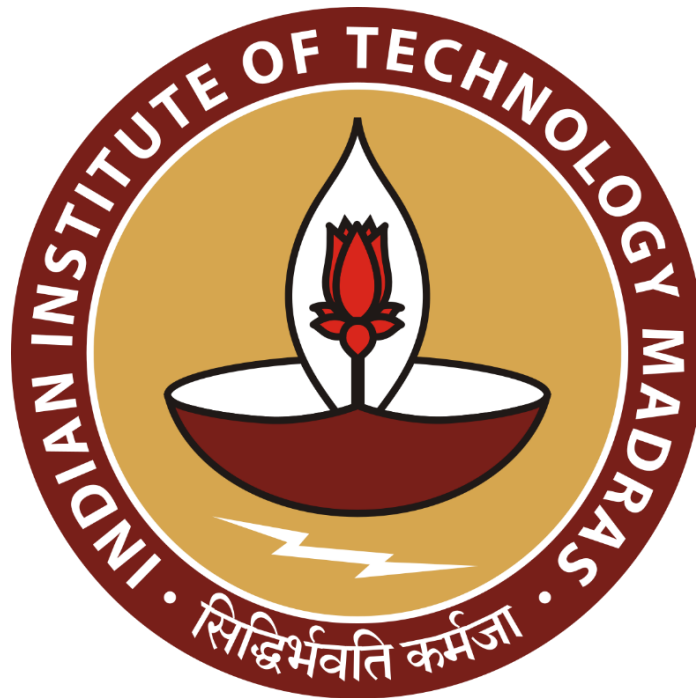# Understanding the Business Purview of a Grocery Firm

Mid Term report for the BDM capstone Project

Submitted by

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1. Executive Summary

Moji Ram Surender Kumar & Company, established in the 1940s and located in the historic Khari Baoli market of Old Delhi, specializes in traditional Indian grocery items, including sugar and essential food products. Despite its long-standing presence, the shop faces challenges such as inefficient inventory management, material wastage, and declining profit margins due to rising competition from online platforms and mega stores. The business generates monthly revenues between ₹3 to ₹3.5 lakhs and employs two permanent staff members and one contractual worker.

This project aims to optimize inventory control and improve profitability by analyzing sales, purchase, and inventory data. Data will be collected from duplicates of handout receipts over a one-month period (September 14, 2024 – October 14, 2024). The analysis will employ time-series analysis to see the impact of wastage, calculations of gross margins for sales trend analysis, and SKU-level assessments to identify discrepancies between purchases and sales. Pivot tables, bar charts, Pareto analysis, and comparative online pricing studies will be used to provide actionable insights. The study will also focus on identifying high-revenue-generating products and evaluating their contribution to overall sales. The selection of top-performing products will be based on historical sales data and margin analysis to ensure a representative sample.

Key recommendations will include demand forecasting, optimized procurement strategies, and improved inventory tracking to reduce wastage and enhance profitability. Implementing these measures will position Moji Ram Surender Kumar & Co. for long-term growth and competitiveness in the evolving retail landscape.

2. Proof of originality of the Data

The data collected by me is primary data, which means the same has been collected through one-on-one interaction with the business owner Mr. Vikas Goel and his son Mr. Rishabh Goel. The business is yet to adapt to the modern methods of maintaining an organized data leveraging technology and still relies on the age-old system of keeping handwritten bills. I was given the data likewise, and it has been cleaned and stored in excel for analysis. Following are the pictures that shows my interactions with the owner for the discussion and data collection processes:

Picture 1: Shop Front of Moji Ram Surender Kumar & Co.

