INVENTORY MANAGEMENT SYSTEM FOR RETAILERS

A PROJECT REPORT

Team ID PNT2022TMID12995

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ABSTRACT:

This Project is aimed at developing a desktop based application named Inventory Management System for managing the inventory system of any organization. Inventory Management System(IMS) refers to the system and processes to manage the stock of organization with the involvement of Technology system.This system can be used to store the details of the inventory,stock maintanance,update the inventory based on the sales details,generate sales and inventory report daily or weekly based.

This project is categorize individual aspects for the sales and inventory management system.In this system we are solving different problem affecting to direct sales management and purchase management.Inventory Management System is important to ensure quality control in businesses that handle transactions resolving around consumer goods.Without proper inventory control,a large retail store may run out of stock on important item.

A good inventory management system will alert the retailer if the User cannot have stock on their account.An automated Inventory Management System helps to minimize the errors while recording the stock.After User logged in their account and User can get the retail store in nearby location in location filter using Global Positioning System(GPS) Tracker. Also User can scan the particular product using Zia Barcode Scanner. Finally the User can Understand the sales growth percentage by Visualization tool like Tableau that can be viewed in the dashboard

INTRODUCTION

The project Inventory Management System is complete web based application designed on Bootstrap using Visual Studio Software.The main aim of the project is to develop Inventory Management System Model Software in which all the information regarding the stock of the organization will be presented. It is an intranet based desktop application which ahs admin component to manage the inventory and maintenance of the inventory system.

This application is based on the management of stock of an organization. The application contains general organization profile, sales details, Purchase details and the remaining stok that are presented in the organization. There is a provision of updating the inventory also. This application also provides the remaining balance of the stock as well as the details of the balance of transaction.

Each new stock is created and entitled with the named and the entry date of that stock and it can also be update any time when required as per the transaction or the sales is returned in case .Here the login page is created in order to protect the management of the stock of organization in order to prevent it from the threads and misuse of the inventory.

PROJECT OVERVIEW:

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 tools and methods give retailers more information on which to run their businesses. Applications have been developed to help retailers track and manage stocks related to their ow products. The System will ask retailers to create their accounts by providing essential details. 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. They can view details of the current inventory. The System will automatically send an email alert to the retailers if there is no stock found in their accounts. So that they can order new stock.

PURPOSE:

Inventory management is key to maintaining a profitable, organized, and productive business. For some companies, practicing inventory management is simple: they take inventory every week or so by walking through a storage closet and checking to see if they're low on anything. But other companies must take inventory management quite seriously, tracking every item the minute it arrives, moves, or is used up.The primary purpose of inventory management is to ensure there is enough goods or materials to meet demand without creating overstock, or excess inventory.Inventory can be a company's most important asset. Inventory management is where all the elements of the supply chain converge. Too little inventory when and where it's needed can create unhappy customers. But a large inventory has its own liabilities — the cost to store and insure it, and the risk of spoilage, theft and damage. Companies with complex supply chains and manufacturing processes must find the right balance between having too much inventory on hand or not enough.

LITERATURE SURVEY:

EXISTING PROBLEM

Edwin Sitienei and Florence Memba(2015)

Conducted a study on Effect of Inventory Management on profitability of Cement Manufacturing Companies in Kenya. The study concluded that Gross profit margin is negatively correlated with the inventory conversion period, Increase in sales, which denotes the firm size enriches the firm's inventory levels, which pushes profits upwards due to optimal inventory levels. It is also noted that firms inventory systems must maintain an appropriate inventory levels to enhance profitability and reduce the inventory costs associated with holding excessive stock in warehouses.

Srinivas Rao Kasisomayajula(2014)

An analytical study was conducted on" Inventory Management in Commercial Vehicle Industry In India". A sample of five companies' was selected for study. The study concluded that all the units in the commercial vehicle industry have significant relationship between Inventory and Sales. Proper management of inventory is important to maintain and improve the health of an organization. Efficient management of inventories will improve the profitability of the organization.

Isabel Fernandez

This paper presents experimental results from the application of a data-based model predictive decision support system to drug inventory management in the pharmacy of a mid-size hospital in Spain. The underlying objective is to improve the efficiency of their inventory policy by exploiting pharmacy historical data. To this end, the pharmacy staff was aided by a decision support system that provided them with quantities needed for the satisfaction of clinical needs and the risk of stockout in case no order is placed for different time horizons. With this information in mind, the pharmacy service takes the final order decisions. The results obtained during a test period of four months are provided and compared with those of a previous model predictive control approach, which was implemented in the same hospital in the past, and with the usual policy of the pharmacy department.

REFERENCES:

T. A. Zwaida, Y. Beauregard, and K. Elarroudi, “Comprehensive literature review about drug shortages in the canadian hospital’s pharmacy supply chain,” in 2019 International Conference on Engineering, Science, and Industrial Applications (ICESI), 2019, pp. 1–5.

