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Retail Store Stock Inventory Analytics

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ABSTRACT: - Inventory management is the process of ensuring you carry products that shoppers want, with neither too little nor too much on hand. By managing inventory, retailers meet customer demand without running out of stock or carrying excess supply. Inventory management is vital for retailers because the practice helps them increase profits. The efficiency of a retail store is based on the retailer's ability to provide the right goods to the consumer, in the right quality, in the right quantity, at the right place and in right time. The entire process of retailing depends on the efficient inventory management. Inventory management is one area that differentiates successful and unsuccessful retail stores. Inventory control is not just a materials management or warehouse department issue.

KEYWORDS: : Inventory Management, Inventory Analysis, Python.

I. INTRODUCTION

Retail inventory management is the process of ensuring you carry products that shoppers want, with neither too little nor too much on hand. By managing inventory, retailers meet customer demand without running out of stock or carrying excess supply. Inventory management is vital for retailers because the practice helps them increase profits. They are more likely to have enough inventory to capture every possible sale while avoiding overstock because too much inventory means working capital costs, operational costs, and a complex operation. Based on the inventory management analysis we can manage how much inventory is required for selling the product based on which they can calculate the profit & losses. Inventory management is a critical part of retail operations. It helps retailers to keep track of their inventory, ensure that they have the right products in stock, and manage their stock levels. It also helps retailers to optimize their stock levels and pricing. Inventory management is a complex process. It requires the use of multiple software applications and data sources. Retailers need to have a clear understanding of their inventory levels and the products they sell. They also need to be able to track and manage their inventory in Realtime. The first step in inventory management is to track inventory levels. This can be done manually or through the use of an inventory management system. Inventory management systems are designed to track and manage inventory in real-time. They provide retailers with the ability to view their inventory levels, stock levels, and sales. They also allow retailers to manage their stock levels and pricing. Inventory management systems can be used to track inventory in a number of ways

II. OBJECTIVE

- To ensure a continuous supply of materials and stock so that production should not suffer at the time of customer's demand.
- To avoid both overstocking and under-stocking of inventory.
- To maintain the availability of materials whenever and wherever required in enough quantity.
- To maintain minimum working capital as required for operational and sales activities.
- To optimize various costs indulged with inventories like purchase cost, carrying a cost, storage cost, etc.

III. LITERATURE REVIEW

1. Israa Mohamed- "In this study, we aim at predicting the readmission of COPD (Chronic Obstructive Pulmonary Disease) patients through the deployment of machine learning algorithms
2. Jorge Andres Espinoza Aguirre -Inventory management is one of the important business processes which ensure that the supply of raw materials and finished goods remain continuous throughout the business operations. It could be during manufacturing or production to ensure smooth operations and organization as it relates to purchases,

sales and logistic activities. Inventory management systems has the objective of ensuring smooth running of the production process, reduce the ordering cost of inventory, take advantage of quantity discount, and avoid opportunity loss on sales.

3. Ariful Islam -A small saving in the inventory will mirror a crucial edge in benefit of the organization. In Bangladesh, the retail shops generally face two types of inventory related problems which are either stock-out or overstock. As a result, most of the shops fail to maintain their product availability with lowest possible inventory cost. Through proper inventory control techniques, probability of stock-out as well as overstock situations in the retail shops can be minimized.
4. Mirco Sturari -Retail surveying and inventory using visual and textual Analysis. The manpower cost for surveying and monitoring the shelves in retail stores are high, because of which these activities are not repeated frequently causing reduced customer satisfaction and loss of revenue. Further, the accuracy of data collected may be improved by avoiding human related
5. Hien Vu -Inventory management in retail industry - Application of big data analytics the retail industry is becoming rigorously
6. competitive and narrowly profitable that retailers find themselves in a dilemma of neither excessive in- stock nor depleted out of-stock is negotiable. The report finds the prospects of integrating BDA in the conventional inventory management techniques and promoting the viability and appropriateness of these models in the big data era.

