DATA DRIVEN ANALYSIS FOR OPERATIONAL IMPROVEMENT: TELANGANA BELLAM CHAI

A Mid-Term report for the BDM capstone Project

Submitted by

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1 Executive Summary

Data Driven Analysis for Operational Improvement: Telangana Bellam Chai

Telangana Bellam Chai is a Small and single owner beverage outlet in the Kadem belonging to Nirmal district Telangana. This is Specialized in the Bellam Chai, Coffee, Milk based drinks and light snacks. The shop serves to the local people around the shop, students and workers in a roadside setting known for affordability and freshness. The Business faces mainly 3 problems, 1. Inconsistent inventory management causes stockouts of milk and jaggery powder while others are overstocked, 2. High customer credit leads to stain daily cash circulation, and 3. Lack of man force this leading to the delayed service and losing money on peak hours.

The primary data (It is a random data Given by the owner as he was not maintained the records of the data) were collected to study sales volume, Inventory and Credit flows. The key metadata includes transaction date, item, quantity, unit cost, sales value and payment/credit attributes. The credit records include costumer name, credit amount, repayment and outstanding balance. Descriptive statistics summarize central tendency and variability for core measures example; quantity, cost, sales, credit, repayment etc. Which tells about the ups and downs in customer demand, how the money is stuck in customer credit and less money comes in daily, the business struggles to manage expenses. These statistics help us understand what normally happens, how much daily values change, and how this affects sales, cash flow, and profit patterns.

The analysis is done by using Spreadsheets and the Python (Pandas, Matplotlib) for validation and visualization and by ABC analysis and RFM analysis, I analyzed the daily data to understand how the shop works on different days and at different times. First the data was cleaned by correcting dates, units and the sale values so everything was clear and accurate. After that I checked the Credit transactions and the usage of ingredients. From this analysis I observed that certain key items, such as milk and jaggery, run out more frequently, while some other ingredients remain unused for longer periods. The credit data showed that a few customers regularly buy on credit and repay gradually over time. Based on these insights, I recommend improving stock planning, creating simple credit rules for customers, and organizing work more efficiently during rush hours. These improvements will help ensure sufficient stock, reduce wastage, maintain better cash flow, and improve service speed without losing sales.

2 Proof of Originality of the Data

Business Name: Telangana Bellam Chai

Address: Kadem, Nirmal, Telangana 504202

Owner's Name: Mr. Godari Swamy

Video of Interaction with Business Owner: Telangana Bellam Chai Owner interaction Video

Letter: Letter_from_Owner

Fig 1 : The Shop Photo and The Items they selling Poster Image.

The Owner of the business is using Three primary methods for Recording Data:

1. **Credit Book**: The owner using a book for record the credits of different persons in different pages.
2. **Notepad**: The owner is using notepad to record the Inventory and Expenses for example daily Milk purchase and expenses which are used for the business
3. **WhatsApp Messages**: Used for credit and repayment communication with retail customers. Frequency varied depending on the customer, with some receiving daily updates and others receiving accumulated updates.