Edwin Sitienei, Florence Memba(2015-16) “ The Effect of Inventory Management on Profitability of Cement Manufacturing Companies in Kenya: A Case Study of Listed Cement Manufacturing Companies in Kenya” International Journal of Management and Commerce Innovations Vol. 3, Iss. 2, pp. 111- 119

Srinivasa Rao Kasisomayajula(2014) “An Analytical Study on Inventory Management in Commercial Vehicle Industry in India”, International Journal of Engineering Research, Vol.3, Iss.6, pp.378-383.

PROBLEM STATEMENT DEFINITION:

The Problem faced by the company is they do not have any systematic system to record and keep their inventory data. It is difficult for the admin to record the inventory data quickly and safely because they only keep it to be the Logbook and not properly organized**.**Also to keep all the stock inventory data because we do not any system to maintain the data. So the retailers faces issues to keep the inventory data. In this Inventory System we are contacting to get the product from suppliers

IDEATION & PROPOSED SOLUTION

EMPATHY MAP CANVAS:

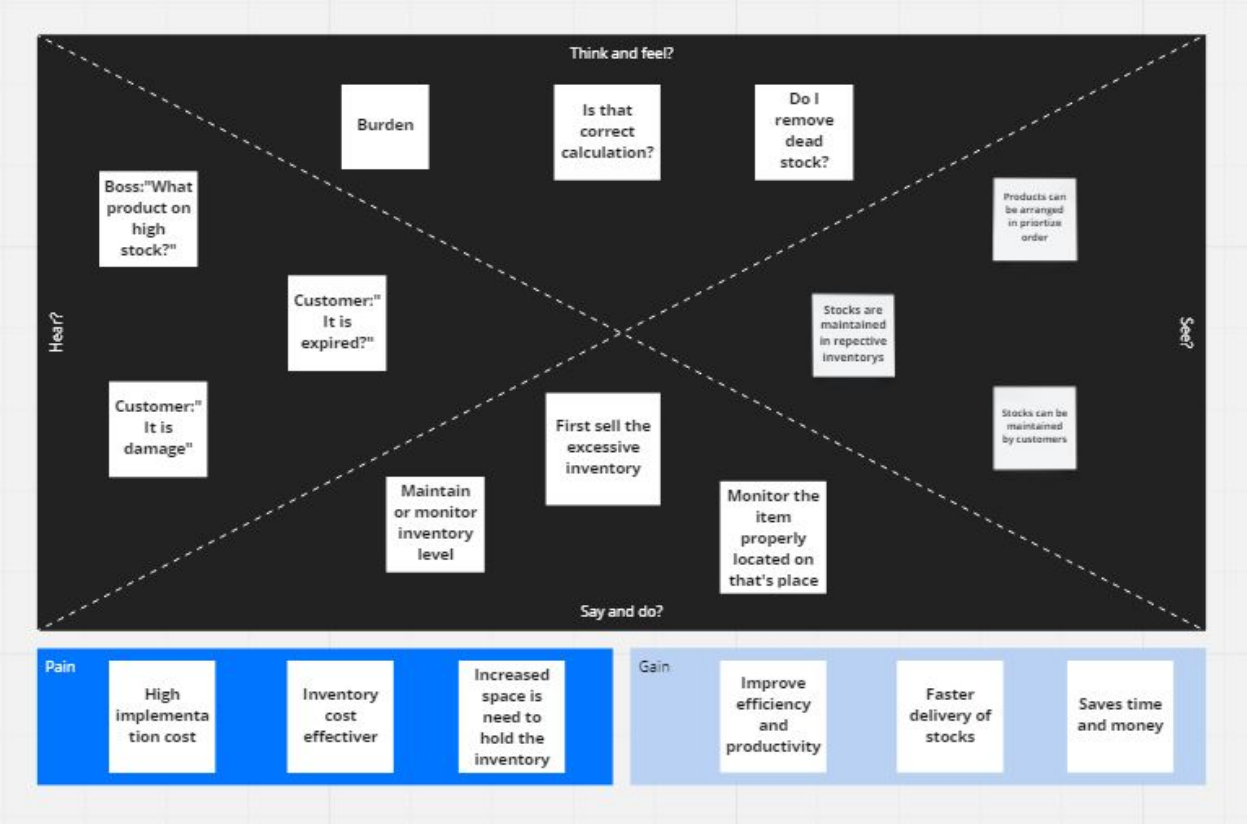
Ideation Phase
Empathy Map Canvas

Date	19 September 2022
Team ID	PNT2022TMID12995
Project Name	Inventory Management System for Retailers
Maximum Marks	4 Marks

Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to helps teams better understand their users.
Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.


