

INVENTORY MANAGEMENT AND FORECASTING SYSTEM USING ML

Business Data Management Project

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Summary:

This project aims to enhance the accuracy and efficiency of inventory management processes within Nasan Medical Electronics Pvt. Ltd. The company is a medium-scale medical equipment manufacturer. Being a manufacturer having an established inventory management system is paramount to reducing overhead costs. Inventory management is a very complex problem. If we maintain too high of an inventory or overstock the inventory additional costs of storage and maintenance are incurred while if insufficient inventory is maintained it may lead to a reduction in manufacturing efficiency.

This project aims to formulate an algorithm to predict inventory needs and to identify outliers in the inventory management system. Using past data I aim to present a comprehensive analysis of the crucial factors that can contribute to maintaining ideal inventory volumes. Using Machine Learning (ML), I propose to automate the process by delivering a model that can be used by the company to check the inventory fitness against past data.

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4. Proof of originality of the Data

4.1 Letter from Organization

NASAN MEDICAL ELECTRONICS PVT. LTD.

CIN : U31909PN1991PTC063916

Corporate Office.:

Office No.3 and 4, 'C' Wing, Shubham Heights, Off Mumbai-Bangalore Highway,
Service road, Warje, Pune - 411058 Ph: 8237032381

E-Mail : admin@nasanmedical.com **Website :** www.nasanmedical.com



To,

Mr. Himanshu Savargaonkar

Pune

Subject: Project Confirmation: "Inventory Management and Forecasting System Using ML"

Dear Mr. Himanshu Savargaonkar,

We are pleased to officially assign you the project titled "Inventory Management and Forecasting System Using ML" at Nasan Medical Electronics Pvt. Ltd. We recognize that this project is an integral part of your coursework for the IIT Madras Diploma in Data Science's Business Data Management Project.

Thank you for your commitment. We look forward to a productive collaboration and the positive impact it will have on our organization.

Best Regards,



Veena Markandeya

Admin and RA Manager

Nasan Medical Electronics Pvt. Ltd.

Date: 15 June 2023

4.2 Images



Image 1: Company Logo



Image 2: Street Photo of the company



Image 3: Photo with Founder and Team

People in the Photo (From the Left to Right):

1. Leena Akiwate – Inventory Manager
2. Veena Markandeya – General Manager
3. Yashwant Samant – Founder and CEO
4. Myself (Himanshu Savargaonkar)

8.3 Video

The video is a zoom call recording between myself, Leena Akiwate and Veena Markandeya. Recorded as proof of collaboration between the student and the organization.

<https://youtu.be/bUXmveB7r1Q>

8. Metadata

Data Provided from company:

- Inventory Transaction Data for the past 3 years was provided from the company in excel format.
- The data had sub tables divided by blank rows for each item tracked in the inventory system.
- Each item had the following columns of data:
 1. Item No.
 2. Item Name.
 3. Initial stock of the item
 4. Initial price of the present stock
 5. Transaction Date
 6. Transaction type
 7. Quantity of transaction
 8. Price of Components involved in the transaction
 9. Final stock quantity of the item
 10. Final price of the present stock
- Each transaction for every item is presented in the data provided.
- Data of total 3119 items was provided.

8. Descriptive Statistics

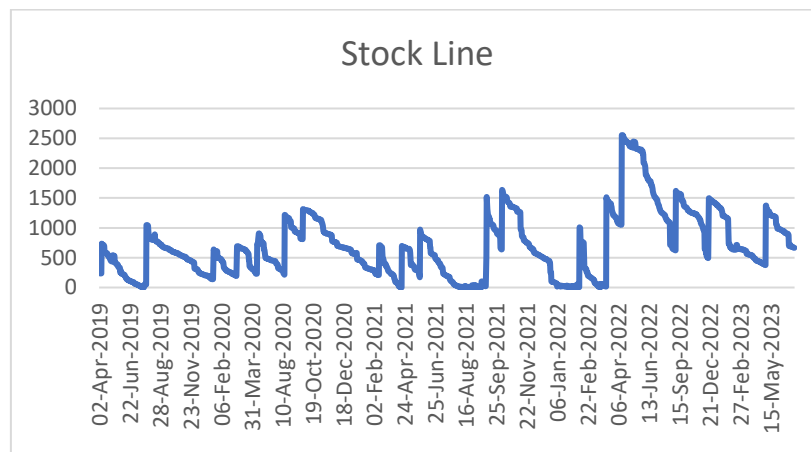
- Individual dataframes were constructed for all the items individually.
- The items were divided into 5 categories based on number of transaction in the past 3 years:
 - Very Low(0-5): 982 items
 - Low (6-100): 1608 items
 - Medium (101-500): 488 items
 - High (501-1000): 34 items
 - Very High (>1000): 7 items
- The items were also divided based on the final quantity:
 - Very Low(0-5): 1320 items
 - Low (6-100): 894 items
 - Medium (101-500): 486 items
 - High (501-1000): 125 items
 - Very High (>1000): 294 items
- The data consists of total 1,90,648 transactions.
- The total number of items present in the inventory system are 13,49,587.