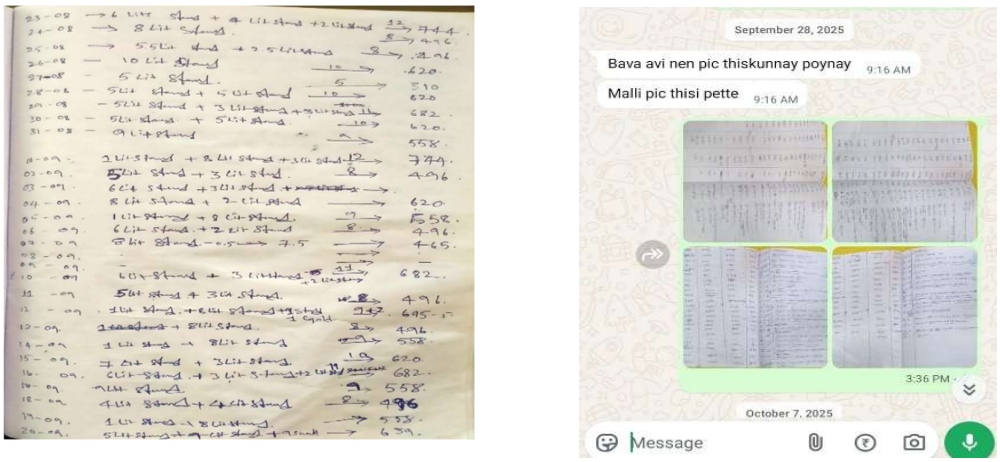

Fig 2: Recording the Data by the owner

3 Meta Data

3.1 Information about the Inventory and Sales

Date	Item	Price	Quantity	Total_Price
1-Jun-2025	Bellam Chai	10	98	980
1-Jun-2025	Boost	20	4	80
1-Jun-2025	Green Tea	20	5	100
1-Jun-2025	Coffee	20	10	200
1-Jun-2025	Biscuits	5	14	70
1-Jun-2025	Ginger Tea	20	5	100
1-Jun-2025	Leamon Tea	20	10	200
2-Jun-2025	Bellam Chai	10	147	1470
2-Jun-2025	Boost	20	4	80
2-Jun-2025	Green Tea	20	7	140
2-Jun-2025	Coffee	20	15	300
2-Jun-2025	Biscuits	5	22	110
2-Jun-2025	Ginger Tea	20	7	140
2-Jun-2025	Leamon Tea	20	15	300
3-Jun-2025	Bellam Chai	10	146	1460
3-Jun-2025	Boost	20	4	80
3-Jun-2025	Green Tea	20	7	140
3-Jun-2025	Coffee	20	15	300
3-Jun-2025	Biscuits	5	22	110

Date	Item	Quantity	Cost
1-Jun-2025	Milk	8	480
1-Jun-2025	Jiggery Powder	2	600
1-Jun-2025	Coffee Powder	0.2	550
1-Jun-2025	Water Tins	3	36
1-Jun-2025	Biscits	200	1000
1-Jun-2025	Green Tea Bags	500	250
1-Jun-2025	Ginger	1	80
1-Jun-2025	Lemon	0.5	100
1-Jun-2025	Honey	0.5	500
1-Jun-2025	Basil Seeds(Sabja Seeds)	0.5	260
1-Jun-2025	Water Bottles	20	400
1-Jun-2025	Vennela Milk Shake Flavour	0.25	50
1-Jun-2025	Butter Scotch Milk Shake Flavour	0.25	50
1-Jun-2025	Mango Milk Shake Flavour	0.25	50
1-Jun-2025	Chocolate Milk Shake Flavour	0.25	50
1-Jun-2025	Sugar	5	200
1-Jun-2025	Tea Powder	0.75	280
1-Jun-2025	Boost	0.55	300
2-Jun-2025	Milk	7	420

Fig 3: Inventory and Sales Data sample Snap.

The sales and inventory dataset contains day-wise information regarding the purchase and usage of raw materials and the sale of different Items. The data was recorded once per day

based on the owner's logs (The sales data is expected data which is given by the Owner as he doesn't have proper organized data for sales of each Item).

Dataset Link: Inventory and Sales Data
Data Collection Duration: 4 Months
Data Collection Dates: 01-06-2025 to 30-09-2025

- Data Format: CSV (Comma-Separated Values) and Excel/Sheets (XLSX)
- Range: June 1, 2025, to September 30, 2025
- Units of Measurement for Features involving Money: Indian Rupee (₹)

The sales and inventory data contains the date of business activity, the name of each item used (such as milk, jaggery powder, and tea powder), the quantity purchased, the quantity consumed per day, and the cost of raw materials. In addition, the dataset includes the sales amount recorded for each day, which helps in identifying revenue patterns and estimating daily profitability.

3.2 Information about The Credits

	A	B	C	D	E	F	G	H
	Transaction date	Ajay	Naveen Jawa	Raj	Siddu	Vamshi	Vardhan	Grand Total
	1-Jun-2025			30		15		45
	2-Jun-2025			15	28			43
	3-Jun-2025			30		50		80
	4-Jun-2025	55	15	15	40			125
	5-Jun-2025			20		15		35
	6-Jun-2025	11	10	15	40			76
	7-Jun-2025			20		15		35
	8-Jun-2025	11	15	30	15		45	116
	9-Jun-2025			40		15		55
	10-Jun-2025	10		15	18			43
	11-Jun-2025	10		20		15		45
	12-Jun-2025		10	60	75			145
	13-Jun-2025	22		20		20		62
	14-Jun-2025			15	45			60
	15-Jun-2025	10	30	30		5	40	115
	16-Jun-2025			15	30			45
	17-Jun-2025			20		50		70
	18-Jun-2025			15	15			30
	19-Jun-2025		30	20		15		65
	20-Jun-2025			25	30			55
	21-Jun-2025			20		15		35
	22-Jun-2025		15	25	15		60	115
	23-Jun-2025			10		15		25
	24-Jun-2025	20		30	30			80

Fig 4: Day wise Credit Data of each Person

Link: Credit Data

Features Collected:

- Customer Name: The name of the borrower.
- Transaction Date: The date the credit transaction took place.
- Credit Amount: The amount of money loaned to the borrower.

