



**INVENTORY MANAGEMENT SYSTEM FOR RETAILERS**

**Professional Readiness for Innovation, Employability and  
Entrepreneurship**

**PROJECT REPORT**

*Submitted by*

<b>AADHARSH R</b>	<b>2019103604</b>
<b>BHUVANESHWAR S</b>	<b>2019103513</b>
<b>DHEEPAKRAAJ</b>	<b>2019103516</b>
<b>JYOTIR ADITHYA GIRI</b>	<b>2019103531</b>

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## **INTRODUCTION**

Retail inventory management is the process of ensuring you carry merchandise 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.

### **1.1 PROJECT OVERVIEW**

In practice, effective retail inventory management results in lower costs and a better understanding of sales patterns. Retail inventory management tools and methods give retailers more information on which to run their businesses. Retailers can access their accounts by logging into the application.

Once retailers successfully log in to the application they can update their inventory details, also users will be able to add new stock by submitting essential details related to the stock.

### **1.2 PURPOSE**

Retail inventory management works by creating systems to log products, receive them into inventory, track changes when sales occur, manage the flow of goods from purchasing to final sale and check stock counts.

Inventory management helps companies identify which and how much stock to order at what time. It tracks inventory from purchase to the sale of goods. The practice identifies and responds to trends to ensure there's always enough stock to fulfill customer orders and proper warning of a shortage.

## 1. LITERATURE SURVEY

### 1. Research on the optimization of Retailer Inventory Strategy based on System DynamicsSimulation

**LINK :** <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6252235>

**AUTHOR :** Yang Lin, Hou Kaihu, Zhong Jinyuan

The supply chain inventory management aims at meeting customers' demands, reducing inventory cost and increasing enterprise profit. We need to place an order and replenish productions when the inventory is under safety stock quantity. We can appropriately combine with historical records and product sale reports through a dynamic simulation analysis, and then provide variable parameters which are similar to the reality operation situation. So a simulation model is established and it must meet customers' demands, operate smoothly and use up the inventory in time. Therefore, we can use the method of system dynamic simulation to optimize the variable parameters in a two-stage supply chain inventory system. We simplify the model actually and assume that it primarily consisted of a manufacturer and a retailer. Moreover, it can describe the process of supplying an order directly from a manufacturer to a retailer. The model should meet the customers' demands primarily, and we need to reset the variable parameters of adjustment production time, demand production delay time and demand sale time to get a better retail inventory strategy ultimately. System dynamics (SD) was created during the mid-1950s by Professor Jay Forrester of the Massachusetts Institute of Technology. A system is integrated by multiple elements, such as constraint conditions, inputs, outputs and feedbacks. They are all included in the complex of systems and the environment. The theory foundation of system dynamics consists of classical fluid mechanics and feedback control theory. It is a discipline that focuses on cognizing and solving system problems, connecting with natural science and social science as well. It is widely used within the company, between businesses and businesses, among regions and even in cross border strategy decisions. System dynamics is usually called "strategic decision laboratory". Supply chain inventory management system is an integrated system, and the operation process of the supply chain is much more complex in reality than a simulation model. This paper focused on a two-stage supply chain inventory management system and it was simplified rationally. We used Vensim software to establish models and simulate the system and provided some better supply chain inventory operation projects by adjusting the value of Apt, Dpd, Dst and other parameters. And the retailer inventory storage strategy was optimized under an uncertain environment ultimately. We made a conclusion that the method was feasible through analyzing an example. And a better inventory storage strategy was given to the retailer. The simulation model which we researched was a simplified one, so it couldn't react to the whole storage operation process of the supply chain system roundly and objectively. Since the theory of system dynamics is integrated and complex.

### 2. EFFECTS OF YIELD AND LEAD-TIME UNCERTAINTY ON RETAILER MANAGED AND VENDOR MANAGED INVENTORY MANAGEMENT

**LINK :** <https://ieeexplore.ieee.org/document/8922591>

**AUTHOR :** SOONKYO LEE, YOUNG JOO KIM, TAESU CHEONG AND SEUNG HO YOO [2019]

Generally, there are various elements of uncertainty in a supply chain. In particular, uncertainties in lead time, demand, and yield are very important in the semiconductor industry. Higher uncertainty can lead to bullwhip effects that can undermine the performance of the entire supply chain. This study examines the relationship between uncertainty in the supply chain and the outcome of inventory replenishment policies. Specifically, we analyze the effects of well-known uncertainties on manufacturer production quantity and retailer order quantity decisions in a decentralized supply chain. In addition, we also analyze

and compare the effects of these uncertainties for the retailer-managed inventory and the vendor-managed inventory policies. Using numerical experiments, a comparative analysis of the two alternatives is conducted to determine suitable options for improving supply chain performance. In general, the performance of vendor-managed inventory is better than that of retailer-managed inventory, but we observe from the numerical experiments that there exist circumstances under which retailer-managed inventory shows better supply

chain performance. y, we examine models that analyze the impact of supply uncertainty in retailer-managed and vendor-managed decentralized supply chains on supply chain performance. We thus identify optimal production and order quantities for centralized and decentralized supply chains under lead-time, yield, and demand uncertainty. For the RMI model, when yield is low, the retailer always attempts to order more than the optimal quantity, which might lead to the bullwhip effect. Therefore, in order to minimize the impact of the bullwhip effect, the manufacturer wishes to obtain and utilize its yield information so that they can better gauge the exact level of demand. The centralized production quantity is always greater than the production quantity of the VMI, which is quite intuitive. Under the same conditions, it would be more advantageous for the manufacturer under the VMI model to set the wholesale price higher; however, because the retailer's profit decreases rapidly as the wholesale price increases, there needs to be an appropriate agreement to ensure a fair distribution. As we have confirmed in this study, under the decentralized supply chain model, the total profit of the VMI and RMI models increases as the unit cost decreases, the holding cost decreases, the salvage value increases, and as the lead-time and yield uncertainty decrease. Therefore, we confirm through the numerical studies that higher yield or lead-time uncertainty generally leads to lower expected profits for both the manufacturer and retailer no matter which inventory management policy is utilized. Overall, the profit for the RMI model is higher than that for the VMI model. In addition, for certain parameters (unit cost and wholesale price), we observe that, although total profit increases or remains the same, there is a conflict of interest between the retailer and the manufacturer. One of the limitations of this study is that we do not propose appropriate contracts that coordinate a decentralized supply chain under either the RMI or VMI model when both yield and lead-time uncertainty exists. Therefore, we believe that the result of our study can be used as the foundation for in-depth research into supply chain contracts. Another limitation is that we assume that the retailer knows the manufacturer's yield and lead-time information. Thus, our study can be extended to a decentralized supply chain where this information is not fully available to the retailer.

