**SMART INVENTORY MANAGEMENT SYSTEM**

**A PROJECT REPORT**

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***in***

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**



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**NATIONAL INSTITUTE OF TECHNOLOGY**

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**BONAFIDE CERTIFICATE**

This is to certify that this project report entitled **“SMART INVENTORY MANAGEMENT SYSTEM”** is the bonafide work of “**SINGALURI NAMRATHA, TADASINALIKHIT REDI, THOTA ROHITH, ABHIRUP ACHARYA, MIRZA ADIL AMMAR BAIG**” who carried out the project work under my supervision. This is to further certify to the best of my knowledge that this project has not been carried out earlier in this institute.

SIGNATURE

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**INTRODUCTION**

Though it may seem obvious that effective inventory management techniques are vital to a successful wholesale distribution business, many companies large and small still struggle with the process of preventing stock-outs and overages, achieving maximum throughput, and keeping costs down.

**1.1What is Inventory Management?**

Effective inventory management is all about knowing what is on hand, where it is in use, and how much finished product results.

It is a process of efficiently overseeing the constant flow of units into and out of an existing inventory. This process usually involves controlling the transfer of units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of the company into jeopardy

**1.2 INVENTORY CONTROL SYSTEMS**

In addition to regular inventory counts, there are also techniques that involve planning and optimization procedures that coordinate with fluctuations in demand**.**

***1.2.1. Maintaining Minimum Stock Levels***

One of the most basic forms of control, this process involves ordering new stock when existing inventory has reached a predetermined minimum level. This works well for smaller businesses

***1.2.2. Keeping Safety Stock***

Keeping safety stock is another basic method of inventory control, which involves carrying an additional amount of inventory over normal levels to protect against uncertainties in consumer demand, supplier delivery, or product availability.

***1.2.3. Accurate Response***

The accurate response method involves more intense demand forecasting––using data analytics to make more accurate predictions of how much stock you’ll need at a particular point in time.

Ultimately, the more automated the system is, less paperwork there will be and there is a whole host of inventory management software options out there.

**1.3. INVENTORY MANAGEMENT SYSTEMS**

Within inventory control systems there are two major kinds of management systems

***1.3.1. QR/ Barcode systems***

Barcode technology is more accurate and efficient than manual processes When used as part of an overall inventory control system, Barcode systems update inventory levels automatically when workers scan them with a a barcode scanner or mobile device.

1.3.2. ***RFID Inventory systems***

Active RFID technology uses fixed tag readers throughout the warehouse; RFID tags pass the reader, and the movement is recorded in the inventory management software. Passive RFID technology, on the other hand, requires the use of handheld readers to monitor inventory movement.

**1.4. WELL MANAGED INVENTORIES**

a retailer’s worst nightmare is to go out of stock. Lost sales and lost goodwill can tarnish a brand’s reputation in record time. However, with effective inventory control to ensure that well-received products can always be delivered, going out of stock can be avoided with good inventory control.

H&M manufactures 80%of its retail inventory in advance and introduces the remaining 20% based on the most current market trends. These manufacturing strategies help the company to reduce lead times, keeping them at the top of their inventory control game.

Something that has been in trend lately, automated shopping involves automatic updates and notifications to the customers about his entry and exit and his current and past purchases instantly on his mobile

**1.4. AUTOMATED SHOPPING**

It is one of the latest technologies wherein small businesses start sending their customers push notifications.

About 52% of Smartphone users have push enabled on their devices, and these notifications can be used to benefit businesses in the following ways:

* Directing users to your social media channels
* Promoting products and services (especially special offers)
* Building trust and brand reputation by delivering valuable content
* Engaging users who aren’t currently on your site

These notifications make it easier for the customer as well as the store to maintain a track of their sales and purchases.

**FORMULATION OF PROJECT**

The basic idea of our project is to manage the Inventory in a smarter way so as to minimize the losses incurred due to poor judgement during order of the products for offline shopping. Such errors are mainly common in small scale businesses..

**2.1. IDENTIFICATION OF PROBLEM**

Several errors can cause a whole lot of losses:

1. Spoilage of food items (especially dairy items, fruits &vegetables) due to less demand of the particular product or some particular reason costing the seller 100% of the product price.
2. Degradation in the quality of the fibres of clothes owing to overtime storage in not-so-well conditioned warehouses.
3. Poor choice on ordering of in-demand items over not-so-in-demand items causing a shortage in the actually selling products and an excessive of dormant products causing storage, maintenance and selling problems at the end or even frequently selling those excessive items at a bare minimum profit (or loss at times for the sake of clearing the stock to facilitate the income of the next poorly chosen batch again repeating the cycle) which also attributes to the problem of lower customer satisfaction.
4. Not all businesses can afford a humongous warehouse for storage of their products. Space is a vital necessity in such cases. Thus there is a need to strategically implement product orders to cut losses as well as save space and hence allow for greater efficiency and lower storage costs.
5. Storage of products cannot always be under optimal conditions which is why there is a need for rapid sale of the products which can be done if the batches are strategically ordered to satisfy the current trends (excepting a few).
6. Large work force couldn’t always be afforded owing to the demand of a particular product in a specific duration of time.
7. Maintenance could be another nightmare as things might go well out of control overnight; here things could mean product or product based fields.

