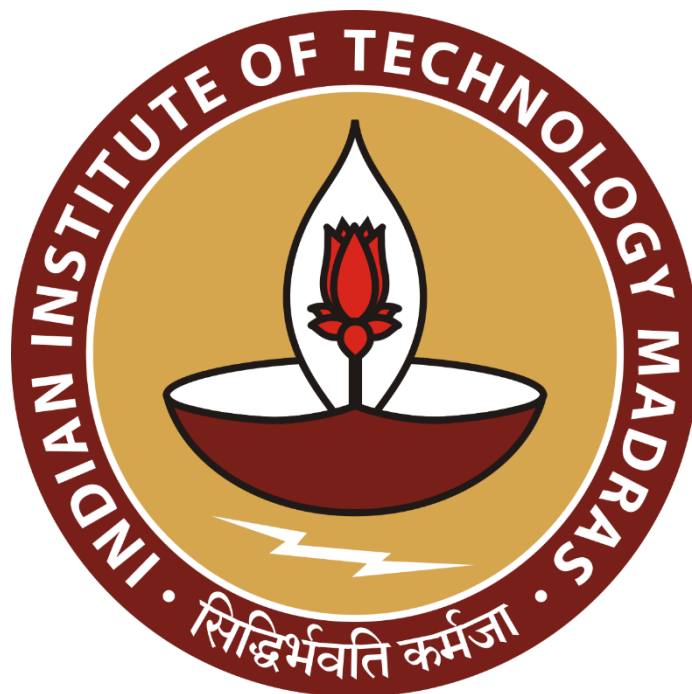# Streamlining Inventory and Logistics: A Data-Driven Approach for New Agarwal Footwear

A Mid-term report for the BDM capstone Project

Submitted by

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Declaration Statement

I am working on a Project titled "**Streamlining Inventory and Logistics: A Data-Driven Approach for New Agarwal Footwear**". I extend my appreciation to New Agarwal Footwear, for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate:

Name: Aditya Singh

Date: 2023-09-09

1 Executive Summary and Title

This project centers on addressing challenges faced by new role footwear situated at 29PAC Road, Kanpur UP. Commencing in 2016 this business operates under a B2C model offering a diverse range of footwear products. The intricacies of managing inventory particularly during festive and wedding seasons, necessitate the incorporation of a dual stock keeping unit (SKU) management system. Currently data is stored in unstructured books warranting a more organized and efficient approach.

The primary aim of this project is to optimize operations at New Agarwal Footwear through enhanced data management and analysis. By transforming the unstructured data into a more coherent format, we aim to extract valuable insights for informed decision-making. The midterm report provides a comprehensive overview of data originality, sources, metadata, and descriptive statistics, demonstrating our commitment to maintain data integrity.

Our analysis process and methodology are rigorously explained, emphasizing transparency and reproducibility to ensure the reliability of our findings. Graphs and visual representations are employed to succinctly convey results, enhancing comprehension.

In conclusion, this executive summary encapsulates our dedication to enhancing inventory management and operational efficiency at this footwear business. As the project advances a refined data driven strategy will be developed to optimize inventory process, alleviate complexity, and ultimately enhance profitability and customer satisfaction.

2 Proof of Originality of the Data

1. Letter from Organization in letter head with stamp and sign:

All the data is provided by Mr. Nagesh Agarwal who is the owner of New Agarwal Footwear. Please find below letter given from New Agarwal Footwear to validate the authenticity of the data.

New Agarwal Footwear

To Whomsoever it may concern

This is to certify that I, Mr. Nagesh Agarwal Owner of New Agarwal Footwear Shop situated at 29 PAC Road, Kanpur UP has provided few months of Business data to Mr. Aditya Singh for the purpose of an academic project in IIT Madras.

The data provided by me is true to my knowledge and this can be used only for the academic purpose.