In addition, we consider a supply chain consisting of a single manufacturer and a single retailer. Thus, our study can be extended to more complex supply chains (e.g., multiple retailers or three-echelon supply chains including a distributor) and evaluate the impact of simultaneous yield and lead-time uncertainty.

### **3) A Study of Inventory Management**

#### **System Case Study**

#### **LINK:**

[https://www.researchgate.net/publication/327793184\\_A\\_Study\\_of\\_Inventory\\_Management\\_System\\_Case\\_Study](https://www.researchgate.net/publication/327793184_A_Study_of_Inventory_Management_System_Case_Study)

**AUTHOR:** Nazar Sohail, 2Tariq Hussain Sheikh, : Received: April 19, 2018, Accepted: May 22, 2018

Inventory management is a challenging problem area in supply chain management. Companies need to have inventories in warehouses in order to fulfil customer demand, meanwhile these inventories have holding costs and this is frozen fund that can be lost. Therefore, the task of inventory management is to find the quantity of inventories that will fulfil the demand, avoiding overstocks. This paper presents a case study for the steel manufacturing industry (Small Scale Industry) on inventory management. The relationship between the inventory management and company performance was determined based on inventory days and return on asset (ROA) analysis. The research found that company X had a few inventory problems such as unorganized inventory arrangement, large amount of inventory days / no cycle counting and no accurate records balance due to unskilled workers. The study also proved that there was a significant relationship between return on asset (ROA) and inventory days. This paper also provides recommendation to the company and for further research.

Inventory management has to do with keeping precise records of finished goods that are ready for shipment.

This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a subcategory contained in the finished goods inventory to account for any returned goods that are reclassified or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and ready for shipment at any given time. The ROI of Inventory management will be seen in the forms of increased revenue and profits, positive employee atmosphere, and on overall increase of customer satisfaction. The next step of the present research will be the application of achieved results of demand forecasts, safety stock and reorder points into simulation software in order to achieve more accurate results. Research paper on Inventory management system

**LINK :** <https://www.irjet.net/archives/V5/i4/IRJET-V5I448.pdf>

**AUTHOR :** Punam Khobragade\* , Roshni Selokar\* , Rina Maraskolhe\* Prof. Manjusha Talmale+ 2018

Inventory Management System is software which is helpful for the businesses operate hardware stores, where storeowner keeps the records of sales and purchase. Mismanaged inventory means disappointed customers, too much cash tied up in warehouses and slower sales. This project eliminates the paper work, human faults, manual delay and speed up process. Inventory Management System will have the ability to track sales and available inventory, tells a storeowner when it's time to reorder and how much to purchase. Inventory Management System is a windows application developed for Windows operating systems which focused in the area of Inventory control and generates the various required reports.

This paper presents an alarm about the information section in the bill which in view of desktop application. It's a straightforward desktop application in which the network to the immediate distribution center with the goal that information ought to be refreshed in store for the confirmation. It's a secure application in which there is no information spillage from the stockroom. And furthermore gives the one table organization look so that after the finish of month we know about what we sold.

#### 4) A Study of Inventory Management System of Linamar India Pvt. Ltd, Pune

**LINK :** <https://amity.edu/userfiles/admaa/da2a0paper%204.pdf>

**AUTHOR :** Anajali Mishra & Harshal Anil Salunkhe ,2018

The aim of the study is to examine the inventory management process. The significance of this research is based on the benefits that can be obtained by identifying the issues of inventory control. The methodology used are unstructured interviews, on-site study, and annual report analysis. Inventory management is an important area of manufacturing industry. If company fails to manage inventory, they will face failure. It is a challenge for the company to maintain fair inventory. There are various inventory management techniques available for maintaining fair inventory level in the company. The basic objective of this paper is to study about inventory management techniques used in Linamar India Pvt. Ltd. and find out some measures for improvement on inventory management process of the concerned company. The present system of inventory management of the company is good. For improvement of the present inventory management system, company should adopt other inventory management techniques.

The Inventory management is significant for any manufacturing organization. It helps the organization in smooth running of its activities and in reducing the cost of managing the inventory. From the above data study, it can be concluded that Linamar India Private Limited is managing its inventory very efficiently. The techniques undertaken by the organization are helping it in continuous flow of its production activities. EOQ, safety stock analysis, ABC analysis are being undertaken efficiently and effectively. Inventory turnover ratio is also showing an increasing trend which indicates that sales of the organization is increasing every year.

#### 5) Development of Inventory Management System

**LINK :** <https://ieeexplore.ieee.org/document/5478077>

**AUTHOR :** Yang Fan ,2010



This paper introduces Agent technology into domestic storage management and uses the autonomy, reactivity and sociality of Agent to realize the seamless connection among enterprises by defining interaction and cooperation mechanisms among different Agents, thereby achieving the aim of reducing and even eliminating inventory, so it is a feasible thought and method for enterprises to realize effective storage management. This paper mainly designs a storage management system model based on multi-Agent and describes main Agent cooperation processes of the system.

In the design of storage management system model based on multi-Agent in this paper, we use a hierarchical federation multi-Agent system organization structure and the cooperation among Agents is based on improved contract net protocol, which enhances system performance on the whole. Next, we will analyze from Agent performance and system processing efficiency. The autonomy of Agent in the model is mainly manifested as follows. It can carry out task allocation independently when accepting tasks. It can distinguish commodity kinds for the tasks submitted by users and look for suitable task undertakers according to the grades and names of these commodities, the process doesn't need user's intervention and it can be finished independently. When a task can not be finished in time, the system can reallocate the task independently.

After a task is allocated, the original task needs to be undertaken by another Agent due to some unexpected matters, the system will reallocate the task. After a task is finished, the system can report on its own initiative and doesn't need user's surveillance. Interaction is mainly manifested as follows: Agents can communicate with each other by sending message and Agents cooperate with their own behaviors and finish the execution of tasks through these interactions. It can be seen from the foregoing communication message among Agents that Agents in this model have interaction and strong interactive ability and there is a time constraint when they interact with each other. Reactivity is mainly manifested as follows: MatManagerAgent can place an order according to bidding information of various Agents and StoManagerAgent can also make different responses to the messages sent by MatManagerAgent according to its own conditions, it can accept the order or refuse the order. When production management Agent doesn't agree with this order, storage management Agent makes a response in time to cancel this order. Using hierarchical federation multi-Agent system organization structure in the model can solve system management well and realize centralized management in domain and it doesn't need that every Agent in domain has rich knowledge and ability, which is convenient for system implementation and the performance of the whole system will not decrease. Adopting distributed processing among federations also conforms to the practical environment of the system and convenient implementation technology, which makes interaction and cooperation among different organization Agents easy. Adopting the model system based on improved contract net protocol can reduce communication traffic and interaction among Agents effectively and make system processing efficiency and stability higher. Increasing constraint conditions of bidding activity will also reduce the bidding activities of some Agents who don't have bidding qualifications, thereby reducing communication and increasing processing efficiency. In the places where tasks need interaction frequently, if these information interactions are not improved, a bottleneck will form and users need to issue new tasks frequently, which may cause system crash. The improved contract net protocol considers many possible cases in bidding, introduces three evaluation indexes and combines the ability information of Agent with historical circumstances of finishing tasks before to provide a forceful foundation for manager Agent to select the optimal successful bidder. The improved contract net protocol is favorable for not only optimizing task allocation scheme but also increasing task allocation success rate and task completion quality.