- Repayment: The amount of money paid back by the borrower towards the loan.
- Outstanding Balance: The remaining amount owed on the loan after considering any repayments made and credit taken on the day.

This Credit Data is collected for the same 4 months i.e., 1st June 2025 to 30th September 2025.

3.3 Descriptive Statistics

Index	Total Price
Count	122
Mean	957.4262295
Median	844
Mode	548
Min	324
Max	4936
25%	844
50%	25372.5
75%	45869.25
Standard Deviatio	524.6366853
total	116806

Fig 5: Descriptive Statistics of Overall Data in Inventory

```
print(monthly_descriptive_stats)
```

```
        Quantity                                                    Cost  \
           count       mean        std   min   25%   50%   75%    max count
Month
6.0        108.0  12.290278  54.385430  0.05   2.0   4.0   6.0  500.0   108.0
7.0         98.0   6.263265  19.966697  0.20   2.0   4.0   6.0  200.0    98.0
8.0         99.0   8.128788  27.808496  0.20   2.0   4.0   5.5  200.0    99.0
9.0         96.0   9.550000  50.668255  0.20   2.0   4.0   7.0  500.0    96.0

              mean         std   min   25%    50%    75%     max
Month
6.0     299.685185  259.101815  24.0  48.0  277.5  480.0  1500.0
7.0     289.285714  224.755767  24.0  48.0  280.0  525.0  1000.0
8.0     287.535354  226.021821  24.0  48.0  280.0  480.0  1000.0
9.0     290.875000  218.538651  24.0  48.0  280.0  540.0   600.0
```

Fig 6: Monthly Descriptive Statistics for the Inventory for cost and Quantity

Index	Total Price
Count	122
Mean	2293.07377
Median	2415
Mode	1765
Min	1660
Max	2790
25%	2415
50%	24299.5
75%	45869.25
Standard Deviatio	384.9559633
Total	279755

Fig 7: Descriptive Statistics of Sales Data

```
print(item_descriptive_stats)
```

```
                Quantity                                                    \
                   count        mean         std   min    25%    50%     75%
Item
Bellam Chai        122.0  131.549180   22.994107  93.0  101.0  139.0  149.75
Biscuits           122.0   19.647541    3.544107  14.0   15.0   21.0   22.00
Boost              122.0    4.196721    0.474809   3.0    4.0    4.0    4.00
Coffee             122.0   13.229508    2.196116  10.0   10.0   14.0   15.00
Ginger Tea         122.0    6.655738    1.126470   5.0    5.0    7.0    7.00
Green Tea          122.0    6.655738    1.126470   5.0    5.0    7.0    7.00
Leamon Tea         122.0   13.229508    2.196116  10.0   10.0   14.0   15.00

                     Cost                                                    \
                      max  count         mean         std    min     25%     50%
Item
Bellam Chai         161.0  122.0  1315.491803  229.941072  930.0  1010.0  1390.0
Biscuits             24.0  122.0    98.237705   17.720536   70.0    75.0   105.0
Boost                 5.0  122.0    83.934426    9.496183   60.0    80.0    80.0
Coffee               16.0  122.0   264.590164   43.922312  200.0   200.0   280.0
Ginger Tea            8.0  122.0   133.114754   22.529392  100.0   100.0   140.0
Green Tea             8.0  122.0   133.114754   22.529392  100.0   100.0   140.0
Leamon Tea           16.0  122.0   264.590164   43.922312  200.0   200.0   280.0

                    75%     max
Item
Bellam Chai      1497.5  1610.0
Biscuits          110.0   120.0
Boost              80.0   100.0
Coffee            300.0   320.0
Ginger Tea        140.0   160.0
Green Tea         140.0   160.0
Leamon Tea        300.0   320.0
```