Signature

2. Images related to Organization along with my images with founder:

Business Owner

My Image with founder

3. Recorded video with the founder in the Organization:

*Please use the below link to see the video with the founder

https://drive.google.com/file/d/1NmsMdng-
GPy5xxQCutMUbSH3F4WyftRn/view?usp=sharing

3 Metadata and Descriptive Statistics

3.1 Data Collected:

Here is the excel file which contains all the sales data:
https://docs.google.com/spreadsheets/d/15sQNVUK3D0Vx7BwSho8B3FC8B1zR0qm9
XlVlgJSAEQE/edit?usp=sharing

Here is the excel file which contains inventory data:
https://docs.google.com/spreadsheets/d/1XxtOl3t0EGmPYvj5uUfPaEvUPXyyYnPt-
orCqTdz_sc/edit?usp=sharing

3.2 Metadata:

Date	Sports Price (Rs)	Sports Pairs Sold	Casual Price (Rs)	Casual Pairs Sold	Sandals Price (Rs)	Sandals Pairs Sold	Sports Revenue	Casual Revenue	Sandals Revenue	Total Revenue	Date
01-04-2023	1360	2	580	1	315	12	2720	580	3780	7080	Saturday
02-04-2023	1285	3	485	2	385	14	3855	970	5390	10215	Sunday
03-04-2023	1355	4	655	3	395	15	5420	1965	5925	13310	Monday
04-04-2023	1305	1	550	1	325	10	1305	550	3250	5105	Tuesday
05-04-2023	1270	3	500	2	285	13	3810	1000	3705	8515	Wednesday
06-04-2023	1380	2	625	1	310	11	2760	625	3410	6795	Thursday
07-04-2023	1375	4	465	3	375	12	5500	1395	4500	11395	Friday
08-04-2023	1315	3	550	2	390	14	3945	1100	5460	10505	Saturday
09-04-2023	1365	2	465	1	330	15	2730	465	4950	8145	Sunday
10-04-2023	1340	4	670	3	385	10	5360	2010	3850	11220	Monday
11-04-2023	1280	3	480	2	295	13	3840	960	3835	8635	Tuesday
12-04-2023	1400	2	625	1	370	11	2800	625	4070	7495	Wednesday
13-04-2023	1375	4	560	3	395	12	5500	1680	4740	11920	Thursday
14-04-2023	1310	1	470	1	320	10	1310	470	3200	4980	Friday
15-04-2023	1350	3	650	2	395	13	4050	1300	5135	10485	Saturday
16-04-2023	1295	2	520	1	275	14	2590	520	3850	6960	Sunday
17-04-2023	1390	4	660	3	375	15	5560	1980	5625	13165	Monday
18-04-2023	1360	3	465	2	310	12	4080	930	3720	8730	Tuesday
19-04-2023	1325	2	590	1	355	11	2650	590	3905	7145	Wednesday
20-04-2023	1310	4	500	3	385	10	5240	1500	3850	10590	Thursday
21-04-2023	1370	3	480	2	295	15	4110	960	4425	9495	Friday
22-04-2023	1355	2	645	1	320	10	2710	645	3200	6555	Saturday
23-04-2023	1305	4	520	3	365	14	5220	1560	5110	11890	Sunday
24-04-2023	1385	3	470	2	300	13	4155	940	3900	8995	Monday
25-04-2023	1320	2	655	1	315	12	2640	655	3780	7075	Tuesday
26-04-2023	1345	4	585	3	390	11	5380	1755	4290	11425	Wednesday
27-04-2023	1290	3	480	2	275	10	3870	960	2750	7580	Thursday
28-04-2023	1350	2	560	1	355	15	2700	560	5325	8585	Friday
29-04-2023	1380	4	500	3	310	14	5520	1500	4340	11360	Saturday
30-04-2023	1325	3	620	2	375	13	3975	1240	4875	10090	Sunday

The Sales data collected from New Agrawal footwear consist of the following elements:

- Date: This column represents the date of each day's sales.
- Sports Price: The price of sports footwear on each day.
- Sports Pairs Sold: The number of pairs of sports footwear sold on each day.
- Casual Price: The price of casual footwear on each day.
- Casual Pairs Sold: The number of pairs of casual footwear sold on each day.
- Sandals Price: The price of sandals in on each day.
- Sandals Pairs Sold: The number of pairs of sandals sold on each day.
- Sports revenue: The total revenue generated from the sales of sports footwear on each day (calculated as "Sports Price (Rs)" multiplied by "Sports Pairs Sold").
- Casual Revenue: The total revenue generated from the sales of casual footwear on each day (calculated as "Casual Price (Rs)" multiplied by "Casual Pairs Sold").
- Sandals Revenue: The total revenue generated from the sales of sandals on each day (calculated as "Sandals Price (Rs)" multiplied by "Sandals Pairs Sold").
- Total Revenue: The overall total revenue generated on each day, which is the sum of revenue from sports, casual, and sandals.

