

IBM-Project-30572-1660149468

INVENTORY MANAGEMENT SYSTEM FOR RETAILERS

**NALAIYA THIRAN PROJECT BASED LEARNING ON
PROFESSIONAL READLINESS FOR INNOVATION, EMPLOYMENT
AND ENTREPRENEURSHIP**

A PROJECT REPORT

S.MELKI SETHAK PHILIP	950819106040
K.MOHAMED MUZZAMMIL	950819106042
K.KAVIN	950819106028
S.MUTHURAJA	950819106045

**BACHELOR OF ENGINEERING IN ELECTRONICS AND
COMMUNICATION ENGINEERING**

Government College of Engineering, Tirunelveli– 627007

1.INTRODUCTION

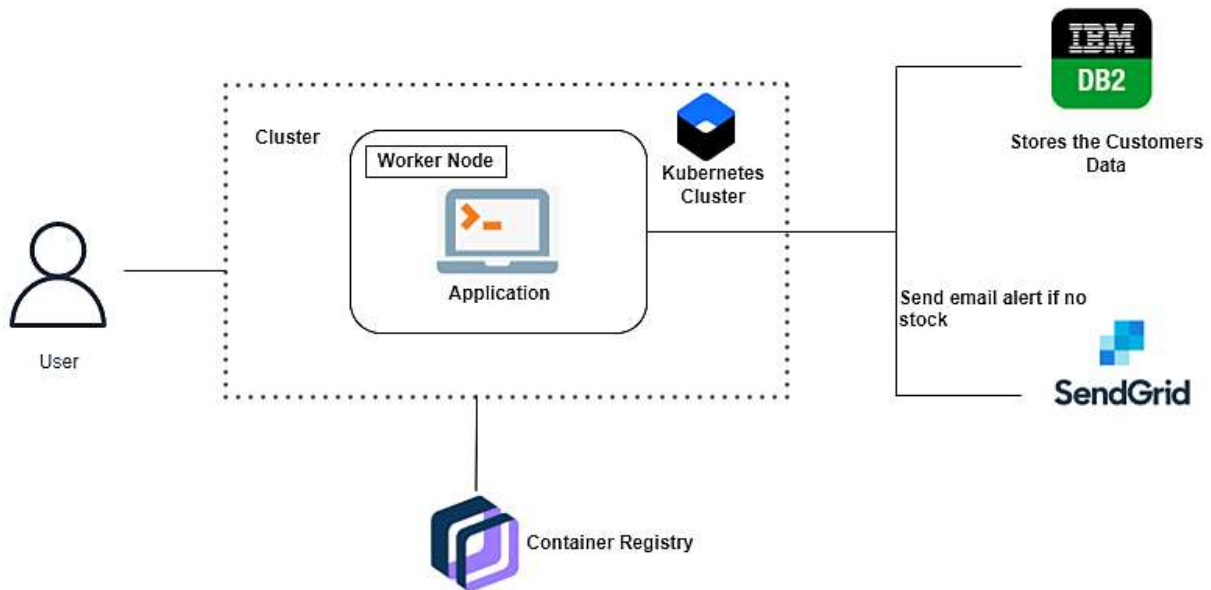
1.1.Project overview:

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 own 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.

Technical Architecture:



1.2.purpose:

To help retailers for perfect stock maintenance.

2.LITERATURE SURVEY

2.1.Existing Problem:

Inventory Management Challenges for B2C E-commerce Retailers Authors:
Harish Patil , Brig. RajivDivekar
This research was conducted on B2C e-commerce companies or online retailers to study the challenges involved such as demand variations, reverse logistics, seasonal fluctuations, and stockless policy in inventory management and the risks such as lost sales, lost customers, low customer satisfaction associated with the same. This study also includes various strategies to mitigate the risk associated with inventory management of online retailers.

Inventory management represents a key success factor that shows how efficient a company is controlling its inventories. However, there is little information on inventory management practice in a small business setting. Therefore, this study examines the current state of inventory management practices and factors that influence their use in micro retailing enterprises. A questionnaire survey was employed to gather data from the targeted respondents. Using 100 completed replies, the results demonstrate that most responding enterprises have adopted both unsystematic and systematic inventory management approaches in their business. In terms of inventory management techniques used, 'the rule of thumb' is the most popular among respondents. Meanwhile, EOQ, Bar Code Tagging and VMI are only applied by a small number of respondents. The results also indicate that Purchasing and Controlling are the most

frequent inventory management activities applied by micro enterprises as opposed to Storage and Tracing. Finally, the results suggest that owner/managers' attitude and knowledge in inventory management have significant and positive influences on inventory management practices.