Fig 8: Descriptive Statistics of Sales data of each item

```
print(monthly_descriptive_stats)
```

```
       Quantity                                                          Cost  \
          count       mean        std  min  25%   50%   75%    max   count
Month
6.0       210.0  27.376190  42.781591  3.0  7.0  10.0  16.0  157.0   210.0
7.0       217.0  27.889401  43.500072  4.0  7.0  10.0  16.0  157.0   217.0
8.0       217.0  27.884793  43.745376  3.0  7.0  10.0  16.0  161.0   217.0
9.0       210.0  28.371429  44.423206  3.0  7.0  10.0  16.0  161.0   210.0

              mean         std   min    25%    50%    75%     max
Month
6.0     321.809524  411.904855  60.0  100.0  140.0  280.0  1570.0
7.0     327.718894  418.714390  70.0  100.0  140.0  280.0  1570.0
8.0     327.511521  421.432776  60.0  100.0  160.0  300.0  1610.0
9.0     333.285714  427.818170  60.0  100.0  160.0  280.0  1610.0
```

Fig 9: Month wise Descriptive Statistics for Sales Data

```
Descriptive Statistics per Customer:
                Credit Amount                                                \
                        count        mean         std    min    25%    50%   75%
Customer Name
Ajay                     38.0   16.631579   10.167306   10.0   10.0   11.0  20.0
Naveen Jawa              28.0   25.357143   12.614554   10.0   15.0   20.0  30.0
Raj                     122.0   41.655738   46.429146   10.0   20.0   25.0  50.0
Siddu                    56.0   29.357143   20.457876   10.0   15.0   30.0  30.0
Vamshi                   88.0   22.386364   15.719840    5.0   15.0   15.0  20.0
Vardhan                  14.0   43.928571   26.470489   15.0   30.0   35.0  45.0

                    Repayment                  ...                        \
                          max      count        mean  ...   75%      max
Customer Name                                  ...
Ajay                     55.0       38.0   12.710526  ...   0.0    483.0
Naveen Jawa              60.0       28.0   21.071429  ...   0.0    590.0
Raj                     315.0      122.0   32.786885  ...   0.0   4000.0
Siddu                    90.0       56.0   24.285714  ...   0.0    500.0
Vamshi                  100.0       88.0   16.136364  ...   0.0    510.0
Vardhan                 125.0       14.0   35.714286  ...   0.0    500.0

                Outstanding Balance                                          \
                              count        mean         std    min     25%
Customer Name
Ajay                           38.0  222.184211  153.793096   31.0   89.50
Naveen Jawa                    28.0  250.535714  182.474449   15.0  105.00
Raj                           122.0 1754.229508 1300.449654   30.0  750.00
Siddu                          56.0  367.250000  171.754291   28.0  252.75
Vamshi                         88.0  290.625000  161.727052   10.0  148.75
Vardhan                        14.0  285.714286  164.373603   45.0  122.50

                     50%     75%     max
Customer Name
Ajay               169.5   343.50   514.0
Naveen Jawa        200.0   391.25   575.0
Raj               1304.5  2727.00  4932.0
Siddu              365.0   484.50   739.0
Vamshi             280.0   422.50   605.0
Vardhan            315.0   401.25   540.0
```

Fig 10: Descriptive Statistics of Credit Data Person wise which includes Credit Amount, Repayment and Outstanding Balance