## **6) INVENTORY MANAGEMENT INFORMATION SYSTEM DEVELOPMENT AT BPRTIK KEMKOMINFO JAKARTA**

**LINK :** <https://ieeexplore.ieee.org/document/8089303>

**AUTHOR :** Elvi Fetrina<sup>1</sup> , Eri Rustamaji<sup>2</sup> , Tatat Nuraeni<sup>3</sup> , Yusuf Durrachman<sup>4</sup> ,2022

The Institute of Training and Research for Information and Communication Technology (BPRTIK) is an institution under the Ministry of Communications and Information Technology (KEMKOMINFO). Since this Institution manages its inventories by using spreadsheet so that the data are not synchronized properly and prone duplication of data. The inventory reports such as maintenance process reports are also done manually and are recorded in papers that have not been organized into a single database, making those

reports are vulnerable to a loss or corruption of data. In addition, the process of task's assignment and monitoring are still done manually by using a memo or even verbally which then lead to the undocumented reports. In this study, the data were collected by interview, observation and literature study. Rapid Application Development(RAD) and Object-Oriented Approach using Unified Modeling Language (UML) were used as the system development and design methods respectively. The results of this study is inventory management information system, which can support and manage the inventory's processes such as the process of controlling and monitoring, maintenance, assignment and reporting.

Inventory Management Information System is able to facilitate the performance of the division of state property and asset inventory management process starts from the process control, maintenance, filing, purchasing, external service, reception, assignment to the reporting process. The system was built using Rapid Application Development (RAD) and Unified Modeling Language (UML) With this system, the data is stored directly into the database so it will minimize the possibility of loss or damage data .

## **7) An IoT Application for Inventory Management with a Self-Adaptive Decision Model**

**LINK :** <https://ieeexplore.ieee.org/document/7917105>

**AUTHOR :** Lizong Zhang, Nawaf Alharbe, Anthony S. Atkins ,2022

Safety storage in large warehouse is an urgent issue to be addressed by both the local authorities and businesses, especially after the Tianjin explosions. This paper proposes an inventory management system for a warehousing company. The system integrates RFID technology and a self-Adaptive distributed decision

support model for inbound and outbound actives, inventory location suggestions and incident handling. The model consists of three major components: environment recognition, knowledge merging and the decision making. In addition, a 'selfadaptive' feature is adopted for adjusting the knowledge used in decision making procedure. An experiment is also outlined to validate the utilisations of our model and the proposed system. In this paper, a novel inventory management system designed for storage company is described. It uses the RFID technology for tracking the movement of goods, and a proposed self-adaptive distributed decision support model is introduced to enable the system automatically 'fit' to its deployed environment by adjusting of the nodes' knowledge base. The proposed model provides a more generic approach for decision support in inventory management. It uses a distributed schema and all decision makings are carried out by the nodes individually to avoid any possible delay caused by network communications. The model uses the result of scenario recognition as a benchmark for knowledge selection to create a local knowledge base that used by node individually to carry out the decisions with its own rule-based system. In addition, a selfadaption step is introduced to further modify the local knowledge base for better adaption to the scenario where the node deployed. A simulation experiment is then carried out in this paper, in order to prove the utilization of the proposed inventory management system, as well as the self-adaptive model. This design is also confirmed by another chemical storage company, and they estimated the design could bring 10% work efficiency improvement to their current work procedures.

## **8) Study On A New System for Inventory Control**

**LINK :** <https://ieeexplore.ieee.org/document/4659581>

**AUTHOR :** ZHU Xiaoyu LI Xiaojiu , 2022

As we all know, inventory control is important in a clothing company and Agent Technology has become very popular in the last few years as a new approach to developing software systems. This paper study on a new system for inventory control using plannin and distributed agents in apparel indursty. Multi Agent Systems (MAS), a term used to describe the incorporation of multiple types of agents into various systems, is a way of designing and implementing a system with the advantages of agent entities. We chose to use agents as a decision support tool for use in a Retail Inventory Management System. Since the management of inventory is crucial to the success of most companies, and since we see a potential major role for agents in the business process management MAS seems a likely choice for a decision support platform. This work stems from our prior work in simulating a MAS inventory system, then implementing the system for production use.



Agents can help design an Inventory Management System that is reliable, more accurate, intelligent, distributed, scalable, faster, and simpler in design. Such a system is very much needed in this time and in the future especially with the growing economy and the growth of the Internet. The future of such systems lies in creating a component that can negotiate online orders for restocking inventory with online suppliers. Our current decision support system is limited to the inventory system (excluding supply chain activities) for a medium sized department store in China. We plan to add to this system a simulation of the store's supply chain (or at least some part of it) to test how the inventory system will behave in a more dynamic scenario (i.e. testing various supply chain situations ).

## **9) Study on Auto enterprise inventory management**

**LINK :** <https://ieeexplore.ieee.org/document/6114678>

**AUTHOR :** Zhang Guirong, Mu Yuxin ,2022

This paper aims at solving the following problems: our country autocar business inventory management, unreasonable supply chain inventory management mode of cooperation, unreasonable vibrator type rectifier the network, inappropriate new technique information technique and physical distribution, physical distribution system reaction capability scarcity and all the components purchased by the storekeeper according to his mastery of the stock. This paper puts forward a series of measures like a total inventory management, strengthening production management and lowering in products inventory, strengthening the marketing management to reduce inventory, strengthening the whole coordination of enterprise and countermeasures to improve the management inventory level.

To improve the present stock situation of the car enterprises, they should not only strengthen their internal supply chain management, but also strengthen the coordination and cooperation between supply chain enterprises and the whole coordination countermeasures so as to improve the management level of the inventory. A set of supply chain enterprise identity of credit evaluation system and effective performance evaluation system and incentive mechanism should be established as well as supply chain cooperation monitoring and control system in order to vitalize the whole supply chain.

### **2.1 PROBLEM STATEMENT:**

In inventory systems, demand is usually uncertain, and the lead-time can also vary. To avoid shortages, managers often maintain a safety stock. In such situations, it is not clear what order quantities and reorder points will minimize expected total inventory cost. Simulation models can address this question.