Inventory management is one of the success stories of recent years and it is changing rapidly in response to international competition and new technology. This paper examines some of these developments. Inventory is a major investment in most companies. It strongly influences the internal flexibility of a company, e.g. by allowing production levels to change easily and by providing good delivery performance to customers. Yet inventory ties up working capital and space and it can suffer from obsolescence, deterioration and shrinkage. It can also add to administrative complexity. In recent years attention in manufacturing industry has concentrated on an 'inventory is waste' philosophy using JIT production, usually accompanied by visible 'pull' or consumer demand driven systems

Small-medium Enterprises (SMEs) play a vital role in the Malaysian economy. One of the rapidly growing SMEs in Malaysia is the retail industry. One important element in improving the growth of SME retailers is inventory management, as it assists the SME retailers in managing their inventories. SMEs face difficulties in securing financial resources, which inhibits the adoption of computerized inventory systems, as well as limited skill and knowledge in managing their inventory, are among the major problems that causes a less effective inventory management in retail SMEs. Skills and knowledge, and information technology influence inventory management practices of retail SMEs. However financial resources do not influence inventory management practices of retail SMEs in Malaysia suggesting that they do not have problems in getting financial resources as majority of them have received funds from the government.

This study examines inventory management and the role it plays in improving customer satisfaction. It looks at how food companies have been under pressure to streamline their inventory systems, and the consequences of such actions. It also examines how many retailers are trying to implement a "perfect order" system and how suppliers are constantly under pressure to meet the demands of these retailers. Many food companies are, therefore, looking at various inventory management systems as they believe this will have a positive effect on the satisfaction of their customers. The paper also outlines the methodology used in the research and concludes by pointing out the limitations of the research as well as suggestions for further research.

We consider a multi-retailer system operated on an infinite horizon, in which each retailer faces stochastic demand following a Poisson process and adopts a continuous-

review (r, Q) policy for replenishing inventory to satisfy customer demand. The system involves decisions of pricing and inventory management with the goal of maximizing profit, which equals the sales revenue minus the purchase and inventory costs. Taking Cournot competition into account, models are formulated to optimize simultaneously the expected sales volumes and (r, Q) policies of all retailers. An efficient approach is proposed to calculate the approximate inventory cost. Based on this approach, solution methods for centralized and decentralized scenarios are developed.

The importance of effective inventory management has greatly increased for many major retailers because of more intense competition. Retail inventory management methods often use assumptions and demand distributions that were developed for application areas other than retailing. For example, it is often assumed that unmet demand is backordered and that demand is Poisson or normally distributed. In retailing, unmet demand is often lost and unobserved. Using sales data from a major retailing chain, our analysis found that the negative binomial fit significantly better than the Poisson or the normal distribution. A parameter estimation methodology that compensates for unobserved lost sales is developed for the negative binomial distribution. The method's effectiveness is demonstrated by comparing parameter estimates from the complete data set to estimates obtained by artificially truncating the data to simulate lost sales. © 1996 John Wiley & Sons, Inc.

We investigate the value of accounting for demand seasonality in inventory control. Our problem is motivated by discussions with retailers who admitted to not taking perceived seasonality patterns into account in their replenishment systems. We consider a singlelocation, single-item periodic review lost sales inventory problem with seasonal demand in a retail environment. Customer demand has seasonality with a known season length, the lead time is shorter than the review period and orders are placed as multiples of a fixed batch size. The cost structure comprises of a fixed cost per order, a cost per batch, and a unit variable cost to model retail handling costs. Our analysis provides valuable insights on the tradeoff between the complexity of the automatic store ordering system and the benefits of incorporating demand seasonality

2.2. References:

1. Inventory Management Challenges for B2C E-commerce Retailers
Authors: Harish Patil , Brig. Rajiv Divekar
2. Inventory management practices among Malaysian micro retailing enterprises
Authors: Kamilah Ahmad Shafie, Mohamed Zabri