Picture 2: From inside of the shop

Picture 3: The godown

Along with this, here is the link which captures my interaction with the shop's owner : [Video Link](#)

3.Metadata

I have gathered a month-long dataset starting from 14th Sep 2024 to 14th Oct 2024 where I have collected sales, purchase and inventory level data from the business and I also have data which I curated myself for the analysis part of the project for which the metadata is given below :

2a. SALES

The dataset captures daily sales data with key metrics for analysis. **Day of the Week (Column B)** and **Date (Column C)** help track sales trends over time**. Quantity Sold (Columns D–I)** records daily sales for Mawana Sugar, Dhampure Sugar, Bura, Gur, Shakkar, and Roasted Gram, while **Selling Prices (Columns J–O)** track the daily selling prices of these products. **Revenue (Columns P–U)** calculates product-wise earnings. **Total Quantity Sold (Column V)** aggregates the daily sales volume, and **Total Revenue (Column W)** represents the overall revenue generated each day, providing insights into business performance.

Purpose: Provides a overview of sales performance across products and days, essential for understanding demand patterns and revenue contributions.

2b. PURCHASE

Columns: Same structure as SALES but focused on purchase quantities, prices, and costs.

Purpose: Tracks procurement trends, cost variations, and alignment with sales data.

2c. INVENTORY

Columns:

- **Day, Date (B–C)**: Similar to SALES and PURCHASE sheets.
- **Quantity Purchased and Sold (D–O)**: Tracks product inflows and outflows.
- **Current Inventory (P-U):** The current inventory is calculated using the formula:

> **Inventory = Opening Inventory (or previous day's inventory) + Quantity Purchased - Quantity Sold**

However, on days when the business records actual stock levels during purchases, these values are manually updated in the dataset. Such days are specifically highlighted to distinguish between formula-derived and measured data.

- **Ideal Inventory (V-AA):** Ideal inventory levels are calculated solely using the above formula to determine the inventory that should be in stock under normal conditions.
- **Difference in KG (Column AB):** This column calculates the discrepancy between current and ideal stock levels.
- **Loss of Revenue**: Loss of revenue is derived by multiplying each product's average selling price by the discrepancies identified in Column AB
- **Date (AL), Total Current Inventory (AM), Total Ideal Inventory (AN), Difference (AO), 3 Days Moving Average (AP)**

Purpose: Aims to pinpoint inefficiencies and revenue losses caused by stock discrepancies.

2d. Descriptive Statistics

Provides a statistical overview (average, max, min, etc.) of product-wise quantities, prices, and revenues for SALES and PURCHASE data.

2e. SKU Analysis

Content: This sheet contains product-wise metrics, including the following:

- Selling Price, Purchase Price, Quantity Sold, Revenue, COGS (Cost of Goods Sold), and Gross Margin.
- Columns **X** and **Y** represent weekday and date.
- Columns **Z to AE** calculate the difference in KG between current inventory and sales product-wise.
- Columns **AJ and AK** contain a data dictionary referencing product names and their sequences to simplify lookup operations.
- Columns **AF and AH** hold product numbers with maximum and minimum differences, respectively, while **AG and AI** retrieve corresponding product names using lookup formulas.

This sheet includes several *charts, graphs,* and *pivot tables* to visually analyze these metrics, offering insights into sales trends, inventory issues, and product-level performance. Helps understand SKU performance and profitability.

2f. Online Platform Fees : Contains a breakdown of overhead costs associated with listing products on platforms such as Amazon and Flipkart, retrieved directly from official websites. A comparison is also presented to illustrate total product costs incurred by adding purchase prices and the overhead costs for these platforms, with and without shipping.

2g. Material Wastage: This sheet analyzes wastage in stock by comparing actual and ideal inventory levels. Revenue loss due to wastage is computed by multiplying average selling prices with discrepancies between current and ideal inventory.