## **IDEATION & PROPOSED SOLUTION**

### **3.1 EMPATHY MAP CANVAS:**

Was expecting something different

What do you think?

Where should I start

What brand do you prefer?

Which size is the best?

Want something reliable

Why is this so hard?

Am I being cheated?

What is best for me?

What else am I missing?

Is it taking too much time

SAYS

THINKS

user

DOES

FEELS

Lists pros and cons

Checks website

Makes small decisions

More research

Compares products

Asks friends

Observes in store Postpones big decisions

Fear

Anxious

Overwhelmed

Trust issues

Excited

The image displays a collage of 12 student project posters, organized in a 3x4 grid. Each poster represents a different business plan project. The posters are titled and contain various content:

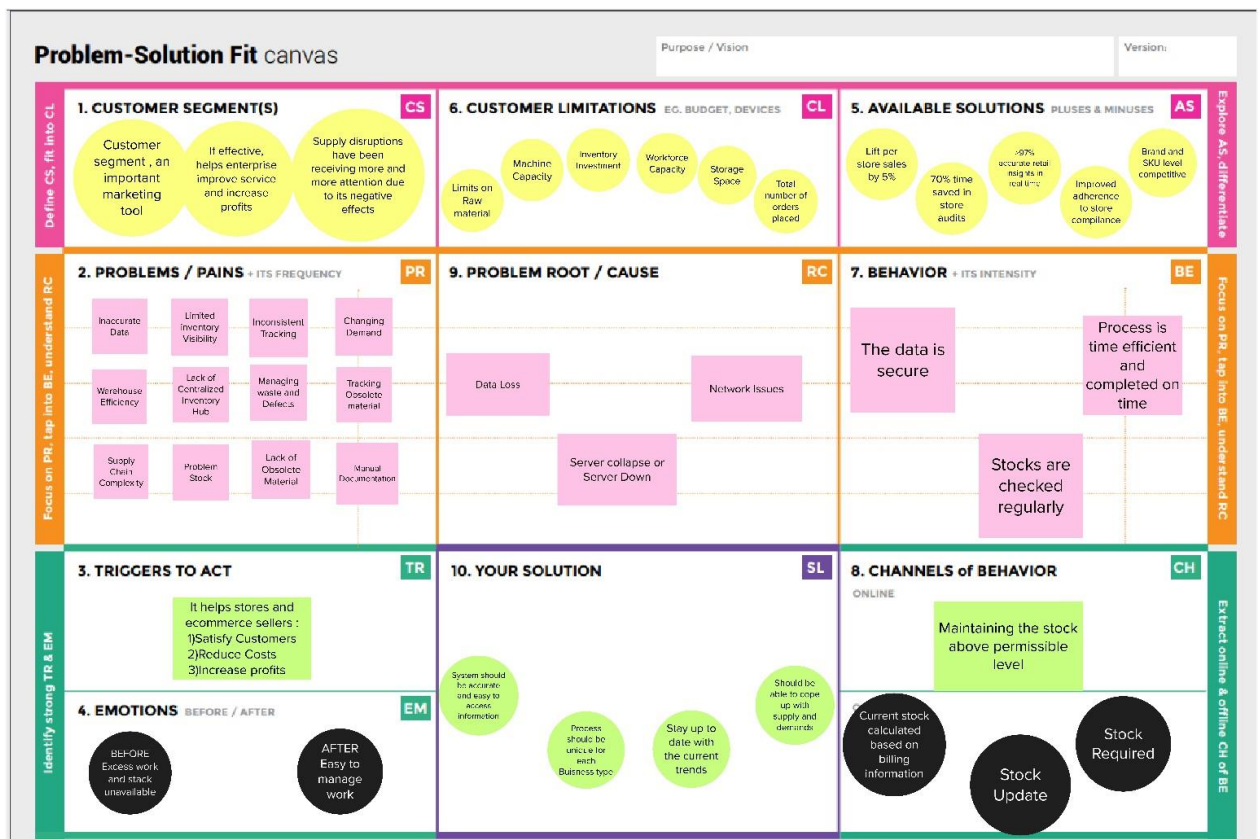
- Brainstorm & idea prioritization:** Focuses on identifying a problem, generating ideas, and prioritizing them based on feasibility and desirability.
- Prediction and analysis:** Includes a section on 'Free door deliveries' and 'Seasonal offers and discount'. It features a chart showing 'Free door deliveries' and 'Seasonal offers and discount'.
- Management:** Discusses 'Management' and 'Product delivery'. It includes a chart showing 'Management' and 'Product delivery'.
- After sales services:** Focuses on 'After sales services' and 'Customer satisfaction'. It includes a chart showing 'After sales services' and 'Customer satisfaction'.
- Free door deliveries:** A poster titled 'Free door deliveries' showing a chart of 'Free door deliveries'.
- Seasonal offers and discount:** A poster titled 'Seasonal offers and discount' showing a chart of 'Seasonal offers and discount'.
- Management:** A poster titled 'Management' showing a chart of 'Management'.
- Product delivery:** A poster titled 'Product delivery' showing a chart of 'Product delivery'.
- After sales services:** A poster titled 'After sales services' showing a chart of 'After sales services'.
- Customer satisfaction:** A poster titled 'Customer satisfaction' showing a chart of 'Customer satisfaction'.
- Free door deliveries:** A poster titled 'Free door deliveries' showing a chart of 'Free door deliveries'.
- Seasonal offers and discount:** A poster titled 'Seasonal offers and discount' showing a chart of 'Seasonal offers and discount'.
- Management:** A poster titled 'Management' showing a chart of 'Management'.
- Product delivery:** A poster titled 'Product delivery' showing a chart of 'Product delivery'.
- After sales services:** A poster titled 'After sales services' showing a chart of 'After sales services'.
- Customer satisfaction:** A poster titled 'Customer satisfaction' showing a chart of 'Customer satisfaction'.

### 3.3 PROPOSED SOLUTION:

S. No.	Parameter	Description
1	Problem Statement	To solve the need that the shopkeepers doesn't have the systematic way to keep their record of inventory data.
2	Idea / Proposed Solution	An application which retailers successfully sign in and log in to the application. They can update their inventory details, also users will be able to add new stock by submitting essential details related to the stock, remove or update existing stock details. They can view details of the current inventory. The System will automatically send an email alert to the retailers, if the stock reduced to the limited amount found in the inventory or if the demand is rapidly increasing. This will help the user to order new stock.
3	Novelty / Uniqueness	This inventory system helps the user efficiently add, update and control the inventory and it also helps the user reduce the wastage of goods by notifying them when it is in high demand and not in other cases. The users can register the stocks that they need by logging in from their account.
4	Social Impact / Customer Satisfaction	Customer Satisfaction is entirely dependent on the services which they expected. If the retailer's system exceeds with customer's expectation, the customers will be satisfied. Along with a user friendly GUI it also adds on waste management which is more than what the customer expectation which will satisfy the customer.