3. Trends in inventory management

Author: M.C. Bonney

4. Inventory Management and Its Effects on Customer Satisfaction

Authors: Scott Grant Eckert1

5. Retail Inventory Management When Records Are Inaccurate

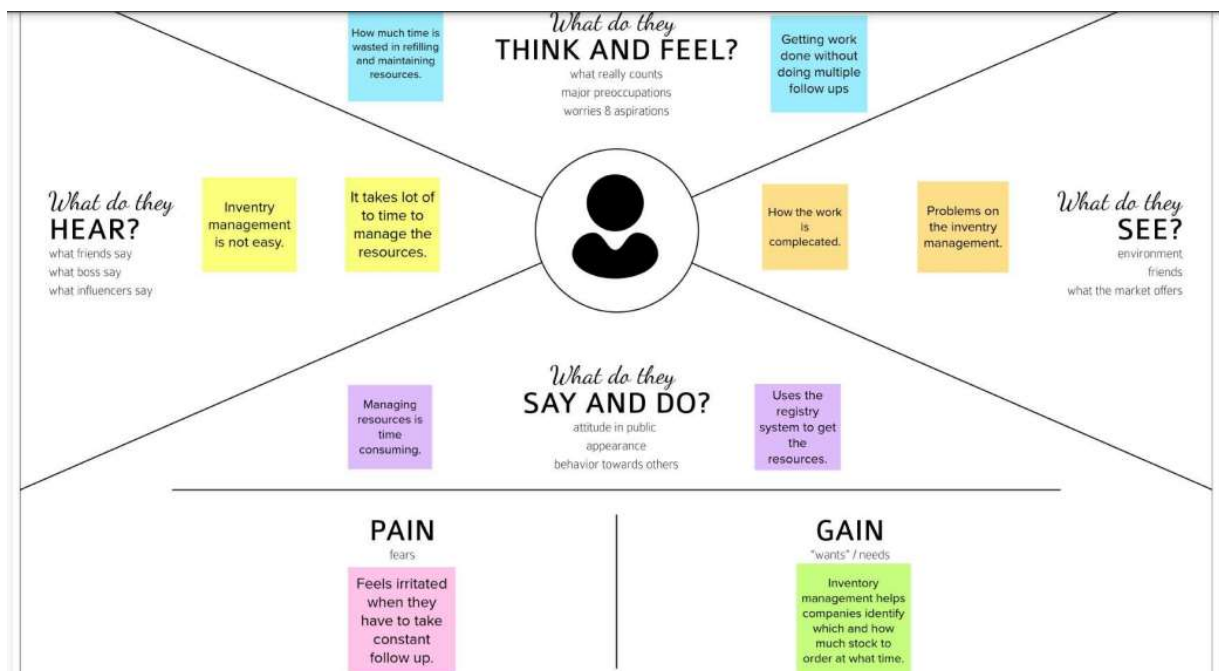
Authors: Nicole DeHoratius, Adam J. Mersereau, Linus Schrage

2.3. Problem Statement Definition:

It's very hard and difficult to manage the stocks manually and it is also a time-consuming process.

3. IDEATION AND PROPOSED SOLUTION

3.1. Empathy map canvas:



3.2. IDEATION AND BRAINSTORMING:

<https://app.mural.co/invitation/mural/kavin4967/1666962978520?sender=uca6bded64c1fa6f308d55983&key=1388e3b4-489c-40f7-acf4-646887d737ab>

3.3.PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Inventory Management System for Retailers
2.	Idea / Solution description	<p>1. Create a System to Get Accurate and Accessible Information on Your Inventory</p> <p>2. Create a Unique Process Customized for Your Business Type</p> <p>3.Keep an eye on Contemporary trends in the industry</p> <p>4.Be prepared for fluctuations in supply and demand 5.Deploy an Integrated Inventory Management software</p>
3.	Novelty / Uniqueness	<p>1. Quickly track stock shortages and excess stock</p> <p>2. Auto-adjust stock from invoices and purchase orders</p> <p>3. Measure current inventory valuation with FIFO pricing</p>
4.	Social Impact / Customer Satisfaction	<p>1.Good inventory control means that your time to fulfill orders stays low</p> <p>2. Inventory management helps you maintain customer satisfaction when it</p>

		comes to product returns
		3. A good inventory management system means that you have an up-to-date inventory count at all times
5.	Business Model (Revenue Model)	Inventory management system for business must be robust and scalable
6.	Scalability of the Solution	To increase the scalability of our business, we should use an automated inventory management system for inventory tracking. This will make our business much more scalable so that we can continue building consistent growth and take advantage of increased sales. An automated inventory management system will give our business the structure and real-time metrics it needs to remain competitive and achieve growth goals