Category	Total Inve	Inventory	Sold	Returns	Company Pairs	Local Pairs
Sports	182000	140	86	6	55	85
Casual Pairs	55,000	110	58	5	50	60
Sandals	143350	470	374	10	220	250
Total per month	380350	720	518	21	325	395

The Inventory data collected from New Agrawal footwear consist of the following elements:

- Category: This column represents the different categories of footwear sold, which include "Sports," "Casual Pairs," and "Sandals."
- Total Investment: This column indicates the total amount invested in each category of footwear.
- Inventory: The inventory column represents the quantity of pairs available in each category at the beginning of the period.
- Sold: This column shows the number of pairs sold for each category during the specified period.
- Returns: The returns column represents the number of pairs returned by customers for each category during the period. Returns can happen due to various reasons, such as size mismatches or defects.
- Company Pairs: This column represents the number of pairs produced or supplied by the company itself.

3.3 Descriptive Statistics:

The purpose of descriptive statistics is to provide a comprehensive analysis of the sales data of New Agarwal Footwear shop, covering three main categories: Sports, Casual, and Sandals.

Sports Category:
- Total Pairs Sold: 86
- Total Revenue: Rs. 115,305
- Mean Price: Rs. 1,339.24
- Median Price: Rs. 1,355
- Mode Price: Rs. 1,375
- Range of Prices: Rs. 115
- Variance in Prices: Rs. 4,070.55
- Standard Deviation in Prices: Rs. 63.77

The Sports Category showed a healthy sales performance with an average price of Rs. 1,339.24 per pair. The most frequent price point was Rs. 1,375, indicating strong demand for certain price levels within this category. Price variations were moderate, as evidenced by a standard deviation of Rs. 63.77.

Casual Category:
- Total Pairs Sold: 58
- Total Revenue: Rs. 31,990
- Mean Price: Rs. 551.55
- Median Price: Rs. 550
- Mode Price: Rs. 465
- Range of Prices: Rs. 185
- Variance in Prices: Rs. 2,828.06
- Standard Deviation in Prices: Rs. 53.15

In the Casual Category, the average price per pair was Rs. 551.55. The most frequent price point was Rs. 465, suggesting that customers were inclined towards more affordable options. Price variability was relatively low, with a standard deviation of Rs. 53.15.

Sandals Category:
- Total Pairs Sold: 374
- Total Revenue: Rs. 128,145
- Mean Price: Rs. 342.49
- Median Price: Rs. 320
- Mode Price: Rs. 375
- Range of Prices: Rs. 120
- Variance in Prices: Rs. 2,636.46
- Standard Deviation in Prices: Rs. 51.35

The Sandals Category demonstrated a strong sales volume, with a mean price of Rs. 342.49 per pair. The mode price of Rs. 375 suggests a popular price point among customers. Price variations were moderate, as indicated by a standard deviation of Rs. 51.35.

Total Revenue for All Categories:
- Total Revenue: Rs. 275,440
- Mean Revenue: Rs. 9,181.33
- Median Revenue: Rs. 8,585
- Mode Revenue: Rs. 7,080
- Range of Revenue: Rs. 11,235
- Variance in Revenue: Rs. 5,998,631.75
- Standard Deviation in Revenue: Rs. 2,449.41

Overall, the total revenue across all categories was Rs. 275,440 for the specified period. The average daily revenue was Rs. 9,181.33. The most frequent daily revenue was Rs. 7,080. The revenue distribution exhibited moderate variability, with a standard deviation of Rs. 2,449.41.

4   Detailed Explanation of the Analysis Process:

In the pursuit of a comprehensive data analysis, Microsoft Excel emerged as the foremost tool for this undertaking. The choice of Microsoft Excel was driven by its versatility and robust analytical capabilities, which were skillfully harnessed throughout the project. The software's feature-rich environment enabled us to delve deeply into the dataset, allowing for the creation of visually impactful graphs and charts that aided in the visualization of sales data for the month of April and inventory data spanning three months.

This methodological approach proved to be exceptionally advantageous, revealing intricate patterns, trends, and essential findings, thus demonstrating its superiority over alternative methods of data analysis.

A range of graphical representations were generated to unravel key insights within the dataset. These visualizations included volume trend analysis, revenue trend analysis, daily sales trends, Sales Pareto chart, Revenue Pareto charts, and month-wise revenue growth graphs. These graphical depictions served as pivotal tools for elucidating the dynamics of the data, offering a deeper understanding of trends and patterns.