5	Business Model	With the better inventory management system, Update the inventory without any need of manpower. Retailer can live up with user's need and be on the flow with current sale products and they can update the inventory with that products.
6	Scalability of the Solution	<p>To create a scalable inventory management system, the retailer have to</p> <ol style="list-style-type: none"> <li>1. Keeping low inventory levels as much as possible</li> <li>2. Keep an eye on Sales Projections</li> <li>3. Use ODM (On-Demand Manufacturing). ODM refers to manufacture or in this case, update the products which are highly in demand.</li> </ol>

### 3.4 PROBLEM SOLUTION FIT:



## 4. REQUIREMENT ANALYSIS

### 4.1 FUNCTIONAL REQUIREMENTS:

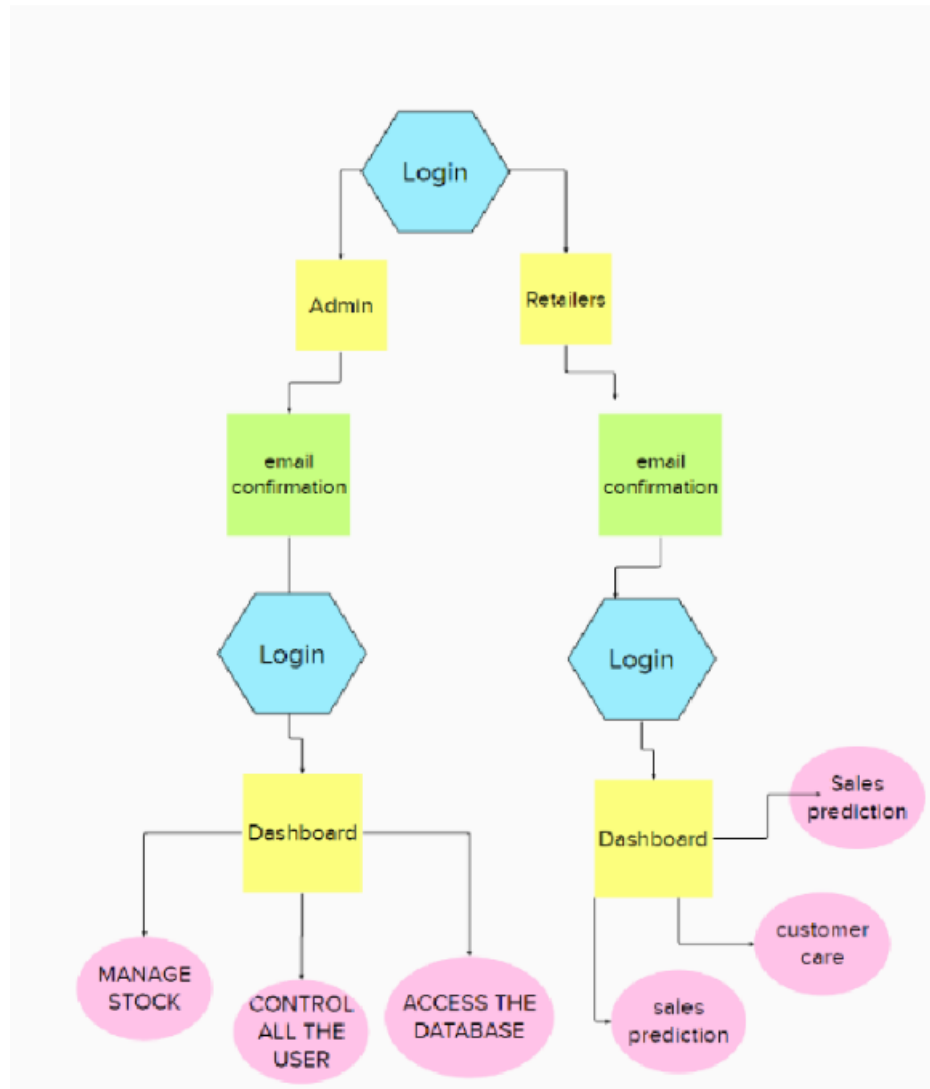
FR No.	Functional Requirement	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through Username and Password
FR-2	User Confirmation	Confirmation via Email
FR-3	Sign in	Sign in to the application by username and password
FR-4	Dashboard	Can view the product details
FR-5	Ordering	Order required products by putting them in a cart first
FR-6	Restocking	Ordering more product when the stock is low

### 4.2 NON - FUNCTIONAL RREQUIREMENTS:

NFR NO.	Non-Functional Requirement	Description
NFR-1	Usability	Designing/Developing the site to be having a learning curve. Having simple and easy to navigate website for users. Attractive looking web-page. Making the site to be responsive for desktops and mobile users.
NFR-2	Security	The security should be strong as to the attackers wont be penetrating to the authorized users account or data. Log in system is used to prove authentication and authorization. Security can be increased by using OTP. Cookies based security system for authentication and improved visiting experience on the site for clients.
NFR-3	Reliability	Should be having the capacity to handle sufficient numbers of users and not be lagging or experiencing any discomfort when browsing when the web-page is busy. Should have minimum errors when executing the programs. Should be available even at the times of calamity
NFR-4	Performance	The convenience of this is it reduces the time period of searching in aisle, searching for desired product, etc. It reduces costs, saves time, restocking period and predicts the bestselling products. This makes the business more productive and profitable by having an organized management system.
NFR-5	Availability	This uses IBM DB2 to ensure high availability of database servers and performances
NFR-6	Scalability	As DB2 is highly scalable, the coding can be produced and developed efficiently and new features can be introduced easily. Reusing the code can be done to add any new features. IBM Container in Docker registry is used which is highly scalable.