4. Descriptive Statistics

Product	Quantity Sold in KG				Selling Price per KG			Quantity Purchased in KG				Purchase Price Per KG		
	Average	Quantity Sold	Max	Min	Average	Max	Min	Average	Quantity Purchased	Max	Min	Average	Max	Min
Mawana Sugar	27.38	712	40	16	41.65	44	40	475	950	550	400	37.75	38	37.5
Dhampure Sugar	25.58	665	42	13	42.08	45	40	375	750	400	350	35	35	35
Bura	30.35	789	50	14	56.81	58	56	475	950	550	400	46.5	48	45
Gur	32.58	847	50	14	54.19	55	52	445	890	450	440	44.25	45.5	43
Shakkar	31.81	827	50	12	56.35	59	54	425	850	440	410	45	46	44
Roasted Gram	23.12	601	31	15	124.23	125	123	325	650	325	325	111.25	111.5	111

Table 1: Descriptive Statistics

These produced results uses Excel formulas like AVERAGE, SUM, MAX, and MIN to calculate product-wise cumulative statistics for prices, quantities. Insights derived include:

- **Gur** is the highest-selling product at **847 KG**, followed by **Shakkar** at **827 KG**.
- Both sugar variants combined account for **1,377 KG** of total sales.
- **Roasted Grams** has the highest *average purchase price* at **₹124.23** but is the least purchased and sold item with **650 KG purchased** and **601 KG sold.**
- **Bura** shows the largest price range, with a maximum purchase price of **₹48** and a minimum of **₹45**, making it the most price-volatile item.
- **Mawana Sugar** and **Bura** are the most purchased items, each at **950 KG** during the period analysed.

5. Detailed Explanation of Analysis Process/Method

The analysis process involved an in-depth examination of inventory management practices, revenue and profit margins, and material wastage.

5a. Inefficient Inventory Management

1. To identify overstocking and understocking issues, a combined area-bar plot was created, visualizing the quantities purchased and sold for each SKU.

- **Visualization Rationale**: The gap between the bar (sold quantity) and the area (purchased quantity) highlights discrepancies, allowing for a straightforward assessment of inefficiencies.
- **Insights Derived**:
  o Quantity differences for key products were as follows:

- **Mawana Sugar: 238 KG**
- **Dhampure Sugar: 85 KG**
- **Bura: 161 KG**
- **Gur: 43 KG**
- **Shakkar: 23 KG**
- **Roasted Gram: 49 KG**

- These gaps signify either overstocking or understocking (shortages), leading to cash flow blockages or lost sales opportunities, clearly Mawana Sugar is an overstocked item while Gur, Shakkar and Roasted Gram seems to be efficiently stocked.

2. A pivot table was created to analyse maximum and minimum differences between sales and current inventory. An Excel formula *(=MATCH(MAX/MIN(Z4:AE4),Z4:AE4,0))* captured the column number corresponding to the highest and lowest differences in Sales VS Current Inventory Quantities for every day of data collection period. These values were cross-referenced using VLOOKUP to map product names to column numbers from a data dictionary.

Row Labels	Count of Days
Mawana Sugar	16
Bura	11
Gur	4
Grand Total	**31**

Table 2 : Count of days reflecting products With Maximum difference between sales and current stock

Row Labels	Count of Days
Gur	12
Roasted Gram	5
Shakkar	5
Dhampure Sugar	4
Bura	3
Mawana Sugar	2
Grand Total	**31**

Table 3 : Count of days reflecting products With Minimum difference between sales and current stock

Key Findings:

- Mawana Sugar had the maximum difference **16 times** during the data collection period, indicating chronic **overstocking**.
- Gur had the minimum difference **12 times**, showing balanced inventory management for this product.

Combining visualizations and pivot tables provides both high-level insights and granular details. This approach ensures data-backed decision making. Alternative Approach: Machine learning algorithms, such as time-series forecasting, could predict demand more accurately. However, these methods require more historical data, which may not be feasible with the amount of dataset that we have at hand and for the business currently.

5b. Declining Revenue and Profit Margins

1. To understand revenue and profit trends, detailed tables and charts were created, showcasing metrics such as average selling price, average purchase price, quantity sold, revenue, cost of goods sold (COGS), and gross margin.