Think and feel?
Burden
Is that correct calculation?
Do I remove dead stock?
Boss:"What product on high stock?"
Products can be arranged in priortize order
Customer:" It is expired?"
Hear?
Stocks are maintained in repective inventorys
See?
Customer:" It is damage"
First sell the excessive inventory
Stocks can be maintained by customers
Maintain or monitor inventory level
Monitor the item properly located on that's place
Say and do?
Pain
High implementation cost
Inventory cost effectiver
Increased space is need to hold the inventory
Gain
Improve efficiency and productivity
Faster delivery of stocks
Saves time and money

Ideation & Brainstorming

Ideation Phase
Brainstorm & Idea Prioritization Template

Date	19 September 2022
Team ID	PNT2022TMID12995
Project Name	Inventory Management System for Retailers
Maximum Marks	4 Marks

Brainstorm & Idea Prioritization Template:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Define your problem statement

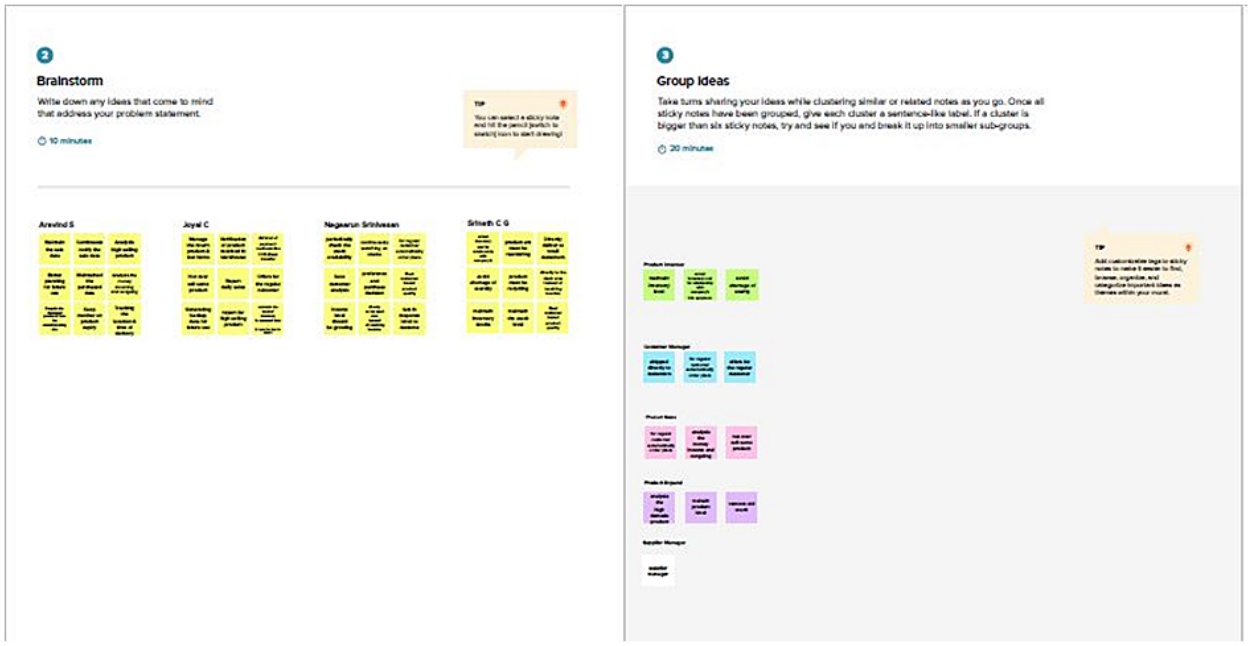
The retailer wants to monitor and maintain stock levels,analyze stocks effectively, avoid selling of excessive stocks in the store, retain customers so that he/she can maintain the inventory system effectively and successfully in their retail store.

How might we [your problem statement]?