## 5. PROJECT DESIGN

### 5.1 DATA FLOW DIAGRAM AND USER STORIES:





# USER STORIES

USER TYPE	FUNCTIONAL REQUIREMENT (EPIC)	USER STORY NUMBER	USER STORY / TASK	ACCEPTANCE CRITERIA	PRIORITY	RELEASE
CUSTOMER (WEB USER)	REGISTRATION	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Gmail	I can register for the application through Gmail	Medium	Sprint-1
	LOGIN	USN-4	As a user, I can log into the application by entering email & password	I can log in by entering Gmail & password	High	Sprint-1
	DASHIBOARD	USN-5	As a user, I can track data of sales of products and inventory levels	I can track data of sales of products and inventory levels	High	Sprint-1
CUSTOMER (MOBILE USER)	REGISTRATION	USN-6	As a user, I can register for the application by entering my email, password, and confirming my password	I can access my account / dashboard	High	Sprint-1
		USN-7	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-8	As a user, I can register for the application through Gmail	I can register for the application through Gmail	Medium	Sprint-1
	LOGIN	USN-9	As a user, I can log into the application by entering email & password	I can log in by entering Gmail & password	High	Sprint-1
	DASHIBOARD	USN-10	As a user, I can track data of sales of products and inventory levels	I can track data of sales of products and inventory levels	High	Sprint-1
CUSTOMER CARE EXECUTIVE	SUPPORT	USN-11	As a Executive, I Provide answers for the queries asked by users	I provide the answers for the queries asked by the users	High	Sprint-3
ADMIN	MANAGE STOCK	USN-12	As a administrator, I manage the stocks by adding, shipping and storing the stocks in the storage unit	I manage the stocks by adding, shipping and storing the stocks in the storage units	High	Sprint-2
	CONTROL ALL THE USER	USN-13	As a administrator, I can control all the users by performing basic CRUD operations.	I can control all the users by performing basic CRUD operations	High	Sprint-2
	ACCESS THE DATABASE	USN-14	As a administrator, I can control and access the database	I can control and access the database.	High	Sprint-2

## 5.2 SOLUTION & TECHNICAL ARCHITECTURE:

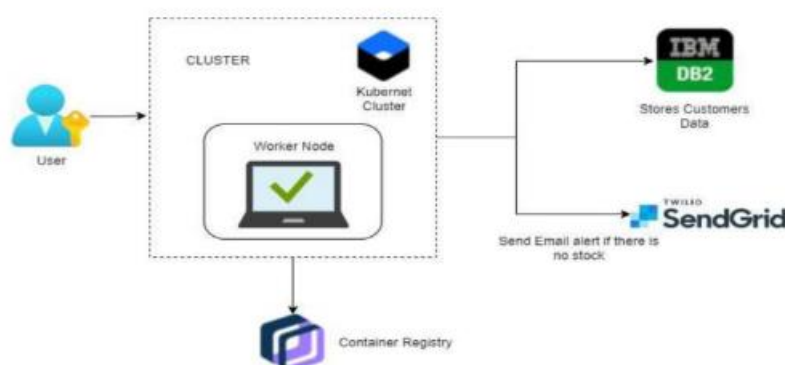


TABLE-1 : COMPONENTS AND TECHNOLOGIES

SNO	COMPONENT	DESCRIPTION	TECHNOLOGY
1	USER INTERFACE	Through web application, the information processed will be sent to the user via mail.	HTML, CSS, jQuery, JavaScript, python, etc.
2	APPLICATION LOGIC-1	User registration through form and confirmation will be sent to the user via email.	Flask, SendGrid
3	APPLICATION LOGIC-2	Dashboard is used by which the system will Maintain tracking of sales of product and inventory levels	Flask
4	APPLICATION LOGIC-3	User will get notified about the stock status.	Flask
5	DATABASE	The data can be stored in database and user can retrieve or manipulate the data whenever required	IBM DB2
6	CLOUD DATABASE	Information of the stocks will be stored and hosted on the cloud	IBM DB2
7	FILE STORAGE	Requirements to store files	IBM Block Storage or Other Storage Service or Local File system
8	EXTERNAL API-1	SendGrid used in application will send the email alert if there is less number or no stock to the user	SendGrid
9	EXTERNAL API-2	IBM container Registry enables you to store and distribute Docker images in a managed private registry	IBM container registry
10	MACHINE LEARNING MODEL	Purpose of Machine Learning Model	Object Recognition Model, etc
11	INFRASTRUCTURE (SERVER/CLOUD)	Application Deployment on Local System / Cloud Local Server Configuration:localhost:5001(Flask) Cloud Server Configuration : Kubernetes	Local, Cloud Foundry, Kubernetes, etc

TABLE-2: APPLICATION CHARACTERISTICS:

S.NO	CHARACTERISTICS	DESCRIPTION	TECHNOLOGY
1	Open-Source Frameworks	SendGrid will send email alert, if there is less number of stock to user, Kubernetes for manipulating Kubernetes API objects, IBM DB2 is used for storing and retrieving the data efficiently	Flask, SendGrid, IBMDB2, Kubernetes
2	Security Implementations	We use login for the user and the information will be hashed so that it will be very secure to use	IBM container registry.
3	Scalable Architecture	It is scalable that we are going to use data in kb so that the quite amount of storage is satisfied.	Flask
4	Availability	Prediction will be available for every user but only for premium user news, database and price alert will be alert	Flask
5	Performance	It will perform fast and secure even at the lower bandwidth	Flask, IBM container registry, IBM DB2.

## 6. PROJECT PLANNING & SCHEDULING

### SPRINT PLANNING & ESTIMATION

#### Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	11	6 Days	24 Oct 2022	29 Oct 2022	11	29 Oct 2022
Sprint-2	7	6 Days	31 Oct 2022	05 Nov 2022	7	05 Nov 2022
Sprint-3	6	6 Days	07 Nov 2022	12 Nov 2022	6	12 Nov 2022
Sprint-4	7	6 Days	14 Nov 2022	19 Nov 2022	7	19 Nov 2022

#### Velocity:

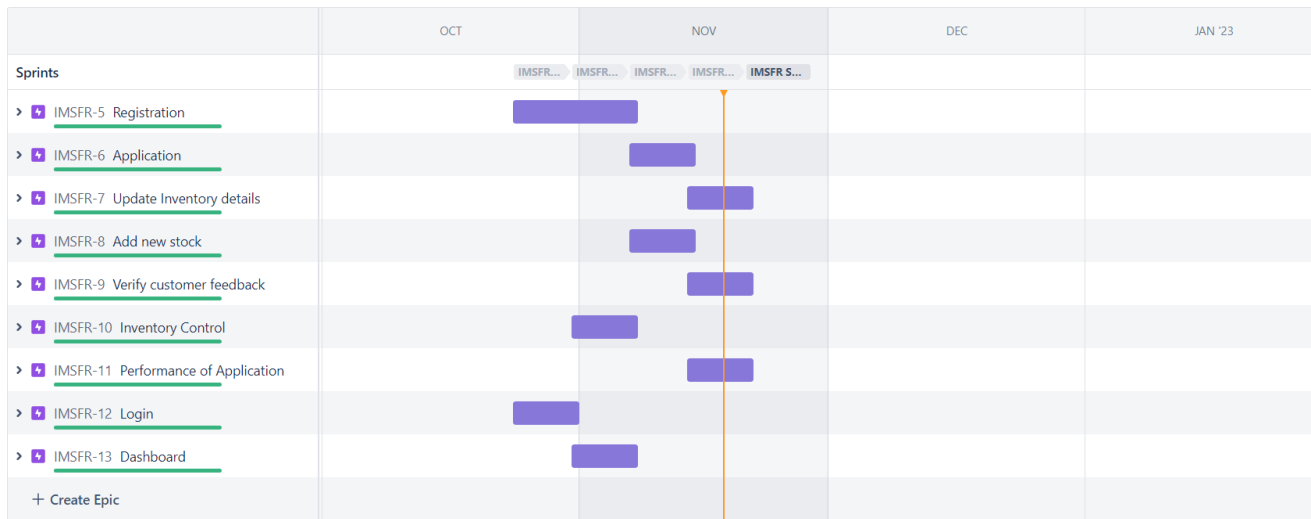
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{\text{sprint duration}}{\text{velocity}} = \frac{20}{10} = 2$$