- **COGS Formula**:
  COGS=Beginning Inventory+Purchases in the Current Period−Ending Inventory

- Beginning Inventory: The amount of inventory left over from the previous period
  - Purchases in the Current Period: The cost of purchases made during the current period
  - Ending Inventory: The inventory that was not sold during the current period
- **Gross Margin Formula**:
  Gross Margin$=((\text{Revenue}-\text{COGS})/\text{Revenue}) \times 100$

2. A pie chart was used to depict revenue contributions of each product:

- Roasted Gram: **28%**
- Bura, Gur, and Shakkar: **17% each**
- Sugar Variants: **21% combined**

However, revenue alone does not paint a clear picture due to price disparities among products. To address this, a gross margin Pareto chart was created:

Applying the **80/20 Pareto Principle** revealed that 80% of gross margins are derived from 20% of products, highlighting Shakkar, Gur, and Bura as key drivers of profitability.

3. A breakdown of overhead costs associated with listing products on platforms (Amazon & Flipkart), retrieved directly from official websites (Refer Amazon : Amazon.in Seller Fees & Pricing: Calculate Your Revenue & Profit, Flipkart : Sell Online on Flipkart | Grow your business with the leader in Indian e-commerce).

- Components include:
  - Referral/Platform/Commission Fee
  - Closing/Fixed/Handling Fee
  - Shipping Fee
  - GST on Referral, Closing, and Shipping Fees
  - Total Overhead Costs
  - Packaging Costs

Charges \ Platform	Amazon.in Seller Fees & Pricing: Calculate Your	Fees and Commission - Low Cost of
	Amazon	Flipkart
Referral fee/Platform fee/Commission Fee:	₹ 2.40	₹ 3.00
Closing fee/Fixed/Handling Fee:	₹ 4	₹ 21.30
Shipping fee:	₹ 42	₹ 20.00
GST on Refrerral + Closing + Shipping fees	₹ 8.71	₹ 7.97
Total:	₹ 57	52.274
Packaging Cost	₹ 5-10	₹ 5-10
Total Overhead Cost	₹ 61-67	₹ 57.27-62.27

Product (Average Purchase Price)	Average Purchase Price	Product Listing Costs (Avg Purchase Price + Total Overhead Cost)		Average Costs of Product on Platform		Difference	
		Amazon	Flipkart	Amazon	Flipkart	Amazon	Flipkart
Mawana Sugar (37.75)	37.75	98.75 - 104.75	95.02 - 100.02	55-60	50-65	-43.75 : -44.75	-45.02 : -35.02
Dhampure Sugar (35)	35	96 - 102	92.27 - 97.27	55-60	50-65	-41 : -42	-42.27 : -32.27
Bura (46.5)	46.5	107.5 - 113.5	103.77 - 108.77	85-90	130-200	-22.5 : -23.5	26.23 : 91.23
Gur (44.25)	44.25	105.25 - 111.25	101.52 - 106.52	110-150	250-300 (Only Organic available)	4.75 : 38.75	148.48 : 193.48
Shakkar (45)	45	106 - 112	102.27 - 107.27	110-150	250-300 (Only Organic available)	4 : 38	147.73 : 192.73
Roasted Gram (111.25)	111.25	172.25 - 178.25	168.52 - 173.52	160-170	136-250	-12.25 : -8.25	-32.52 : 76.48