3.4.PROBLEM SOLUTION FIT:

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) Retailers CS	6. CUSTOMER CONSTRAINTS 1. Unlimited inventory stocks 2. Inventory investment 3. Storage place 4. Workspace Capacity CC	5. AVAILABLE SOLUTIONS Using Inventory management software is one of the available solutions for the customer Pros: 1. Saves cost and time 2. Increased Efficiency 3. Warehouse organization 4. Data security 5. Minimizes losses Cons: 1. Management software is expensive 2. Complexity AS	Explore AS, differentiate
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Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS ->Lack of Inventory Visibility ->Inefficient Inventory Management process or software ->Identifying incorrectly located materials ->Managing inventory wastes and defects	9. PROBLEM ROOT CAUSE The primary purpose of inventory management is to ensure there is enough goods or materials to meet demand without creating overstock or excess inventory RC	7. BEHAVIOUR BE Inventory management refers to process of ordering, storing, using, and selling of company's inventory. This includes the management of raw materials, components, and finished products as well as warehousing and processing of such items.	Focus on J&P, tap into BE, understand RC
	3. TRIGGERS TR Advertising the inventory management system triggers customer to act.	10. YOUR SOLUTION SL 1. Centralized tracking of inventory resources 2. Transparent performance 3. Demand forecasting 4. Preventive control 5. Multi location warehousing	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE Customer needs to order for the stocks they want at inventory management software in online 8.2 OFFLINE Customer has to receive the ordered stocks in offline	
	4. EMOTIONS: BEFORE / AFTER EM Customer feel very ease and flexible while managing available stocks after using Inventory Management System for their business			

4. REQUIREMENT ANALYSIS

4.1. FUNCTIONAL REQUIREMENT:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through web based Inventory management form to access inventory resources Registration through Inventory management software application
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP for given mobile number

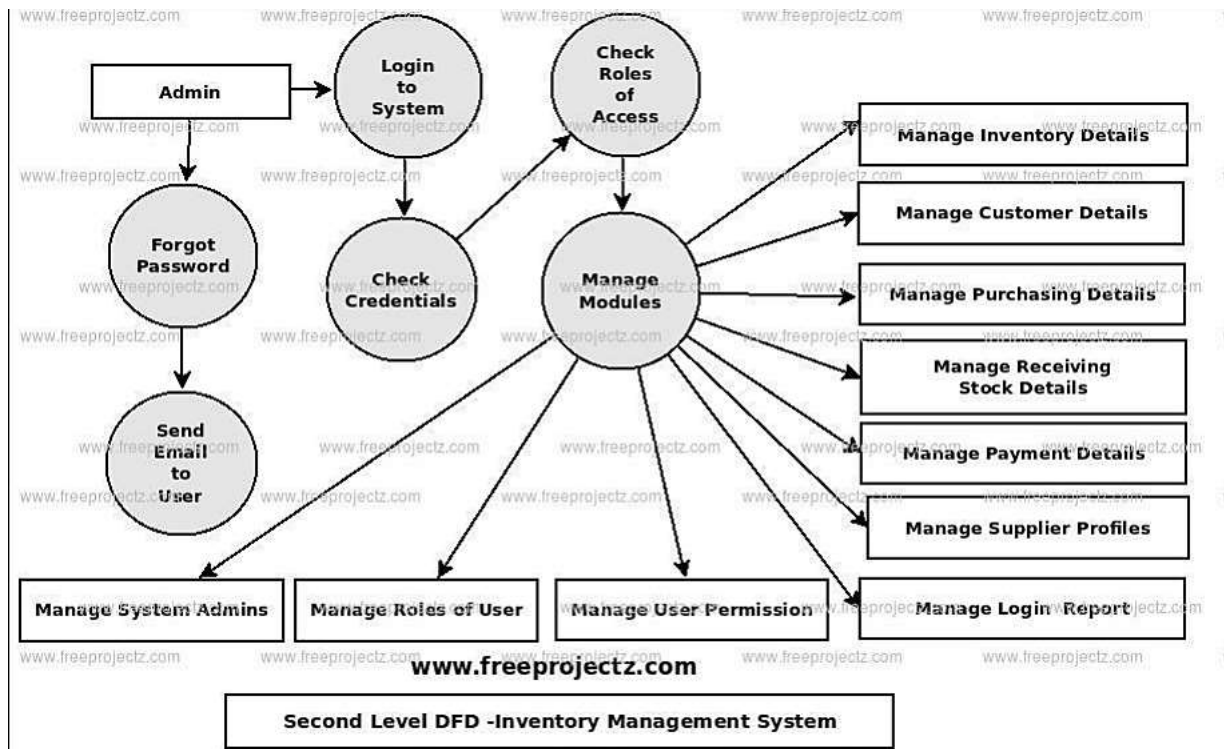
FR-3	Access of resources	After registration user can access the resources in the inventory stock warehouse
FR-4	Rendering for user	Rendering the accessed resources for the user
FR-5	Feedback from user	Getting feedbacks about our inventory management system from the users