Our velocity should be:

$$AV = \frac{(11+7+6+7)}{24} = \frac{31}{24} = 1.29$$

## REPORTS FROM JIRA:



## SPRINT DELIVERY SCHEDULE:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by using my email & password and confirming my login credentials.	3	High	Aadharsh R
Sprint-1		USN-2	As a user, I can login through my E-mail.	3	Medium	Bhuvaneshwar S
Sprint-1	Confirmation	USN-3	As a user, I can receive my confirmation email once I have registered for the application.	2	High	Dheepakraaj
Sprint-1	Login	USN-4	As a user, I can log in to the authorized account by entering the registered email and password.	3	Medium	Jyotir Adithya Giri
Sprint-2	Dashboard	USN-5	As a user, I can view the products that are available currently.	4	High	Aadharsh R
Sprint-2	Stocks update	USN-6	As a user, I can add products which are not available in the inventory and restock the products.	3	Medium	Bhuvaneshwar S
Sprint-3	Sales prediction	USN-7	As a user, I can get access to sales prediction tool which can help me to predict better restock management of product.	6	Medium	Dheepakraaj
Sprint-4	Request for customer care	USN-8	As a user, I am able to request customer care to get in touch with the administrators and enquire the doubts and problems.	4	Medium	Jyotir Adithya Giri
Sprint-4	Giving feedback	USN-9	As a user, I am able to send feedback forms reporting any ideas for improving or resolving any issues I am facing to get it resolved.	3	Medium	Aadharsh R

## **7. CODING & SOLUTIONING:**

### **7.1 FEATURE 1:**

#### **OPTIMIZING YOUR INVENTORY**

You want to maintain the right amount of inventory required to meet demand, keep logistics costs low, and avoid common inventory issues such as stock outs, overstocking, and backorders.

- **Inventory Forecasting**

A company has a 30-day forecast for cookies. If they sold 43 units over the previous 30 days, the base demand would be 43.

It gives a starting point to show you how you can increase accuracy. You can gather trends like these from your data that may influence demand.

- **Demand Planning**

A grocery store wants to prepare its inventory levels for next year at the end of Thanksgiving. They look at sales, competition, and growth. They can now plan and launch new deals to position themselves as the go-to Thanksgiving destination.

Your inventory may need different optimization and planning. For example, you ordered the exact amount of raw materials. Later on, with variation in supply, you wish you had extra safety stock.

### **7.2 FEATURE 2:**

#### **SECURITY AND BACKUP**

You have to make sure that your inventory is safe to be in control of stored goods. You need security for warehouse management as safety and efficiency lead to good performance. To help keep operations running smoothly, ensure you address supply chain and inventory control strategies and have backup plans in place before there is an issue.

## 8.

## TESTING

## 8.1 Test Cases:

Date	16-Nov-22
Team ID	PNT2022TMD26435
Project Name	Inventory Management System for Retailers
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
LoginPage_TC_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup displayed or not	<a href="#">127.0.0.1:5000</a>	Login/Signup popup should display	Working as expected	Pass
LoginPage_TC_002	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	<a href="#">127.0.0.1:5000</a>	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour	Working as expected	Pass
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter URL( <a href="https://shopenzer.com/">https://shopenzer.com/</a> ) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: admin@mail.com password: admin123	User should navigate to user account homepage	Working as expected	Pass
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter URL( <a href="https://shopenzer.com/">https://shopenzer.com/</a> ) and click go 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: admin@im.com password: admin123	Application should show 'Incorrect email or password' validation message.	Working as expected	Pass
LoginPage_TC_005	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter URL( <a href="https://shopenzer.com/">https://shopenzer.com/</a> ) and click go 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: shrrree password: Testing123678686786876876	Application should show 'Incorrect email or password' validation message.	Working as expected	Pass
Dashboard	Functional	Dashboard	Check wheather the user can access dashboard		1.Enter the URL and click go 2.Click on DashBoard 3.Access Dashboard		Application should show all the data entered and can able to search the data	Working as expected	Pass
LogoutPage	Functional	Logout Page	Check wheather the user can access the Logout Button		Click on Logout out Button at top right corner and click signout		Application should signout the user and redirect to login page	Working as expected	Pass

## 8.2 USER ACCEPTANCE TESTING

## 1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Inventory Management System for Retailers project at the time of the release to User Acceptance Testing (UAT).

## 2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved


Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	7	4	5	2	18
Duplicate	1	0	6	0	7
External	2	4	0	1	7
Fixed	12	2	5	20	39
Not Reproduced	0	0	2	0	2
Skipped	0	0	2	1	3
Won't Fix	0	5	2	1	8
Totals	22	15	22	25	84



## 9. RESULTS:

```
E:\ibm_website\venv\Scripts\python.exe E:/ibm_website/main.py
[+] Connecting to DB2 [SUCCESS]
* Serving Flask app 'components'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
```

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### INVENTORY MANAGEMENT SYSTEM FOR RETAILERS

Retail inventory management is the process of ensuring you carry merchandise 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. In practice, effective retail inventory management results in lower costs and a better understanding of sales patterns. Retail inventory management and methods give retailers more information or to run their businesses. Applications have been developed to help retailers track and manage stocks

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### Developed by



**Aadharsh Ram**  
2019103604

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Create a new account!

First name

Last name

Email

Username

Password

Confirm Password

Door no.,Apt name,Street name

×

Log into the account successfully!!

