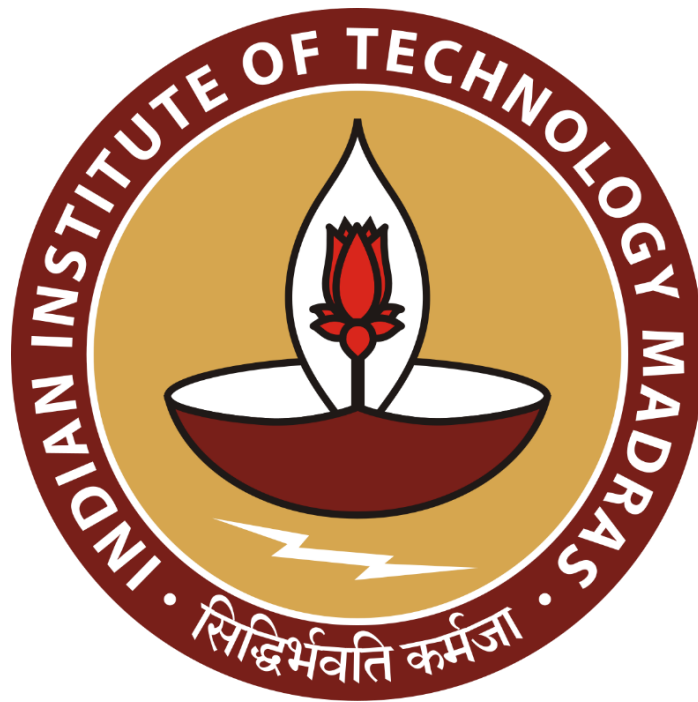# Indian Institute of Technology Madras

Business Data Management Capstone Mid-Term Report

Sales Pattern Analysis and Profit Maximation at Wind Spares Retail Shop

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1.Executive Summary:

Gust Wind Spares and Services, a B2B shop located in Gudimangalam, specializes in windmill spare parts and services. Established in 2011 by Mr. Prakash, this private shop supports local customers and businesses by providing essential spare parts and cost-effective repair services. Despite its reputation as a reliable supplier, the shop faces challenges with low profit margins due to stock management issues, especially during seasonal demand fluctuations.

The monsoon season, from March to August and at the end of the year, sees high demand due to increased wind activity, causing more frequent breakdowns and replacements of parts. This project aims to address these challenges by analysing sales and purchase data to identify trends, enhance inventory planning, and optimize stock levels.

The approach includes collecting and preparing sales and purchase data, performing Exploratory Data Analysis (EDA), and analysing customer purchasing patterns. By implementing demand forecasting through regression and machine learning models, the project will predict high-demand periods, allowing the shop to manage inventory more effectively. Python libraries such as Pandas, NumPy, and visualization tools like Power BI will be employed for data manipulation, with Scikit-learn facilitating machine learning applications.

The expected outcomes include improved inventory management by identifying top-selling products and reducing excess stock, high profit returns by pinpointing high-return items, and a better understanding of customer purchasing behaviour to enhance marketing efforts. This analysis will help Gust Wind Spares and Services increase profitability and better prepare for seasonal demand variations, positioning the business for sustained success.

2. Proof of Originality:

Fig.2.1 Photo of owner Mr. Prakash

Fig.2.2 Inventory

Fig.2.3 Consent letter

Here is the short interview with Mr. Prakash from Gust Wind Spares and Services:

https://youtu.be/QCeqnaLTsNw

Sales and Purchase Dataset Link –
https://drive.google.com/drive/folders/1si0mv-N49ofRPBXUGzY6a44BIpgOtRlT?usp=drive_link

3. Meta Data:

Shop Information:

Field	Description
Shop Name	Gust Wind Spares and Services
Owned by	Mr.Prakash
Address	6/18,Murungapatti, Gudimangalam(Po), Udumalpet(Tk) – 642201 , Tirupur(Dt)
Phone	9788554556
G-mail	gustwindsparesandservices@gmail.com
Description	Gust Wind Spares and Services, established in 2011, is a B2B shop located in Gudimangalam. It specializes in providing windmill spare parts and repair services at competitive prices, serving both local customers and businesses.