Key rules of brainstorming

To run an smooth and productive session

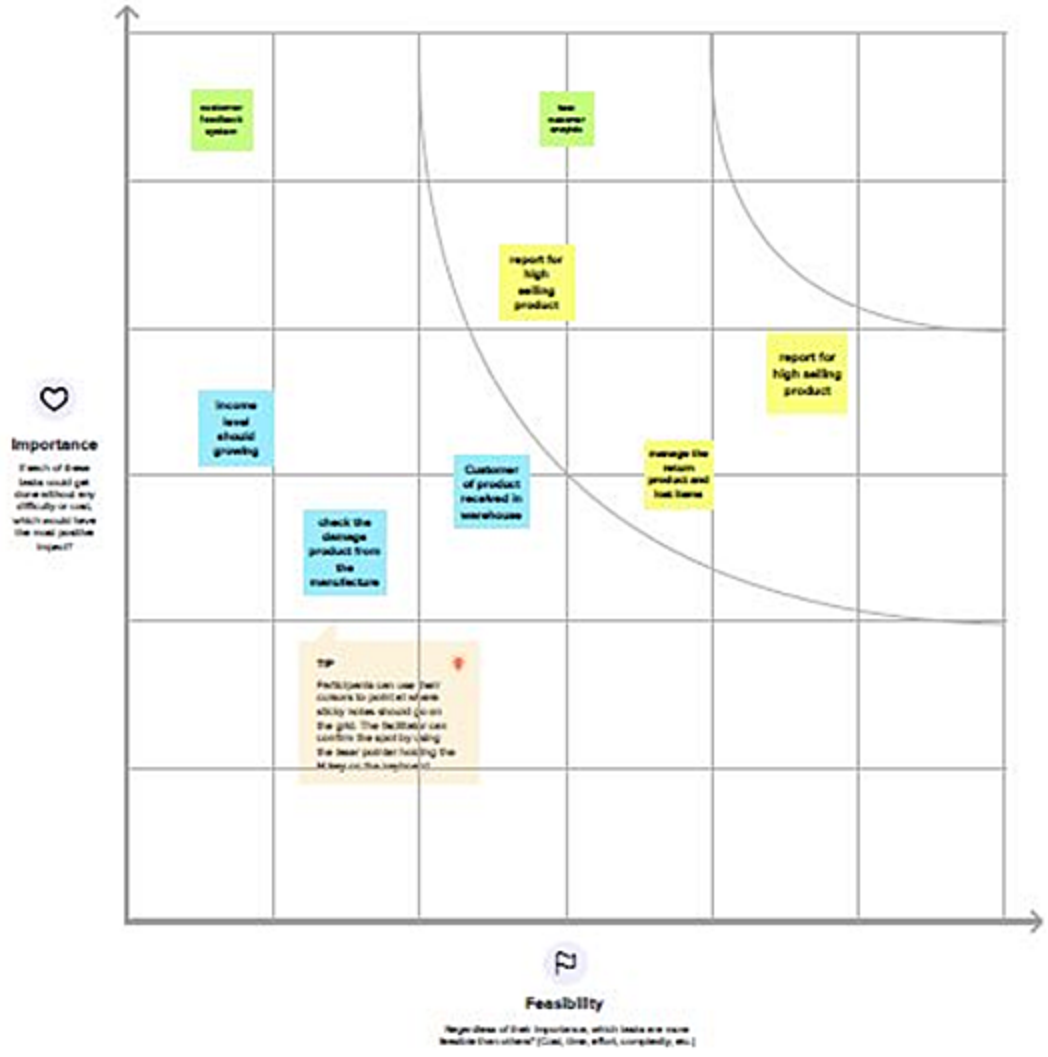
- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.


2
Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
TIP
Arevind S
Joyal C
Nagaarun Srinivasan
Srinath C G
3
Group Ideas
Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.
20 minutes
TIP

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



Project Design Phase-I
Proposed SolutionTemplate

Date	19 September 2022
Team ID	PNT2022TMID12995
Project Name	Inventory Management System for Retailers
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the followinginformation in proposedsolution template.

S.No.	Parameter	Description
1.	Problem Statement	This system can be used to store the details of the inventory, stock maintenance, update the inventory based on the sales details,generate salesand inventory report daily or weekly based.

2.	Idea / Solution description	• Measure and reportwarehouse performance metrics like inventory turnover, customer satisfaction and order processing speed to overcome warehouse inefficiencies. Share this data with employees and suppliers. • Centralize your tracking datawith a cloud-based inventory management solution with real-time data backup andautomated inventory updates. • Schedule frequent stock auditing like daily cycle counting of different stock categories in small, manageable batches. • Reduce Human Error: Use inventory control processes like blind receiving with barcodes and mobile scanners toprevent human error, inventory manipulation and shrinkage due to theft or negligence. • Stock Review : audit your stock • Use LIFO approach(Last in,first out) • Identify low-turn stock. • Inventory Tracking System can beInvoked in that application .

3.	Novelty / Uniqueness	● Better Terms With Vendors andSuppliers. ● Cost Savings ● Sales Effectiveness. ● Physical and Remotecentered ordering ● Reduce manual errorsand flexibility. ● Better Customer Experience ● Understand Inventory Levels Across theBusiness
4.	Social Impact/ Customer Satisfaction	● We provides enlargement Service for small and large scale retailers stores inaffordable pricing.
5.	Business Model(Revenue Model)	Retail Inventory management system helps to tracks from purchase to sale of goods. It ensurethat always enough stock to fulfil the customerdemands & orders and proper warning on scarcity on stocks. In that case we use Transaction free Revenue Model the buyer andseller bothof them can get the stocks easily through them. IT is an application which ishelpful for business operate
6.	Scalability of the Solution	Increase Business Scalability you can buildconsistent growth of Increased Sales.

PROBLEM SOLUTION FIT:

Project Title: Inventory Management System for Retailers **Project Design Phase-I – ProblemSolution Fit**

Team ID:PNT2022TMID12995

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

- Our customer is who need a product from Retailers.
- Customers can be all aged peoples.

6. CUSTOMER CONSTRAINTS CC

- To prevent the customers from product cost, Quality Cost and high demand on traffic to delivery the product on time.
- Mainly we have certain device to access this system to order a products.

5. AVAILABLE SOLUTIONS AS

- Customers can return the product if product quality does not satisfy in product.
- Customers can buy the products in our application and customer can get the tracking System.

Explore AS, differentia

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

- The problem is to keep all the stock inventory data because we do not any system to maintain the data. So the retailers faces issues to keep the inventory data.