RETAILERS MARKETS

Dashboard

Banana

Description : kerala banana

Total Stock : 30

Cost per item : 15

Dealer's name: bhuvan

Quantity

Request

Iphone 14

Description : Longest battery life ever

Total Stock : 20

RETAILERS MARKETS

Inventory

+ Add Item

Iphone 14 Pro Max

Available : 10

Description : The iPhone 14 Pro and iPhone 14 Pro Max are smartphones designed and marketed by Apple Inc They are the sixteenth generation flagship iPhones succeeding the iPhone 13 Pro and iPhone 13 Pro Max

Total Stock : 10

COST PER ITEM : 175000

Edit Total Stock

Delete

HP LaserJet

Available : 15

Add Items

×

Item name

Item name

Description

Description

Available (Current stock)

Available

Total stock

Total Stock

Cost per Item

Cost per Item

Close

Submit

HP LaserJet

Available : 15

RETAILERS MARKETS

Home

Inventory

Logs

Track

Logout

Cost per item : 15

Dealer's name: bhuvan

Quantity

Request

Iphone 14

Description : Longest battery life ever

Total Stock : 20

Cost per item : 150000

Dealer's name: test123

## RETAILERS MARKETS

## Track

#	TimeStamp	Item Name	Dealer Name	Quantity	Delivery Address	Status
1	2022-11-20 11:34:06.229792+05:30	Amazon waterbottle	ibmcustomer	30	65-k, boney street,besant nagar , Chennai , Tamil Nadu , 600058	Request
2	2022-11-20 11:45:28.235183+05:30	baba waterbottle	taylor	10	65-k, boney street,besant nagar , Chennai , Tamil Nadu , 600058	Approved
3	2022-11-20 11:54:27.373768+05:30	harris bottle	harris	30	65-k, boney street,besant nagar , Chennai , Tamil Nadu , 600058	Approved

Thus ,the project is successfully executed and implemented using python ,flask ,HTML ,CSS ,Java Script and with IBM cloud.

## 10. ADVANTAGES & DISADVANTAGES:

### ADVANTAGES:

**Saves Time** - Paper-based retail inventory management can take a lot of time and effort.

**Eliminates Errors** - Traditional retail inventory processes can be vulnerable to errors.

**Improves Transparency** - In the retail industry, the visibility of the real-time status of the various items in the inventory is very critical.

**Cost-Effective** - Manual inventory control would increase your labor and process costs.

**Efficient Stock Counting** - If done manually, stock counting is a tedious and error-prone process.

### DISADVANTAGES:

**Production problem:** even though inventory management can reveal to you the amount of stock you have at hand and the amount that you have sold off, it can also hide production problems that could lead to customer service disasters.

**Complexity:** some methods and strategies of inventory management can be relatively complex and difficult to understand on the part of the staff.

**High implementation costs:** some inventory management systems can come at a high price because the business needs to install specialized systems and software in order to use them.

**Bureaucracy:** even though inventory management allows employees at every level of the company to read and manipulate company stock and product inventory, the infrastructure required to build such a system adds a layer of bureaucracy to the whole process and the business in general.

The control of inventory is complex because of the many functions it performs. It should thus be viewed as a shared responsibility.

## 11. CONCLUSION

The project inventory management for retailers has been successfully implemented by using python, flask, html, css, Java script and the database created by using IBM db2 and also successfully executed and implemented.

## 11. FUTURE SCOPE

The scope of an inventory system can cover many needs, including valuing the inventory,

measuring the change in inventory and planning for future inventory levels. The value of the inventory at the end of each period provides a basis for financial reporting on the balance sheet. Measuring the change in inventory allows the company to determine the cost of inventory sold during the period. This allows the company to plan for future inventory needs.

## 12.

## APPENDIX

### SOURCE CODE:

#### Connecting DB2 and Flask

```
from flask import Flask, render_template
import ibm_db
from flask_bcrypt import Bcrypt
from sqlalchemy import *
from flask_sqlalchemy import SQLAlchemy
import ibm_db_sa
from flask_login import LoginManager

app = Flask(__name__)
app.config['SECRET_KEY'] = '01845a0438c36160cbe978ea'
app.config['SQLALCHEMY_DATABASE_URI'] =
'db2+ibm_db://jbg49873:CWnz9f65Zdaixqgw@b0aebb68-94fa-46ec-a1fc-
1c999edb6187.c3n41cmd0nqnrk39u98g.databases.appdomain.cloud:31249/bludb'

try:
    db2 = SQLAlchemy(app)
    conn = ibm_db.connect(
        'DATABASE=bludb;HOSTNAME=b0aebb68-94fa-46ec-a1fc-
1c999edb6187.c3n41cmd0nqnrk39u98g.databases.appdomain.cloud;PORT=31249;PROTOCOL=TCPIP;U
ID=jbg49873;PWD=CWnz9f65Zdaixqgw;Security=SSL;SSLSecurityCertificate=DigiCertGlobalRoot
CA.crt',
        '', '')
except:
    print("[+]\tConnecting to DB2 [FAIL] : ", ibm_db.conn_errormsg())
else:
    print("[+]\tConnecting to DB2 [SUCCESS]")
```

#### SendGrid

```
import smtplib
from email.mime.multipart import MIMEMultipart
from email.mime.text import MIMEText
from email.mime.base import MIMEBase

def alert(main_msg):
    msg = MIMEMultipart()
    msg['From'] = mail_from
    msg['To'] = mail_to
    msg['Subject'] = '!Alert Mail On Product Shortage! - Regards'
    mail_body = main_msg
    msg.attach(MIMEText(mail_body))

    try:
        server = smtplib.SMTP_SSL('smtp.sendgrid.net', 465)
        server.ehlo()
        server.login('apikey', 'SG.ngeJheYFYQlKU0ufo8x5d1A.TwL2iGABfnBvoTf-
09kqeF8tAmbihYzrnopKc-1s5cr')
        server.sendmail('ucs19430@rmd.ac.in', 'siva@gmail.com')
        server.close()
        print("mail sent")
    except:
        print("issue")
```

## Watson Assistant

```
<script>
  window.watsonAssistantChatOptions = {
    integrationID: "6dlce590-fde3-40b1-9f53-9934ea9dfa0a", // The ID of this
integration.
    region: "us-south", // The region your integration is hosted in.
    serviceInstanceID: "87dfd7aa-1d37-4078-9fe7-a053a541dafa", // The ID of your
service instance.
    onLoad: function(instance) { instance.render(); }
  };
  setTimeout(function() {
    const t=document.createElement('script');
    t.src="https://web-chat.global.assistant.watson.appdomain.cloud/versions/" +
(window.watsonAssistantChatOptions.clientVersion || 'latest') +
"/WatsonAssistantChatEntry.js";
    document.head.appendChild(t);
  });
</script>
```

## GITHUB & PROJECT DEMO LINK:

**GITHUB:** <https://github.com/IBM-EPBL/IBM-Project-50291-1660902116>

**PROJECT DEMO LINK :** [https://annauniv0-my.sharepoint.com/:v:/g/personal/2019103513\\_student\\_annauniv\\_edu/EXt46pYh2vIPq2pdqi5fdbobDOBW2T7d\\_XOxJKhS4khIng?e=0EW2eN](https://annauniv0-my.sharepoint.com/:v:/g/personal/2019103513_student_annauniv_edu/EXt46pYh2vIPq2pdqi5fdbobDOBW2T7d_XOxJKhS4khIng?e=0EW2eN)