7. Detailed Explanation of Analysis Process/Method

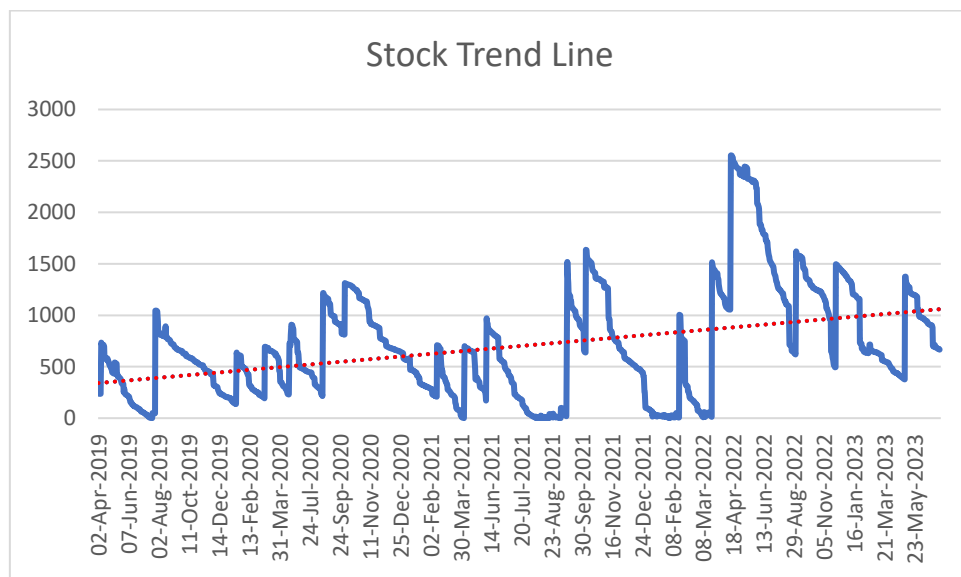
- Since the number of components is very large it is important to split the components into sections.
- This was achieved by using number of transactions and the total quantity of stock for each item. As mentioned above the items have been split into 5 sections on these 2 axes.
- Dead Inventory Identification
 - As a business requirement from the company they requested a report of all the dead inventory present in the system.
 - Dead inventory is described as an item which has had no transactions in the past 1 year.
 - Total dead inventory (items) were identified and a report was generated.
- Zero Inventory Identification
 - Along with dead inventory there are items present in the inventory system which are no longer in use and unnecessary meta-data is being maintained in the inventory management system.
 - These items were classified as dead items with 0 inventory.
 - A separate report was generated and provided to the company so that these items can be removed from tracking in the current inventory system.
- Upon discussing with the Nassan team it was finalized that the predictive algorithms will be only implemented on the High and Very High components of the number of transactions. This decision was taken keeping in mind that more amount of data is required to make a useable predictive algorithm.
- The final goal for the project is to present an ideal stock quantity for the items individually. This will be obtained by finding the trend of usage of the item.
- Preliminary analysis has been done on a single item to understand the characteristics the ML algorithm needs to attain this ideal quantity. The results of this analysis are presented in the section below.

8. Results

- **Dead Inventory Report**
 - Reports identified 1355 items to be dead.
 - A report was generated with the id, name and last transaction detailed to be shared with the company for further analysis from their end.
- **Zero Inventory Report**
 - Report identified 983 items to be zero
 - A similar report to the above was also generated in this case and was shared with the company.
- **Trend analysis for “fuse 8a slow blow 20mm.” item**
 - This item was selected since it has over 1000 entries.
 - Below we can observe the trend line for the quantity in stock over 3 years.



- As we can see the usage and the purchases can be clearly identified in the graph.
- We can also note that more than once the stock has been very close to 0 which is not ideal.
- Using a linear regression ML algorithm a proposed ideal stock quantity was predicted.



- Which is depicted in red.
 - By using the red trend line we can note the number of times the stock has plummeted below the desired amount.
- Implementation of ML algorithm on other items.
 - I have chosen the above item as it has a very clear stock curve.
 - Simultaneously I am executing the algorithm on the other high frequency items.
 - I have not shown the results here as they do not show any additional data.
 - As a final step once the algorithm is tuned it will be implemented on all the other items and then a composite report will be generated as part of the end-term report.