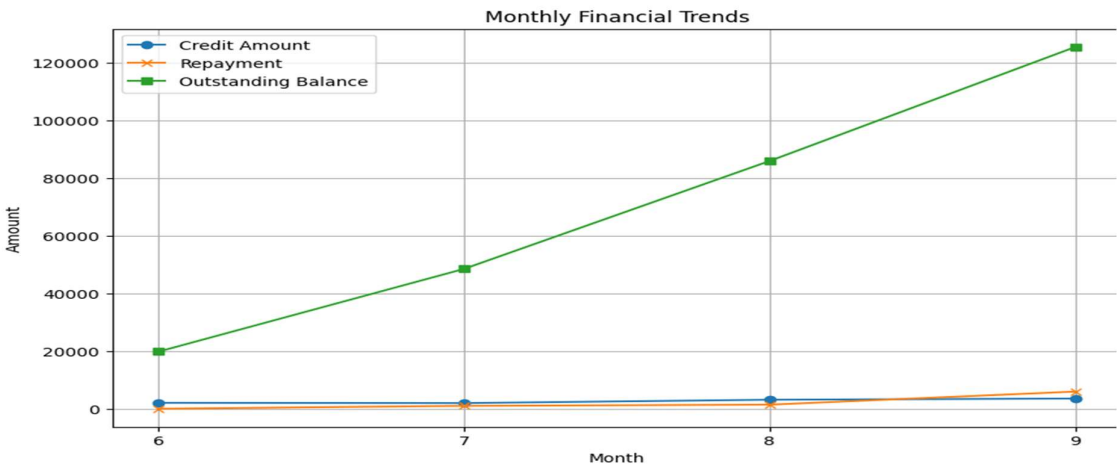

Fig 11: Month vs Amount of Credit Data

I used Python (Pandas and NumPy) for the making of descriptive statistics

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

- Records of Payments: The data, including cost price, sell price, and quantity, address the first problem statement by providing a thorough financial overview of the business and basis for analyzing and setting the right margins to achieve the desired monthly income.
- Credit Management: The credit data, with details on customer names, transaction dates, credit amounts, repayments, and outstanding balances, helps in establishing a clear credit criteria system, tackling the second problem statement.

4 Detailed Explanation of Analysis Process & Methods

The analysis process for the project involves a combination of quantitative and qualitative methods, each chosen for their ability to address specific aspects of the business's challenges.

- Extensively utilized spreadsheets and their functions for various calculations essential to the analysis process. Tasks such as computing the Total Credit across customers or determining the Total Cost were efficiently handled using spreadsheet functionalities.

- Spreadsheets provided a familiar and user-friendly interface for conducting complex calculations and aggregating data. Functions such as SUM, AVERAGE, etc. were employed to streamline the process of summarizing and analyzing large datasets.

- Conversations: Engaging with the business owner provides qualitative insights that are not captured by quantitative data alone.

- Time-Series Analysis: This method is particularly suitable for financial data, which is inherently time-dependent. By examining trends, patterns, and variations over time, we can gain insights into the business's financial health and performance. This method stands out because it allows for understanding of trends based on historical data, which is crucial for setting margins and making informed business decisions. For example, this method can help us observe credit performance among customers and devise credit management practices that can improve the financial health of the business.

- Python, along with libraries like Pandas, was instrumental in conducting descriptive statistical analysis. Through Pandas, I computed measures of central tendency and variability, enabling us to understand the distribution of financial data points and identify any outliers or anomalies. This facilitated a deeper understanding of the business's financial health and performance

5 Results and Findings

5.1 Inventory Results

The cost of Inventory Distribution between 4 months is:

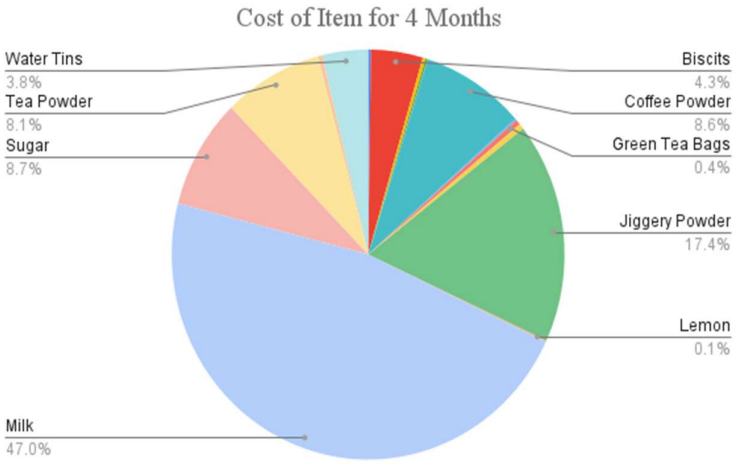

Fig 12: Inventory Distribution between 4 months

Results found in Inventory Data:

- Mean: 957.42
- Median: 844

- Min: Rs. 324
- Max: Rs. 4936
- Standard Deviation: 524.63

From ABC analysis

The items belonging to Class A are (Top 80%):

- Milk
- Jaggery Powder
- Sugar

The Items Belonging to Class B are (Next 15%):

- Coffee Powder
- Tea Powder
- Biscuits

The Items Belonging to Class C are (Last 5%):

- Water Tins
- Green Tea Bags
- Honey
- Water Bottles
- Boost
- Sabja Seeds
- Ginger
- Flavour Items (Butterscotch, Mango, Chocolate, Vanilla)

ABC analysis shows that **Milk, Jaggery, and Sugar are the most critical items** for the tea shop. Better monitoring and forecasting for these items will prevent stockouts and reduce emergency purchases, directly improving inventory efficiency and business performance.