9. PROBLEM ROOT CAUSE RC

- In this inventory system we are contacting to get the product from the Suppliers.
- At the same time we are have low storage or bandwidth to hold the inventory data.
- Retailers can buy stocks but already we have more stocks in accounts.

7. BEHAVIOUR BE

- To finding good suppliers at low cost of stock product.
- The sales growth percentage will be visualized in this application.
- Customer feedback about our product improved in this application

Focus on J&P, tap into BE, understand RC

3. TRIGGERS TR

- Friends and Family who run whole sale shops or markets will motivated by this inventory management system and stock price will be high.
- There is lack of application service.

4. EMOTIONS: BEFORE / AFTER EM

Before : Fearness , forgotful

After : Confident, Stressfree

10. YOUR SOLUTION SL

- Firstly we should create UI to display the stock details,and data can be stored in database .
- Afterwards ,Deploy the application in a cloud server such as purchase details, sales prediction etc…

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE

Customers can check the websites to understand how the inventory system works .

8.2 OFFLINE

Customers can check the stocks in inventory system regularly later intimate to the retailers.

REQUIREMENT ANALYSIS

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Functional Requirement

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	03October 2022
Team ID	PNT2022TMID12995
Project Name	Inventory Management System for Retailers
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Login	User can enter to the Application via Email and Password to access the Inventory System
FR-4	DashBoard Page	Customers can see all the available Products in this phase.
FR-5	Add to Cart	Customers can view the products and send to add to cart option afterwards User can buy later if it is not sold.
FR-6	Billing and Payment	Customers should buy a product it will redirect to payment page automatically generate a bill for the respective Products.
FR-7	Stock Updation	The Particular Stock can be over sold and the stock can be update by the admin quickly and Stock Statistics can be Displayed in the DashBoard page.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	This application can be use any diversity of languages. The UI should be very clear, it can be used by everyone in the world. We can use any Assistant like google assistant so that blind people can access this application.
NFR-2	**Security**	This application should be very securely Created. Incase the customers can buy any products in the inventory store the payment phase can be very securely and finally get a receipt of the buyed products.
NFR-3	**Reliability**	The application can be TrustWorthy UI and the Stock Statistics can be properly displayed on the dashboard page and all the modules can be Properly working on that application.
NFR-4	**Performance**	The User and stock Data can be Stored in IBM DataBase(DB) and that Stock Data can be displayed in main page ,Incase stock can be update simultaneously updated in main page.
NFR-5	**Availability**	The application contains user data and stock data and that particular data can be available to display it in main page.
NFR-6	**Scalability**	The application can be modified according to our User Request and accessing speed of that changes can be very fast based on our Internet Speed.

PROJECT DESIGN

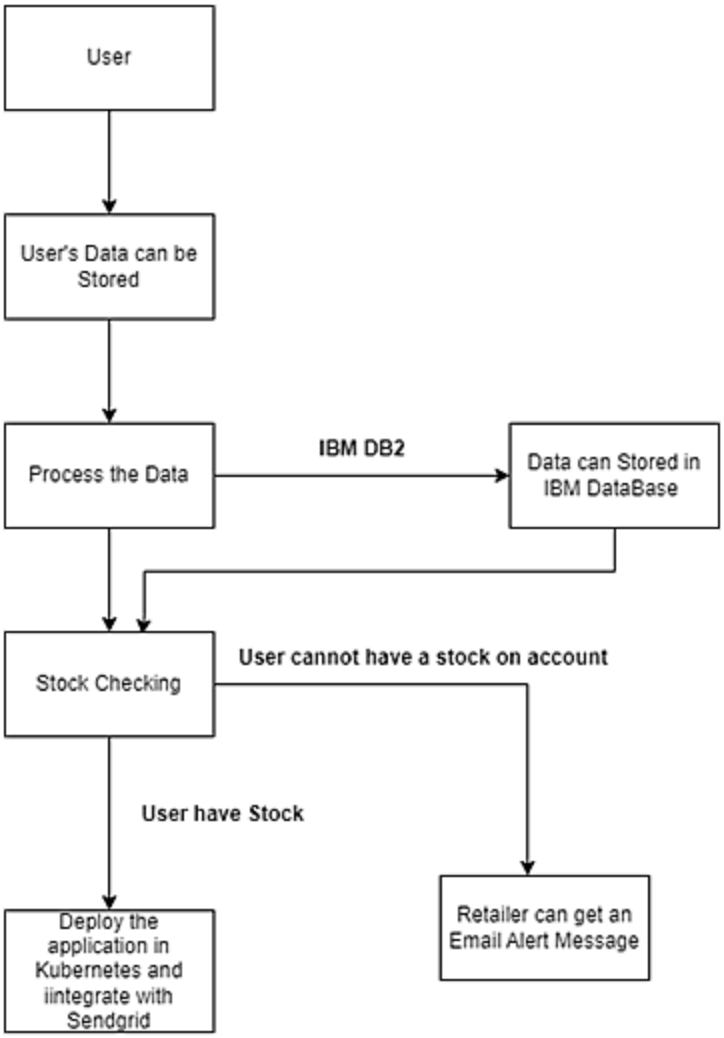
Data Flow Diagrams

Project Design Phase-II
Data Flow Diagram & User Stories

Date	03 October 2022
Team ID	PNT2022TMID12995
Project Name	Inventory Management System for Retailers
Maximum Marks	4 Marks

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where datstored.