Product (Average Purchase Price)	Average Purchase Price	Product Listing Costs without shipping (Avg Purchase Price + Total Overhead Cost - Shipping Fee)		Average Costs of Product on Platform		Difference	
		Amazon	Flipkart	Amazon	Flipkart	Amazon	Flipkart
Mawana Sugar (37.75)	37.75	56.75 - 62.75	75.02 - 80.02	55-60	60	-1.75 : -2.75	-25.02 : -15.02
Dhampure Sugar (35)	35	54 - 60	72.27 - 77.27	55-60	60	1 : 0	-12.27 : -12.27
Bura (46.5)	46.5	65.5 - 71.5	83.77 - 88.77	85-90	130-200	19.5 : 18.5	46.23 : 111.23
Gur (44.25)	44.25	63.25 - 69.25	81.52 - 86.52	110-150	250-300 (Only Organic available)	46.75 : 80.75	168.48 : 213.48
Shakkar (45)	45	64 - 70	82.27 - 87.27	110-150	250-300 (Only Organic available)	46 : 80	167.73 : 212.73
Roasted Gram (111.25)	111.25	130.25 - 136.25	148.52 - 153.52	160-170	136-250	29.75 : 33.75	-12.52 : 96.48

Table 4: Comparison of Product Listings Price and Feasibility of selling our products online

- *Higher costs for organic variants*: Although Gur and Shakkar had ONLY organic variants listed on Flipkart at the time of my research (Refer Screenshot PDF Jaggery and Shakkar/Jaggery Powder), the business does not claim organic certification. This leads to a mismatch in pricing strategies, making it difficult to understand the disparity.
- *Viability Assessment*: Selling on platforms is only feasible if shipping costs are absorbed by customers or subsidized by platforms that too only for some products. However, risks such as returns and complaints remain high, especially in a competitive D2C (Direct-to-Consumer) market.

4c. Material Wastage

1. To address wastage, stock levels were manually recorded before new purchases. Created 4 feature columns that captures Total Current Inventory, Total Ideal Inventory, Difference, 3 Days Moving Average across the data collection period and performed a Time Series Analysis by plotting the Difference between current and ideal inventory and the 3 Days moving average to smooth fluctuations.

The difference is consistently negative and the average difference stands at **-10.15Kg per day**, meaning that your **Current Inventory is always lower than the Ideal Inventory**. Over time, the gap is widening, indicating an increasing inventory deficit. There are sharp downward movements which could indicate :

- Stock miscalculations or losses

- Potential Wastage & Spillage

- Uninformed customer tastings

- Overfilling during packaging

2. Running total bar charts were created to visualize discrepancies between actual and ideal inventory over time. Product-wise bar charts revealed that powdered or granular products (e.g., sugar variants) are more prone to wastage due to factors such as:

- Environmental conditions like high moisture causing damage during monsoons.
- Spillage or extra weight packed during sales (10–20 grams per KG).

This approach combines manual data collection with automated calculations to identify wastage patterns. The results offer actionable insights to minimize losses.

6.Results and Findings

1. Mawana Sugar consistently exhibited overstocking issues, with a maximum inventory difference observed 16 times during the data collection period. Conversely, Gur showed a more balanced stock, with minimum discrepancies recorded 12 times.
   - Overstocking ties up working capital and increases holding costs.
   - Understocking can result in lost sales opportunities and dissatisfied customers.

2. Key products experienced significant gaps between purchased and sold quantities, leading to inefficiencies:
   - Mawana Sugar: **238 KG (overstocked)**
   - Dhampure Sugar: **85 KG (overstocked)**
   - Bura: **161 KG (overstocked)**
   - Gur: **43 KG (Efficient)**
   - Shakkar: **23 KG (Efficient)**
   - Roasted Gram: **49 KG (Efficient)**