These were a few of the many reasons why we felt the need to formulate an advanced concept like **SIMAS.**

**2.2. WHAT IS SIMOS?**

Through SIMAS the warehouse is regularly maintained and stocked according to the customers demand and interests resulting in very low to no wastage.

SIMAS mainly involves:

* A Locally hosted webpage
* webcam based QR code scanner
* A spread/Excel sheet holding customer’s profile and his purchases
* Customer and product identity tags

Every customer subscribing to a membership is provided with a unique ID and his complete profile including his purchase is updated each time he visits. The updated data is displayed within a locally hosted webpage to the administrator. Based on the customer’s most frequent purchases or his frequency of visits the items to be stocked can be determined. As soon as the QR code of a particular customer holding a membership is scanned the customer receives a push notification about his arrival, exit, his purchase, cost, etc. This is a great way to satisfy customers not holding an app installed for the store.

This project could mainly be divided into

1. **Inventory management**
2. **Automated shopping**

**INVENTORY MANAGEMENT**

Inventory management revolves around maintaining the warehouse and products within.

A **web page** was developed for inventory management and is a art of front end.

**Front end** is what is visible to the end user. Basically it is the user interface which takes input of where the output is displayed to the user.

All the WebPages of our project were designed using Java script, html, css and node.js.

**JavaScript** is the most widely deployed language in the world and is useful in writing Front end client side code, backend code for servers, or even game development. It is what makes HTML pages much more interactive

**HTML** is what gives structure to the pages. With cascading style sheets and JavaScript, it forms the cornerstone technology of the World Wide Web

**CSS** is a simple design language intended to simplify the process of making WebPages presentable. It handles the look and feel part of a webpage

WEBPAGE:

The webpage for simas includes:

**1. Homepage**

A simple homepage was designed with the **SIMAS** logo. The homepage basically allows the users to navigate to various other pages and contains the basic idea on **SIMAS** and details and links regarding contact and customer support.

* **About**

This page provides new users with all the information about what they could expect from SIMAS.

**2. A login page**

The homepage also navigates to a login page which allows the personnel to login. Upon logging in the user is taken to an admin page.

* **Admin page**

The admin page can be viewed by the administrators of our project. Here we have given 5 usernames and passwords. Once they log into the page they will be directed to a page graphically representing the statistics, total/current sales, customer excel reports etc. The page would always consist of a an updated  **Weather report** displaying the temperature, humidity, wind speed, visibility and other such factors which could affect the inventory based on which, the factors inside the warehouse could be varied to preserve the stock.

The text/code editor use for the webpage was **Sublime text**

**SUBLIME TEXT**

It is a proprietary cross-platform source code editor with a Python application programming interface (API). It natively supports many programming languages and mark-up languages, and functions can be added by users with plug-inn’s, typically community-built and maintained under free-software licenses. It contains 23 different visual themes, with the option to download additional themes and configure custom themes via third-party plug-inn’s.

Few templates were also downloaded for the webpage which were further modified to suit our purpose.

**Backend code** is something that goes behind the scenes, to which all the input of the front end goes or from where all output comes to front end after processing various algorithms. It includes Processing layer, Database layer etc.

The most common languages used for back end development are: **JavaScript (Node.js), PHP, and Python (Django/Flask).**

**SPREAD/EXCEL SHEET:**

An excel sheet containing profiles of about 1000 customers was prepared using built in excel functions.

The spreadsheet contains several columns for particular customers which are:

* Name of the customer
* Country and city
* His unique id
* His purchase
* Category of his purchase
* Discount offered
* His total purchase price

**PREDICTIVE ANALYSIS**

In this section owing to the existing dataset a model was trained so that it could predict almost accurately in any near future. The dataset had lot many features than required, hence most of the features were trimmed away following which were left out with the Category (Furniture or Office Supply) of the purchase, Date of purchase and the Sales price.

The Code Started off with inclusion of Libraries and feeding the dataset to the Model. It was made sure there weren’t any missing data in the dataset. The dataset was rearranged to start of the month wise details in order to ease the visualization of the prediction. The raw data was plotted with years to visualize the pattern of sales. A model called **Arima** was used in this project. The goodness of Model was measured in terms of AIC (Akaike Information Criterion). Least the AIC better the model. Model with minimum AIC was filtered out to carry the further proceedings. The model was validated using the existing Test data which was separated out in the beginning of the processing and the model showed out some fascinating predictions of Sales on a given future day. The model was ready to get some right predictions and the sales of the following year were visualized. Over the years the model would go unsure about the trend and hence the confidence interval was also visualized which would get widened the farther we predict into the future.

The code was automated so that the all the above visualized plots would be taken down and that would get uploaded on the website as the current trend.