User
User's Data can be Stored
Process the Data
IBM DB2
Data can Stored in IBM DataBase
Stock Checking
User cannot have a stock on account
User have Stock
Deploy the application in Kubernetes and iintegrate with Sendgrid
Retailer can get an Email Alert Message

User Stories

Use the below template to list all the user stories for the product.

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 Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-1
		USN-4	As a user, I can register for the application through Gmail	I can register & receive confirmation Gmail.	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can view the application by entering email & password	High	Sprint-1

	Dashboard	USN-6	As a user,once logged in I can view the Stock Statistics in the Dashboard page.	View Stock details and daily expenses	Medium	Sprint 1
	Alert Message	USN-7	As a user, I cannot have any stock on my account can get the alert email message	I can get the Alert mail Message	High	Sprint 2
Customer Care Executive	Help/Support	USN-8	As a customer care executive,I can fix any issues in my application.	I can give 24x7 support service	Medium	Sprint 2
Administrator	Administrative	USN-9	As a admin,I can Update my application.	I can update any stock details in my application.	High	Sprint 1

1. **PROJECT PLANNING & SCHEDULING**

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Storypoints)

Date	18 October 2022
Team ID	PNT2022TMID12995
Project Name	Inventory Management System for Retailers
Maximum Marks	8 Marks

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint 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 entering my email, password, and confirming my password.	5	High	4
Sprint-1	Login	USN-2	As a user, I can log into the application by entering email & password	5	Medium	4
Sprint-1	Dashboard	USN-3	As a user,once logged in I can view the Stock Statistics in the Dashboard page.	10	High	4
Sprint-2	Add items to Stock	USN-4	As aUsercanabletoadd the item tostock	5	Medium	4
Sprint-2	Stock Updation	USN-5	As a user, To update thestockforcheckavailability	5	High	4
Sprint -3	Customer Care Executive	USN-6	As a customer care executive,I can fix any issues in my application.	10	Medium	4
Sprint-4	Alert Message	USN-7	As a user, I cannot have any stock on my account can get the alert email message	10	Medium	4

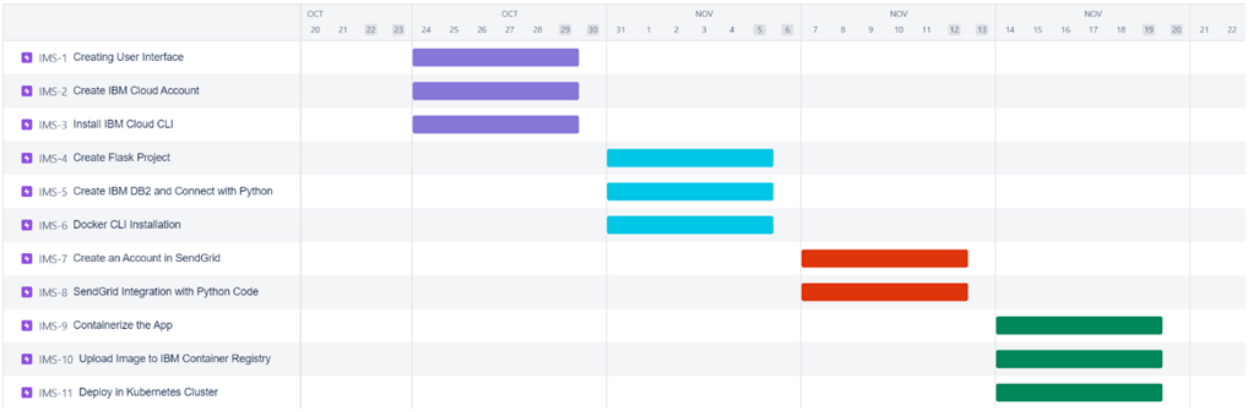
Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	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)

Burndown Chart:



PROJECTPLANNINGPHASE

MilestoneandActivityList

TEAM ID	PNT2022TMID12995
PROJECT NAME	Inventory Management System for Retailers

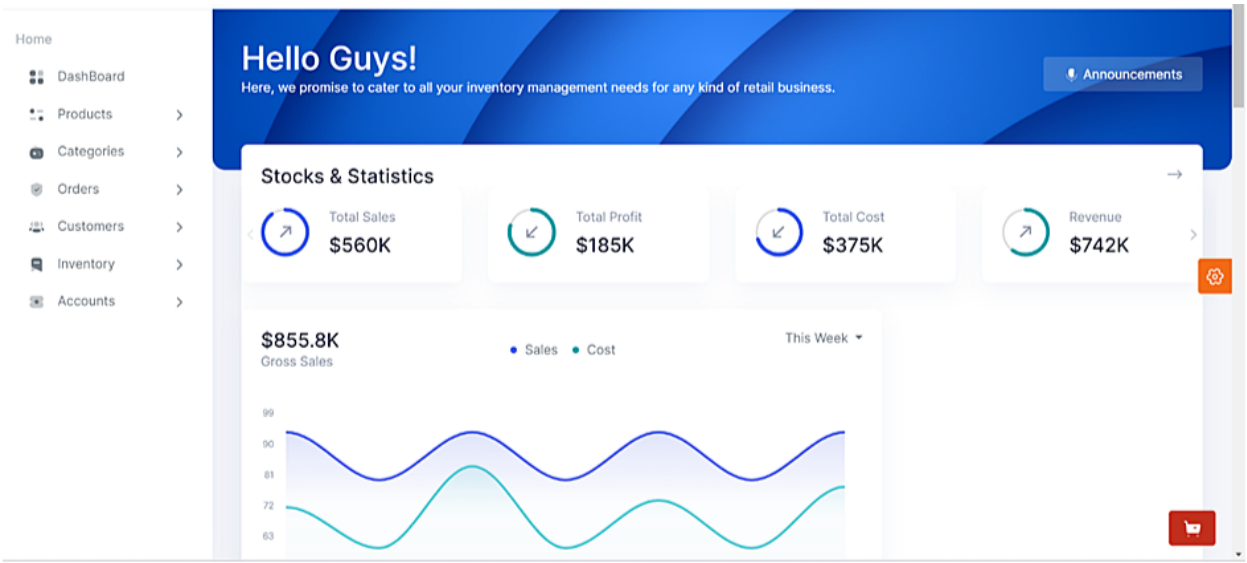
ACTIVITY TITLE	ACTIVITY DESCRIPTION	SUBMISSION DATE	STATUS
Create Flask Project	An application Framework written in Python	17 Sep 2022	Completed
Create IBM Cloud	Create and log into IBM Cloud	17 Sep 2022	Completed
Install IBM Cloud CLI	General-Purpose developer tool that provides access to your IBM Cloud Account	21 Sep 2022	Completed
Docker CLI	Use Docker CLI configuration to customize settings	27 Oct 2022	Completed
Create Account in Send grid	Create account in SendGrid to send mails	27 Oct 2022	Completed
Create UI to Interact with Application	Pages such as Registration, Login page, Displaying items etc.	27 Oct 2022	Completed
Create IBM Db2 and connect with Python	Create IBM Db2 service in IBM Cloud and connect with python code using DB.	28 Oct 2022	Completed
Send Grid Integration with Python Code	To send emails from the applications we need to integrate the SendGrid Service.	28 Oct 2022	Completed
Containerize the App	Need to create Docker Image of the application and push into the IBM Container Registry	28 Oct 2022	In Progress

Upload Image to IBM Container Registry	Upload the Image to IBM Container Registry	31 Oct 2022	In Progress

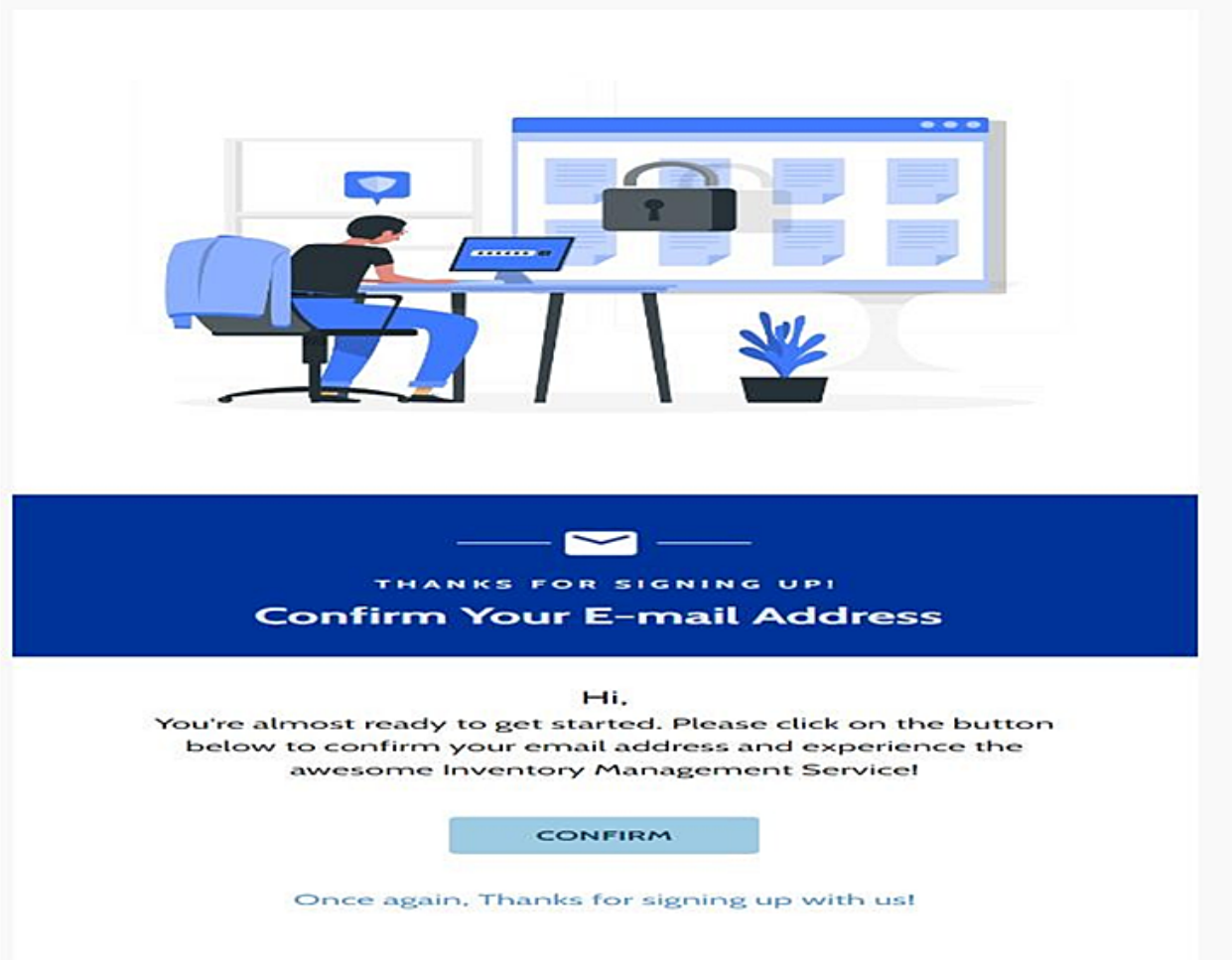
Deploy in Kubernetes Cluster	Once the image is uploaded the IBM Container registry deploy the image to IBM Kubernetes Cluster.	01 Nov 2022	In Progress
Prepare Milestone & Activity List	Prepare the milestone & activity list of the project.	03 Nov 2022	Completed
Project Development - Delivery of Sprints	Develop & submit the developed code by testing it.	In Progress	In Progress