Comparison of Items Sold vs Purchase

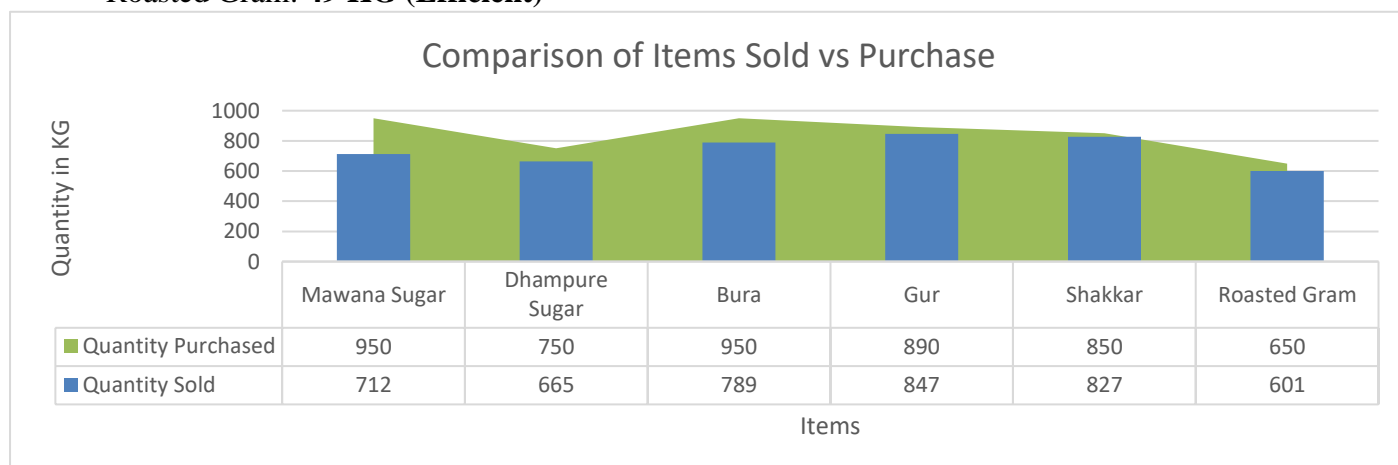| Items	Mawana Sugar	Dhampure Sugar	Bura	Gur	Shakkar	Roasted Gram
Quantity Purchased	950	750	950	890	850	650
Quantity Sold	712	665	789	847	827	601

Fig 1: Comparison of Items Sold Vs Purchased

3. Revenue Contribution by Product: Revenue analysis revealed that Roasted Gram accounted for 28% of total revenue, followed by Bura, Gur, and Shakkar at 17% each, while both sugar variants contributed 21% combined.
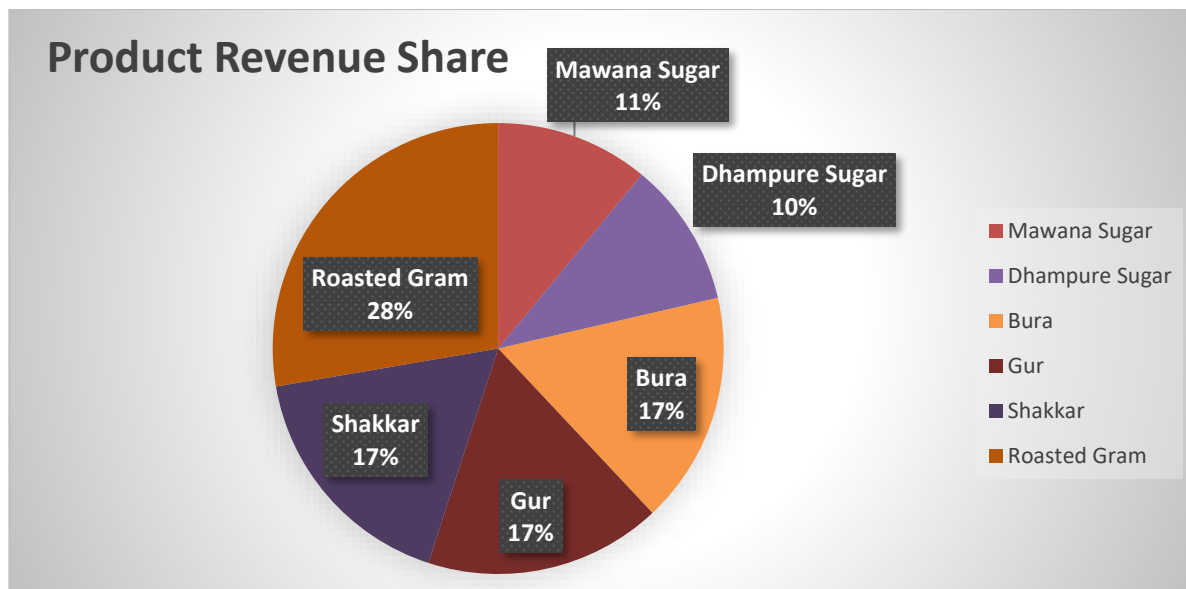
Figure 2: Product Revenue Share