Purchase Dataset:

Purchase Register   [01-04-2023 To 03-11-2024]

S.No	Inv No	Inv Date	Party Name	HSN/SAC	Item Name
1	Ginv/002/g23-24	05-04-2023	Nutech Wind Parts Pvt Ltd	8412	Brake Disc
2	GINV/005/G23-24	06-04-2023	Nutech Wind Parts Pvt Ltd	84128030	GEAR BOX AVM INNER GUIDE
				84128030	GEAR BOX AVM OUTER GUIDE
3	In232400100	07-04-2023	KRISHNA ENTERPRISE	2710	SERVO 460 GEAR OIL
4	Ginv/015/g23-24	13-04-2023	Nutech Wind Parts Pvt Ltd	8412	Brake Disc
5	GINV/018/G23-24	17-04-2023	Nutech Wind Parts Pvt Ltd	8536	EBHU Pressure Switch
6	GINV/017/G23-24	17-04-2023	Nutech Wind Parts Pvt Ltd	8412	BURSTER DISC 97 BAR
12	66	19-04-2023	AMMAN STEEL CORPORATION	7216	MS CHANNELS
				7216	MS ANGLES
				8536	WELDING ROD
7	Vm/23-24/0157	20-04-2023	Vm Engineering	7318	HEX BOLD,NUT & WASHER
10	VM/23-24/0148	20-04-2023	Vm Engineering	7318	AB 12*65
8	UDU-4/23-24	24-04-2023	Allied Spares	84128030	Kettle Brake Pad Sintered (imported)
9	NET/2324/867	24-04-2023	NEW ERA TRADERS	8544	400 SQMM*3.5 CORE ALU. CABLE POLYCAB
				8544	3c*4.0sq.Mm Flat Industrial Cable 1100v

Fig.3.1 Snippet of purchase dataset

- **Inv No –** Invoice no. form the payment.

- **Inv Date –** Date of payment.

- **Party name –** Wholesale dealer where the items are brought from.

- **HSN/SAC -** HSN (Harmonized System of Nomenclature) is a six-digit code used to classify goods in the GST. SAC (Services Accounting Code) is a code used to identify specific services under GST.

Sales Dataset:

Bill No	Date	Party Name	Item Name	Unit Name	Qty	Rate
1	01-11-2023	ARIN WIND POWER	BRAKE PAD SIMI NEPC 225 KW	SET	2	2100
2	01-11-2023	Sakthi Finance Limited	Anabond Thread Locker	Nos	1	200
3	01-11-2023	Sva Syntex Pvt Ltd,	BRIDGE RECTIFIER 50/12	Nos	11	95
4	01-11-2023	Thriveni Car Company Pvt Ltd	16 SQMM COP CABLE	Mtr	3	170
5	01-11-2023	Sakthi Murugan Roller Flour Mill Pvt Lt	12.5 KVAR 440V CAPACITOR EPCOS	Nos	1	1750
6	01-11-2023	Shree Ganapathy Wind Energy Services	BCH 110A 415 VAC 3P AUX 1NO+1NC 120MM	Nos	1	11200
7	01-11-2023	Shree Ganapathy Wind Energy Services	M24*120 ALLEN BOLT NUT	Nos	4	240
8	01-11-2023	Shree Vari Multi Plast India Private Lim	CARBON BRUSH	Nos	8	140
9	01-11-2023	Cnv Textiles(p) Ltd	EBHU Pressure Switch	SET	1	3800
10	01-11-2023	Texcity Wind Farm Pvt Ltd	M14*65 ALLEN BOLT	Nos	12	70
11	01-11-2023	Batliboy Renewable Energy Solutions F	High Speed Pinion 19 T Vestas Hansen	Nos	1	20000
12	01-11-2023	Rajaguru Spinning Mills P Ltd	PRESSURE SWITCH 1PS-30-350 POLYHYDROI	Nos	1	3800
13	02-11-2023	Vasu Yarn Mills India Pvt Ltd,	BRAKE HOSE SIMI 225KW	Nos	1	900
14	02-11-2023	Impact Fashions	22kv Disk Insulator	Nos	4	650
15	02-11-2023	SRI LALITHAMBIGHA TEXTILES P LIMIT	PETROLLEUM JELLY 1 KG	KG	2	450
16	02-11-2023	Impact Fashions	25 KVAR CAPACITOR VISHAY 440V	Nos	1	4500

Fig.3.2. Snippet of the sales dataset

Descriptive Statistics

☐ Total Sales Revenue

- The total sales revenue is ₹11,811,647.00 as of the current date.

