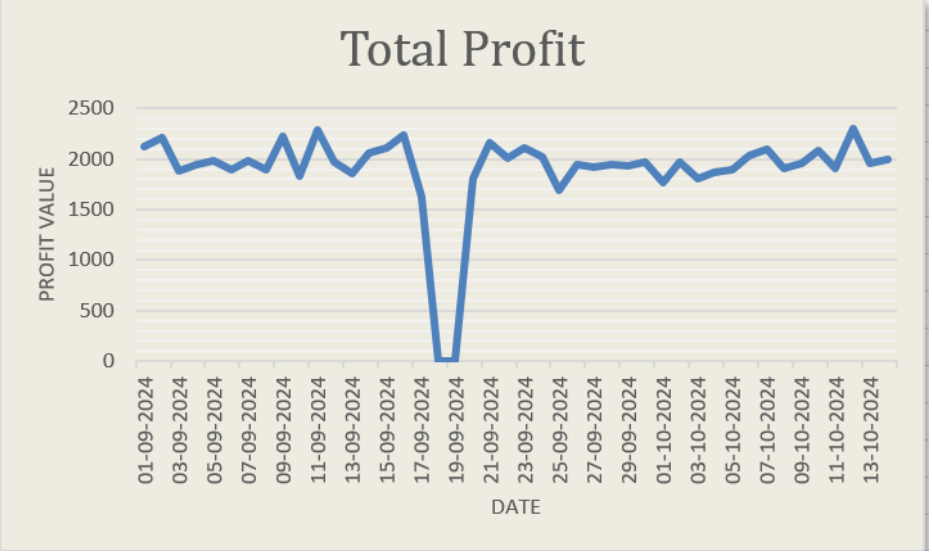

Fig 8. Shows the trend of Daily Profit over Time

A **consistent** pattern can be seen in the Daily Profits.

Mean Daily Profit stood at Rs. 1891.26 with a Standard Deviation of Rs. 442.23.

These numbers are also affected by the two business closure days. Excluding these days, we can observe:

- Mean: Rs. 1981.32
- Standard Deviation: Rs. 149.39
- Min: Rs. 1634
- Max: Rs. 2302.5

A peak profit of **Rs. 2302.5** was observed on October 12, 2024, likely influenced by several factors:

- Dusshera festival on October 11 led to a significant increase in demand, boosting profits on October 12.
- Sudden spike observed in the profit margin of vegetables.

Another key observation is that September and October have almost same daily profits as can be seen in the figure.

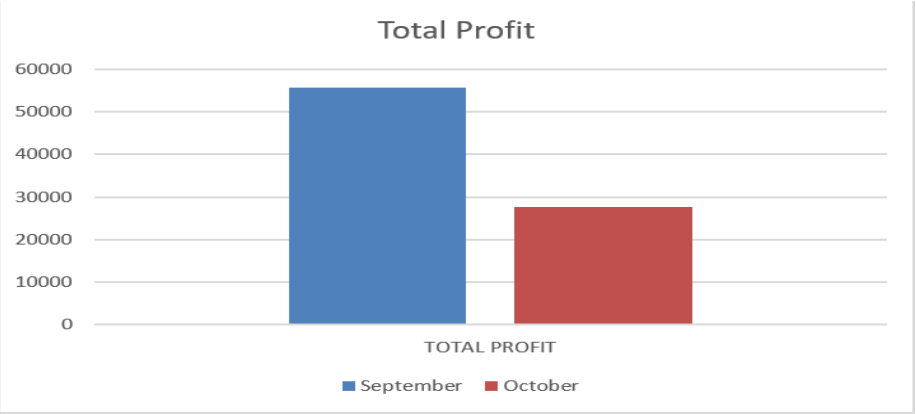

Fig 9. Shows the Total Profit in the months of September and October

During my conversation with the shopkeeper, he highlighted a few key challenges and trends:

1. **Weather Impact:** The shop faces difficulties in managing operations during extreme weather conditions. Sales are notably affected on rainy days and during periods of intense heat, likely due to reduced foot traffic and potential spoilage.

2. **Sales Trends on Sundays:** Sunday is the busiest day of the week, with significantly higher sales compared to other days. This trend reflects increased customer turnout, as more people shop for fresh produce over the weekend.

Additional Information: BDM PROJECT