IV. PROJECT DESIGN

The Common Management Model For Commodities In Retail Stores

There are diverse characteristics of demands among the commodities in a retail store. For instance, some commodities with seasonal characteristic of demand sell well in certain months while the others with random characteristics have a stable level of demand throughout the year. Different levels of demand in different stages will directly affect the commodity inventories in a retail store. Wrong decisions in ordering will cause either higher or lower inventory, result in unnecessary cost. The sufficient inventory will force the manager naturally to reduce the next batch orders while too many orders will cause the additional cost in their inventory. Hence, the problems above are chiefly due to the empirical and traditional forecasting models that fail to reflect various characteristics of demand.

Connection With Operation Management

BDA is the key driver that helps retailers to position and approach their potential customers through various channels, like social media and interactive websites. The online retail market has become more and more ubiquitous and hence has generated an enormous amount of data associated with customers' purchase, interactions, comments, reviews and browsing history. This information is precious inputs for predictive models to understand the needs, interest better and eventually forecast their future demands. The study examines the case study of Amazon investigating the correlation between review volume and rating on sales performance with the aid of BDA. 2939 records of data have been collected from the Amazon website of a basket of various products to ensure product preferences are excluded from the model. Customer reviews are assumed to be the crucial factor explaining customers purchase decision as online customers ranked peer reviews are the second most trustworthy information source (Chong et al., 2016). The result shows that the more amount of feedback given by previous customers, the higher the probability of purchase decision made by potential consumers. Hence managers and practitioners are encouraged to adjust their supply to customers' demand for particular product category and pattern of online review for a product before placing replacement orders. Additionally, the predictive analytics also enable retailers to investigate the product assortment plan to improve their sales. The tools allow retail managers to converse in-store customers' tracking data together with purchase history from POS to uncover the likelihood of product kinds are collected together. This information then becomes a key driver for retailers to decide product sets and product placement in stores BDA plays a growing pivotal role in determining the optimal stock level and minimizing operation costs for retailers. The critical inputs for BD optimization models are data hidden in logs, sensors, electronic devices and monitors. The application of machine learning and artificial intelligence system, such as in "Amazon Go" of Amazon or "Shelf Scanning Robots" of Walmart, has introduced a continuously updated inventory system, thus enhance inventory visibility. Moreover, the transparency in data sharing between retailers and suppliers would reduce misunderstandings and uncertainty in the supply chain, hence positively contribute to better inventory management. With the aid of cloud bases and big data sharing technologies, BDA will not only enable retailers to better understand their clients, but also give a reliable indicator

for suppliers about future demands of ending customers, hence streamline the variation in inventory capacity of the whole supply chain,
lessen the probability of stock-out and increase the seamless logistics services.

Dataflow diagram:

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually "say" things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO. That's why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems

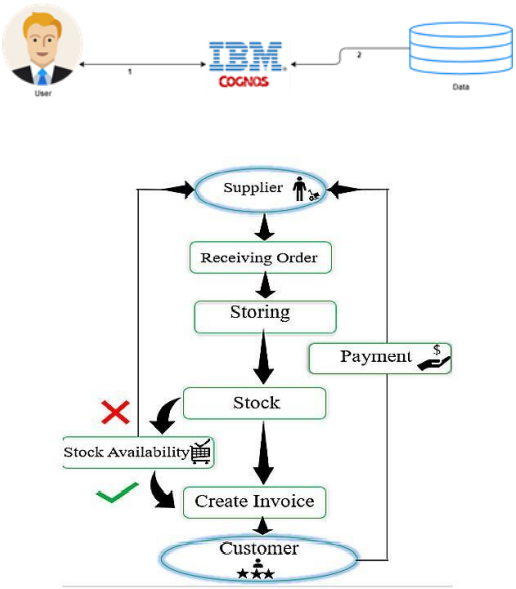

Fig: 1 Data Flow Diagram

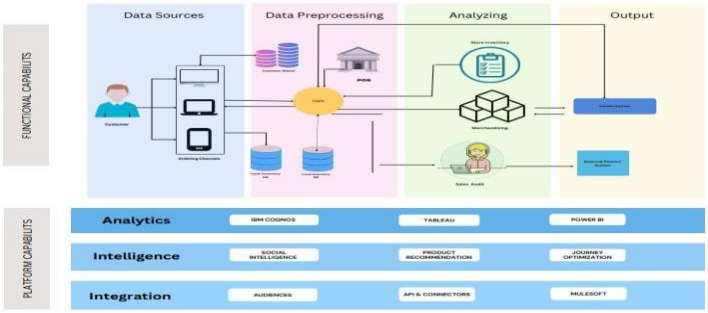

Fig: 2 Solution and Technical Architecture

V. SOFTWARE REQUIRMENT

- PYTHON
- IBM COGNOUS ANALYTICS

Business Model/Impact

- Improve the decision-making process oriented at reducing
- costs and increasing revenues.
- Retailers are able to understand the deepest customer needs and
- adjust their offering to meet shoppers' demands.

Social Impact

- Customers will get more varieties, High availability of the products
- Customers will get better returns

VI. RESULTS

The Clustering Analysis of Commodities in Retail Stores

In inventory management, generally, a method called Activity Based ABC Classification is used to determine the different ways to manage the things. Using this method, we need to sort all the commodities according to the overall profit of each commodity and divide all commodities into 3 types. They are namely Type A, Type B, and Type C. The value of Type A is highest, which need to be focused cautiously by the manager. Clearly, using ABC will have many problems when applying to demand forecasting in retail stores because of the various characteristics of demand like the characteristics in festival, random, and season. How to quickly classify the commodities with different characteristics and establish the forecasting model for each type of characteristics so as to implement the same strategies of ordering for each type is very important. Here we propose an improved K-means clustering method with a concept of weight of diversity to quickly cluster the commodities with unknown characteristics of demand. It will establish a foundation for the forecasting model later. Based on the Clustering analysis, we can build a forecasting model and make some strategies for the commodities with the same demand characteristics so as to improve the commodity management in retail stores. In order to reduce the complication, we will choose some typical characteristics of demand to analyze in detail Commodities. Hence, it is not realistic to establish the forecasting model for each individual commodity manually, which shows the potential value of what we try to study in this paper.

Based on data in Table 1, we implemented the standard Kmeans clustering analysis with a parameter 5 as the number of clustering in Origin 9.0. The monthly demand in a year is normalized by dividing the maximum monthly demand to remove their dimensionless. Finally, the results of analysis are shown in Figure 4. We found that the possible characteristic of commodities in sub graph (c) is seasonal. And sub graph (a) has the characteristic of random while sub graph (b) shows characteristic of stable demand. There are three main types of clustering in Figure 4. As we described previously, using the K-means clustering methods was much more useful and detailed than that in ABC. However, the standard K-means clustering method uses the Euclidean distance to compare two samples mathematically. It will cause unexpected problems in practical applications. For instance, in sub graph (a), we noticed that the curve of the commodity G13 has huge variation compared with the curves of other commodities. Intuitively, G13 should be classified into sub graph (c) instead. The reason for the problem is that the Kmeans clustering method uses the Euclidean distance directly, not the fuzzy calculation to calculate their similarity. Hence, an improved way that modifies the function of distance calculation by importing the weight factor of variation is proposed in the followed. In other words, it rewrites the function of calculating Euclidean distance