CODING & SOLUTIONING

DASHBOARD:



FEATURE:



RESULT

Inventory Management techniques double-check inventory counts, helping retailers avoid stock outages and dead stock. Inventory errors, mistakes and miscounts are prevalent even when using RFID and barcode tagging. Inaccuracies cause inefficiencies, lost sales and budgeting and forecasting difficulties. Also we can use FIFO(First In First Out) or LIFO(Last In First Out), Open to Buy (OTB)and Just in Time (JIT) etc…

AdvantagesandDisadvantages:

ADVANTAGES:

- Better Inventory Accuracy with solid inventory management, you know what's in stock and order only the amount of inventory you need to meet demand.

- Reduced Risk of Overselling in Inventory management helps track what's in stock and what's on backorder, so you don't oversell products.
- Cost Savingsof Stock costs money until it sells. Carrying costs include storage handling and transportation fees, insurance and employee salaries. Inventory is also at risk of theft, loss from natural disasters or obsolescence.
- Paper-based retail inventory management can take a lot of time and effort. The retail inventory management software can cut short your in-store inventory process cycles through automation. Automation would give you time to focus on other productive business tasks.

DISADVANTAGES:

- **System Crash** -One of the biggest problems with any computerized system is the potential for a system crash**.** A corrupt hard drive, power outages and other technical issues can result in the loss of needed data. At the least, businesses are interrupted when they are unable to access data they need. Business owners should back up data regularly to protect against data loss.

- **Malicious Hacks** - Hackers look for any way to get company or consumer information. An inventory system connected to point-of-sale devices and accounting is a valuable resource to hack into in search of potential financial information or personal details of owners, vendors or clients. Updating firewalls and anti-virus software can mitigate this potential issue.

- **Reduced Physical Audits** - When everything is automated, it is easy to

forego time-consuming physical inventory audits. They may no longer seem necessary when the computers are doing their work. However, it is important to continue to do regular audits to identify loss such as spoilage or breakage. Audits also help business owners identify potential internal theft and manipulation of the computerized inventory system.

CONCLUSION:

- Inventory management is a very complex but essential part of the supply chain. An effective inventory management system helps to reduce stock-related costs such as warehousing, carrying, and ordering costs..

- Effective inventory management requires a strategic approach to operate optimally. Inventory management systems are not only used by large companies but also by small and medium sized businesses

FUTURE SCOPE:

The future of inventory is going to be flooded with updates in technology. From virtual reality, to artificial intelligence, to digital signage, and even inventory-less stores, there are constant iterations made in this industry to accelerate business and attract customers. And it's only growing from here

"Future Vision" is another important aspect of long term vendor reliability- the ability to anticipate development needs in advance of their becoming critical.

A good Retail management software vendor should demonstrate enough "future vision" to have already committed substantial resources to support new forms of technology such as data synchronization.

APPENDIX:

https://github.com/IBM-EPBL/IBM-Project-14752-1659589643