☐ Average and Median Monthly Sales

- Average Monthly Sales: ₹244,531.67
- Median Monthly Sales: ₹112,852.50

☐ Sales Range

- Minimum Sales: ₹10,795.00
- Maximum Sales: ₹1,044,029.00

☐ Standard Deviation

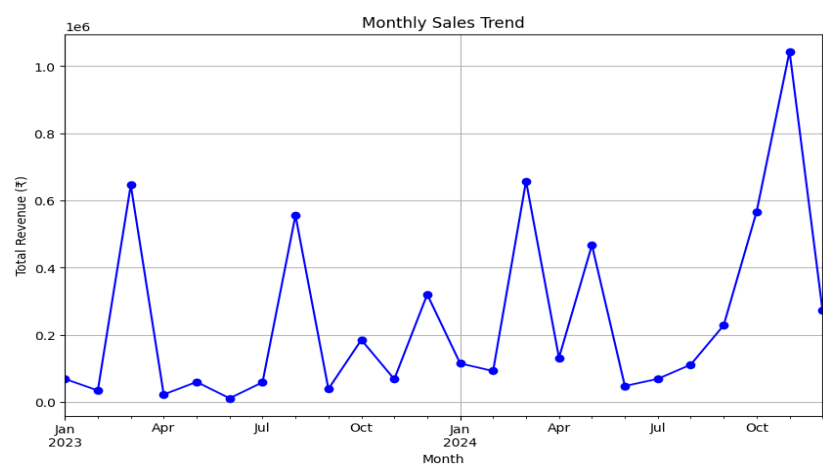- The standard deviation in monthly sales is ₹271,420.43, reflecting monthly variability.

Fig.3.3. Monthly Sales Trend

4. Detailed Explanation of Analysis Process/Method:

- First, the dataset given is cleaned such that the empty rows are deleted and none of the purchase or sales dataset has a null value in its rows such that it wouldn't affect the analysis process.

- The seasonal and the monthly trend of revenue is calculated by summing up Rate with the quantity of item. This could potentially generate where the maximum revenue lies.

- In this monthly trend analysis, we would get to know the frequency of purchase and categorize them into private business or corporate. This is done to know whether the customer needs complimentary Service as most of the corporates avoid service. So, service charges are reduced.

- The top 10 selling products are listed down to keep them always in stock and least consumed products are only brought whenever necessary in this seasonal period.

- Finding a consistent product, so that the inventory is managed with the product throughout the year.

- Monthly Sales revenue is required to know when the profit margin is huge and requires optimized inventory management with the number of employees in the service sector.

- Correlation of items is noted to bring items brought together to keep them in stock.

- The analysis is carried out using the Pandas and Matplotlib with the python with engaging visuals helping in understanding the patterns of sales distribution.

- Few items are brought to notice that signifies the quantity is more such that the stock levels of each item come to know. For eg, buying a motor credits to a quantity of 1 whereas the screws and nuts must be more than 5 used in motors. Even though the revenue for screws and nuts are low, stocking is easy due to their size even with large quantities.

- Customer Segmentation is also looked for categorizing.

- More detailed Seasonal pattern for the sales will be exposed using Machine learning algorithms producing a fit stock segregation in the final submission.

- The Results and Findings will be discussed further.