The Highest cost i.e., Rs. 4936 of Inventory found on 1st June 2025. The owner will take inventory which is not used which may perishable, the usage of perishable inventory may cause to the Customer Health damage and it not gives good taste.

That's why the owner of the shop drops the Inventory it may be expire or not. This leads to the good Customer Health and a healthy relationship between the owner and the Customers who are Coming there to have Chai and other Drinks which are making there.

And the Lowest price is Rs. 324 on 14th August, because on that day Very less inventory was taken by him.

5.2 Sales Results

One of the Key Observations is the Daily Sales Trend over the 4 months.

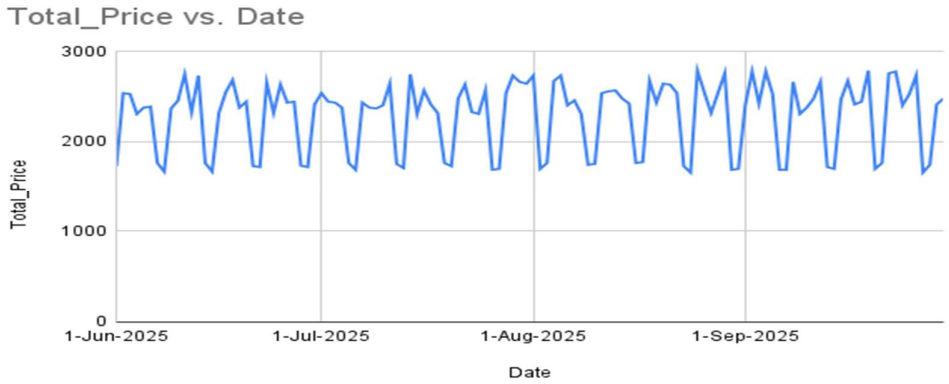

Fig 13: Daily Sales Trend over the 4 months

The Results of the sales we can observe as:

- Mean: 2293.073
- Standard Deviation: 384.9575
- Min: Rs. 1660.000000
- Max: Rs. 2790.00

The Max sales on the 25th August and 19th September Rs. 2790.00.

These two days are week days 25th august is Monday and 19th September is Friday on week days the sales is more because there the customers are students, daily workers and road walkers. In week days the customers are more and weekends are less

The lowest sales on 24th August, 27th September Sunday and Saturday the density of customers is very less.

5.3 Credit Results

The results of the credits as follows:

- Mean: 87.31

- Standard Deviation: 57.20
- Min: Rs. 20
- Max: Rs. 330

From RFM Analysis:

From the RFM analysis Naveen Jawa and Ajay are Good, Vamshi is Loyal and active, medium risk is with the Siddu and need to monitor the Vardhan and last High risk with the Raj because of his high credits and there is no recent payment.

The Highest Credit is taken by the Raj, he is a government servant and daily customer of Telangana Bellam Chai, He takes group of tea every day for his staff in his account he will repay that credit on every month on a date (but in our data it is not clear the owner of the shop not maintained perfect data before I'm approached him that's why this data is not clear)

And the given credit is directly added into owners account. And the owner is not included any interest for these credits so the same price the customers will pay to owner without adding any interest.

Note: In our data the credits are added in the sales value in every day.

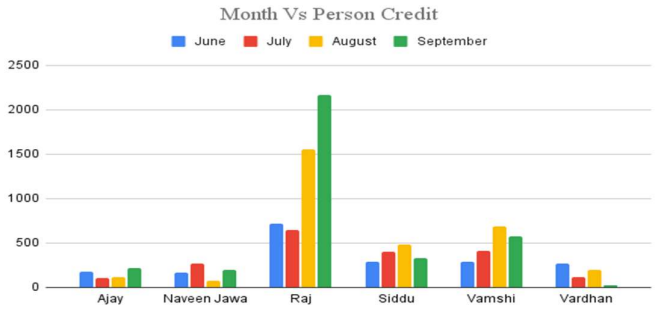

Fig 14: Credits of each month by the persons.

5.4 Additional Information: [Additional Information]