Furthermore, correlation analyses were conducted to unveil potential relationships between these trends. It is noteworthy that this analysis represents an initial exploration, with the commitment to embark on a more extensive and in-depth examination in the forthcoming final term submission.

5   Results and Findings:

The comprehensive analysis of the sales data has yielded significant insights into the business's performance during the specified period. The following key findings were derived from the examination of various trends.

- Volume trend Analysis:

The day-wise Volume Trend Analysis provides a nuanced understanding of the shop's sales dynamics during the month of April. Notably, Saturdays and Sundays emerged as the peak sales days, consistently surpassing the sales volumes of other weekdays.
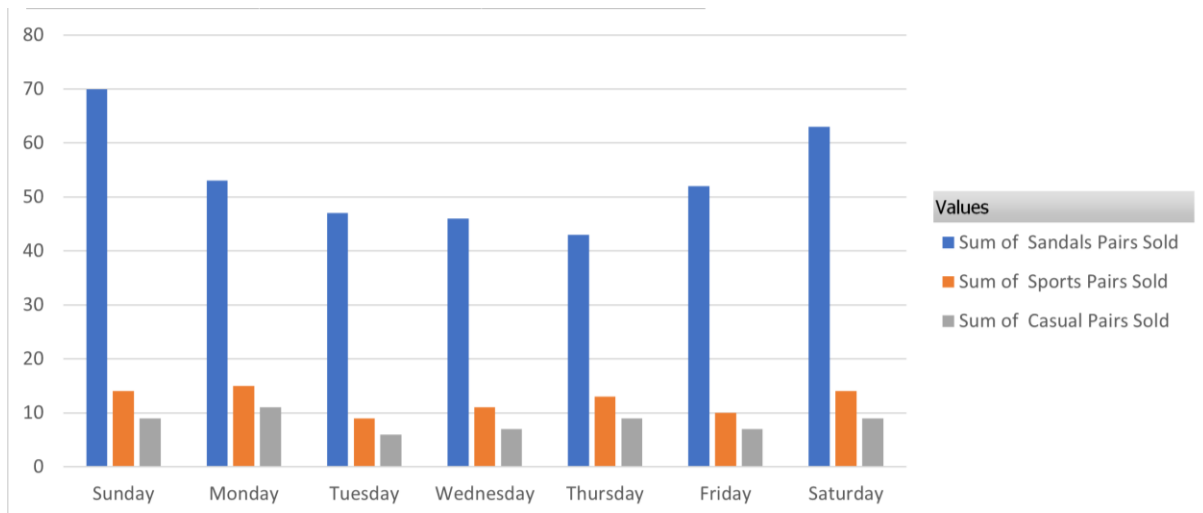

Figure 1: Day wise Volume trend analysis

An intriguing trend was observed in product popularity. Sandals, as indicated by the column bar graph (Blue color), demonstrated a notable increase in sales volume, making them the top-selling category across all days. Conversely, the Casual category consistently recorded the lowest sales volume, highlighting potential areas for improvement.
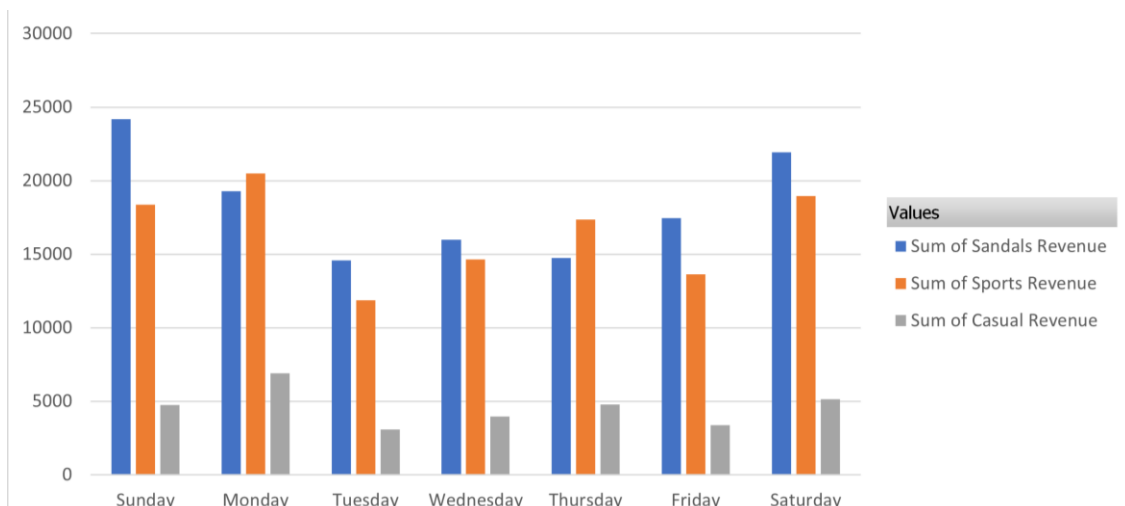
- Revenue trend Analysis:

Figure 2: Day wise Revenue trend analysis

Our exploration into the day-wise revenue trends by category has provided intriguing insights into the shop's revenue dynamics for the month of April. The graph (see Figure 2) vividly illustrates the fluctuations in revenue across each day of the week. Notably, Sundays,

Tuesdays, Wednesdays, Fridays, and Saturdays stand out as days when the 'Sandals' category contributes significantly to overall revenue, showcasing consistent popularity and robust sales.

However, a noteworthy deviation from this trend is observed on Mondays and Thursdays. On these days, the 'Sports' category takes the lead in revenue generation. This shift can be attributed to an average price of Rs. 1339.24 for 'Sports' pairs, highlighting that customers are willing to invest in sports footwear.

In contrast, the 'Casual' category consistently records lower revenue across all days.
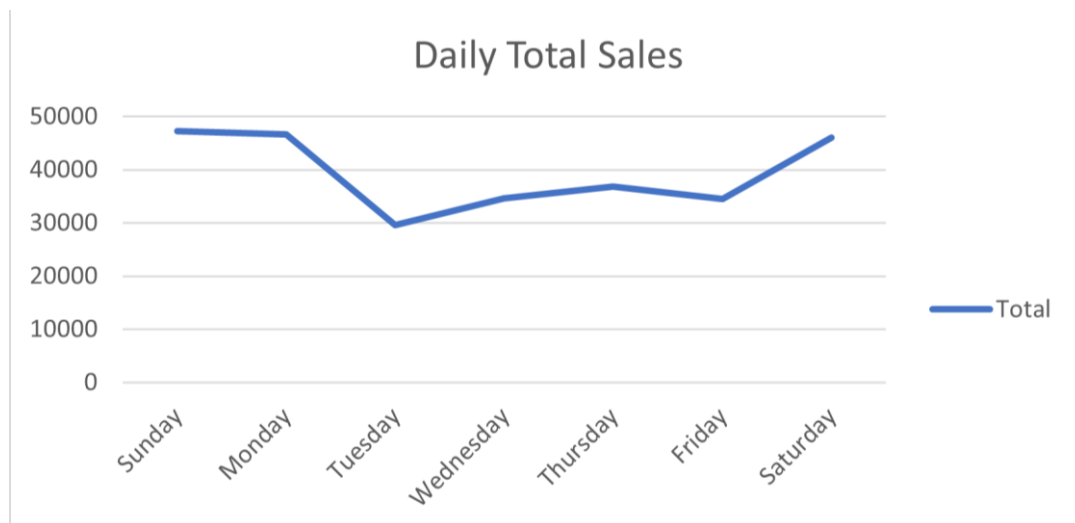
- Analysis of Total Revenue by Day:

Figure 2: Day wise Total Revenue trend analysis

The most conspicuous trend in the analysis of total revenue by day is the pronounced increase in revenue during the weekends, specifically on Sundays and Saturdays. On all the analysis these days consistently emerge as the highest revenue-generating periods, collectively contributing significantly to the overall monthly revenue. This pattern is in line with established consumer behavior, where individuals often allocate more time to shopping and leisure activities over the weekend.

An interesting deviation from the overall trend is observed on Mondays and Thursdays. These weekdays record comparatively higher revenue figures than the rest of the weekdays. On the contrary, Tuesdays, Wednesdays, and Fridays are characterized by relatively lower revenue figures. These midweek days show a plateau in sales, potentially influenced by factors such as work commitments and reduced shopping activity during these periods.

In conclusion, this initial analysis of the sales data for the month of April has illuminated critical facets of the shop's performance.

As we move forward, our commitment to a more thorough exploration of the data in the forthcoming final term submission remains unwavering. With a deeper dive into correlation analyses, product-specific insights, and seasonal patterns.