5. Results and Findings

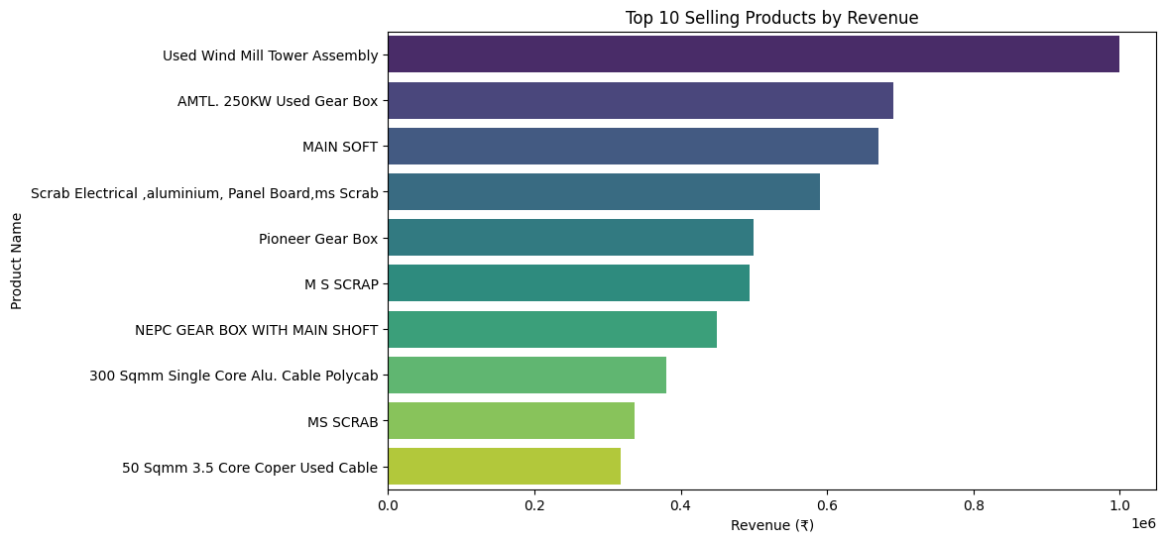- ## Top 10 Selling products by Revenue

Fig.5.1. Top selling products

- The Assembly kit for the windmill has topped the list which seems to generate a high profit margin and the availability of this could increase potential buyers too.
- Other items are generally Gear Box which is huge deal in bringing high investment due its transportation necessity and space consumption because of its size.
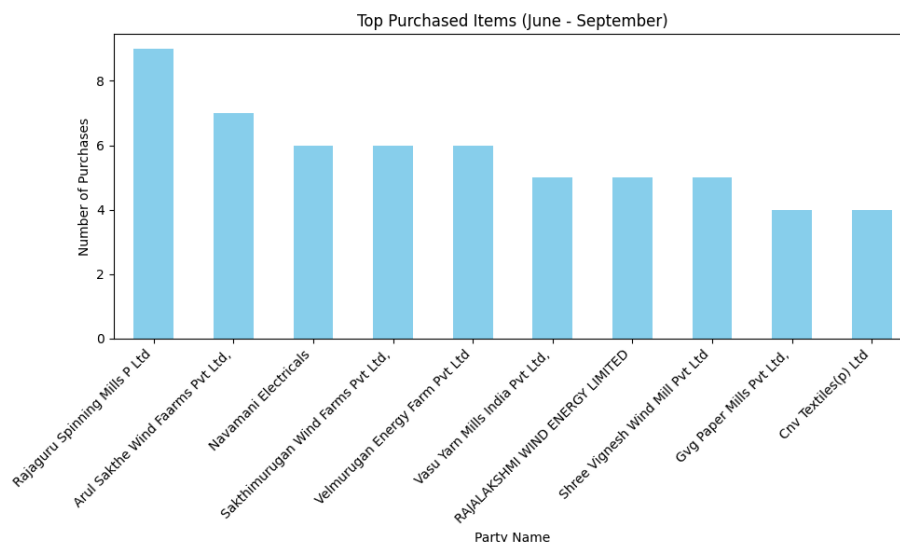
- ## Seasonal High Purchase Rates

Fig.5.2 Seasonal Purchase Rate

- The High purchase done in the seasonal month of July-September is carried out by all corporates, so the service required would be null.

- It's good for-profit margin to employ only temporary employees in the service sector of the shop as the private business does not fall under this period.

- According to detailed analysis of each month, the service sector comes to breathe only in the month of August.
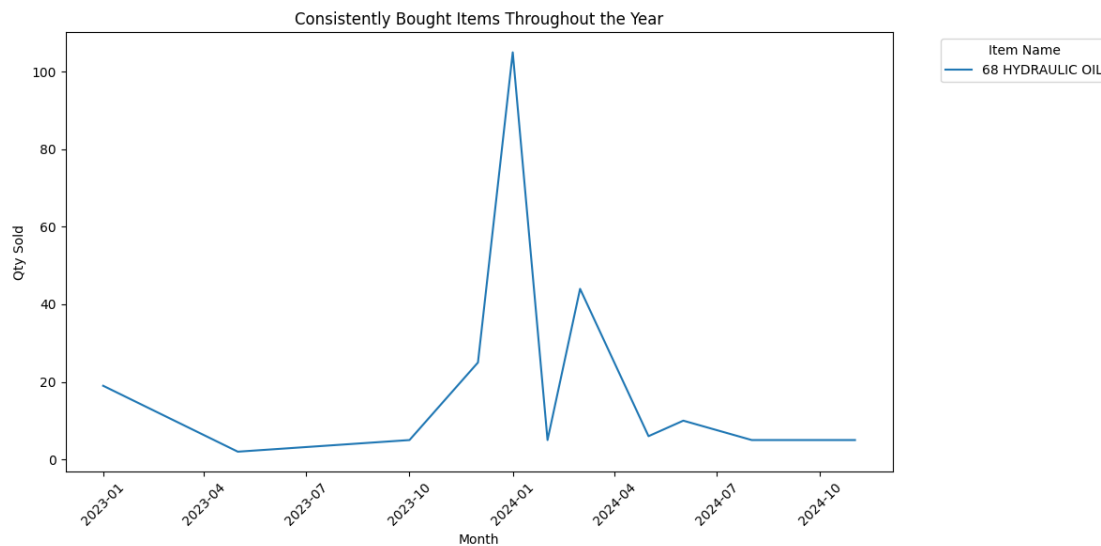
➢ Consistent Item

Fig.5.3 Hydraulic Oil

- Hydraulic Oil is the consistent item which must be in stock throughout the year, most importantly during the seasonal period.
- Also, general screws and nuts must be also in stock as sometimes these small items would not been recorded under sales_data.

➢ Seasonal Preview

Total Sales Revenue: ₹ 11811647.0
Average Monthly Sales (June to September): ₹ 139823.0
Median Monthly Sales (June to September): ₹ 63488.5

- Sales under the seasonal months of July to September are generally high comparatively to other months so inventory must be well optimized.
- More detailed information of Regression of sales data using ML algorithm will be further given in the Final Report for the Seasonal period.