4. The gross margin Pareto chart highlighted that Shakkar (20%), Gur and Bura (18% each), and Dhampure Sugar (17%) are the primary contributors to profitability. This aligns with the 80/20 Pareto Principle, where 80% of margins are driven by 20% of products.

➢ Mawana Sugar and Roasted Gram, despite higher revenue shares, have lower margins (9% and 10%, respectively), indicating the need to evaluate their pricing and cost structures.
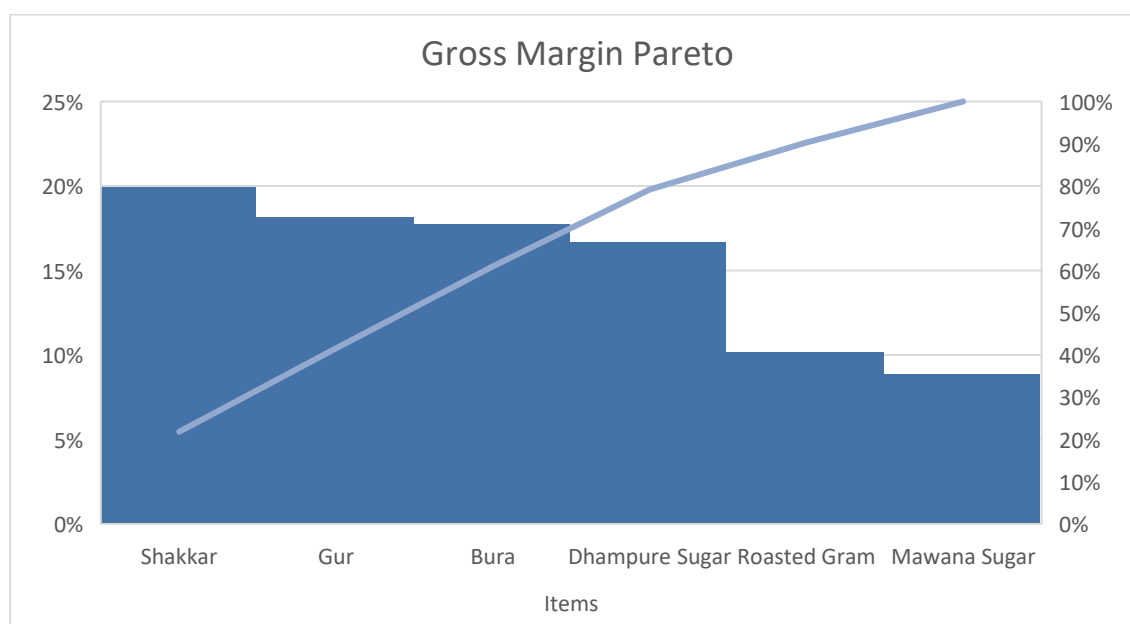

Figure 3: Gross Margin Pareto

5. Overhead costs for listing products on online platforms (Amazon and Flipkart in this case) often exceed margins, and possess risk of returns, complaints and spillage etc. With the current Purchase prices it would be difficult to compete with already listed products or difficult to break even.

6. Average product wastage per category was approximately 1.69 KG, closely aligning with the calculated average wastage of 1.71 KG across all products. Products such as Bura, Dhampure Sugar, and Mawana Sugar were particularly susceptible to material losses, requiring tighter controls and monitoring.