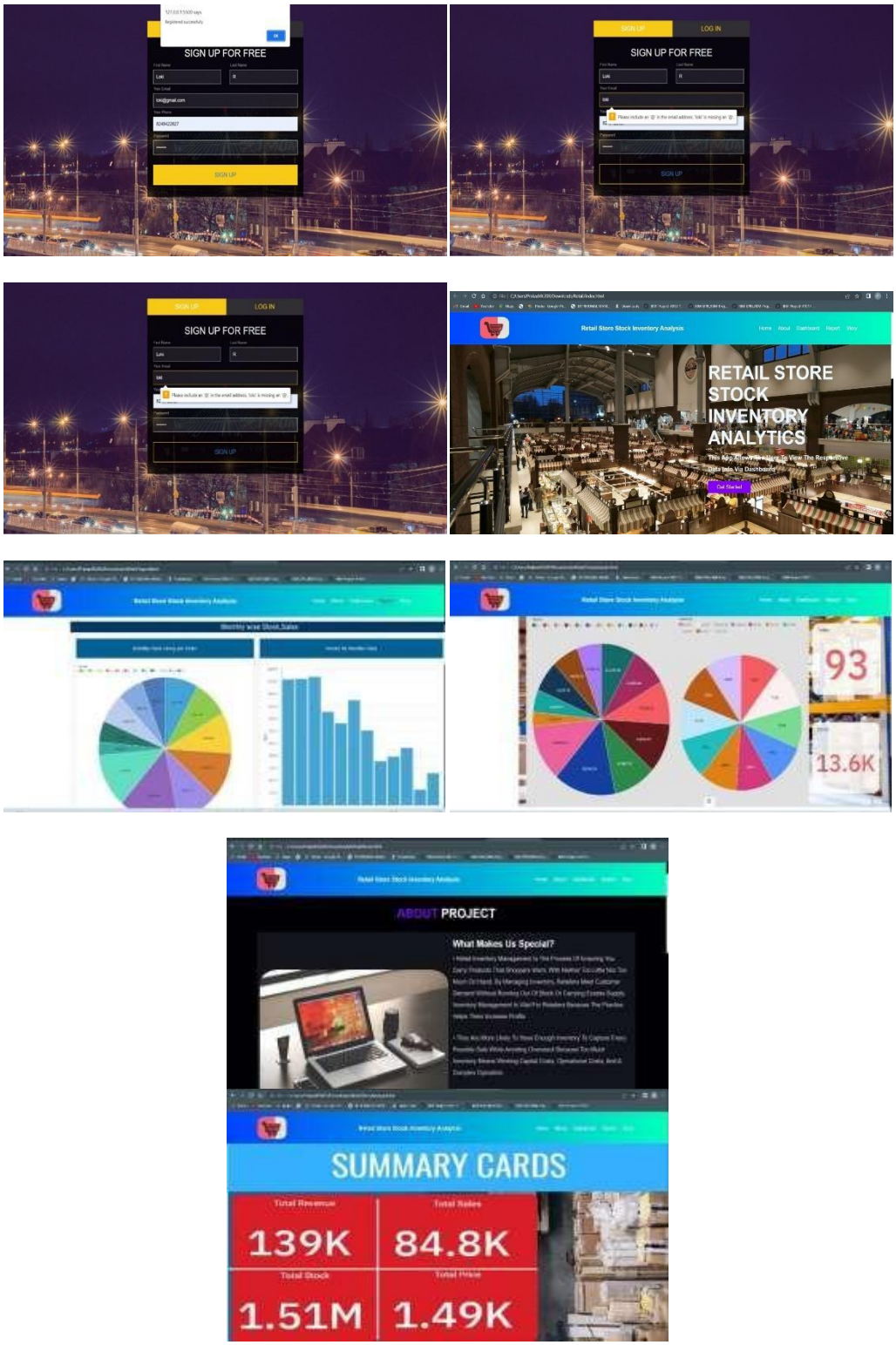

Fig :4 Analyzed data

VII. CONCLUSION

In conclusion as you can see the importance of inventory management is very serious, it is one of the most important aspects of any business. The aspect of this part of the business is whether or not you can satisfy the demand of your customers if you aren't sure if you have all the materials available to make the final product

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Without having the proper inventory management, they would not be able to supply their customers with their ordered ambulance. And this product is what their entire business is based on, so it is of great importance When they are choosing from the different types of programs or automated systems to help with keeping records accurate, needs to keep in mind that the customer is not concerned with which materials are needed to complete the finished product, but the product is operating as promised based on the contract. In addition, the plans for the maintenance of having proper inventory levels need to be in place and also adjusted when the company grows and as the business dictates implements the new suggestions, they will be on the right track to having a well-established business.

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