4.2NON-FUNCTIONAL REQUIREMENTS:

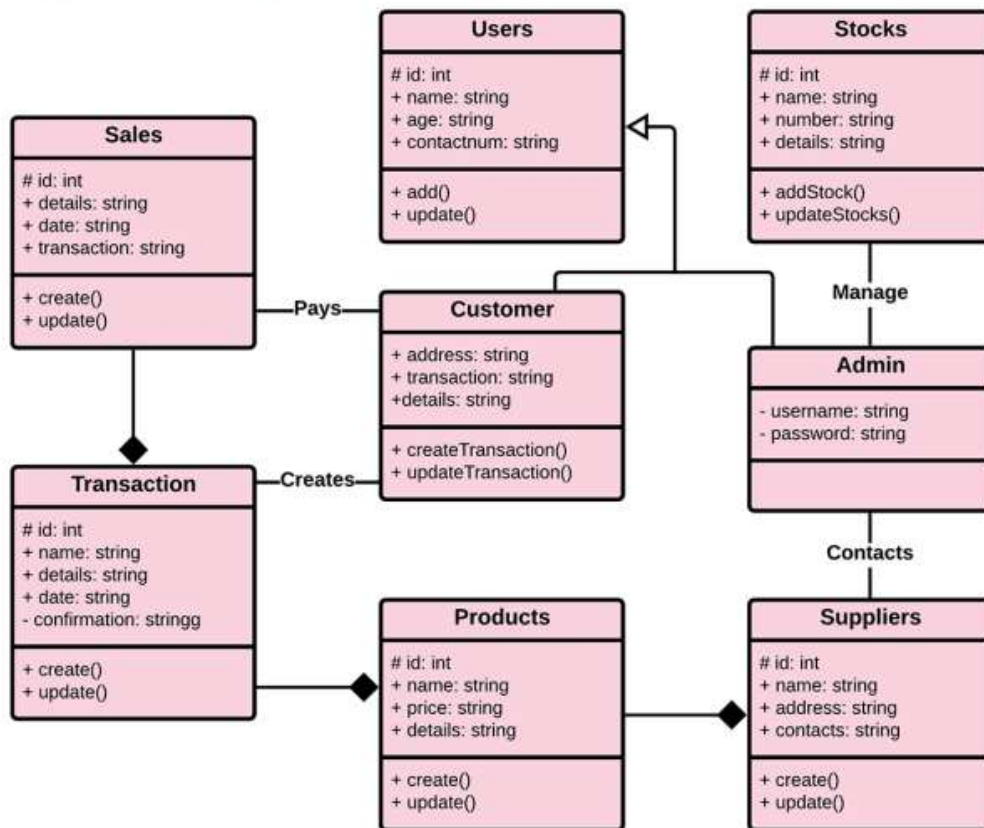
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The usability interface is a quality attribute that is used to evaluate the convenience of people in obtaining information on a product system or service
NFR-2	Security	Inventory security is the process of ensuring the safety and optimum management control of stored goods Performance of company stands or falls with the safety and efficiency of inventory warehouse
NFR-3	Reliability	With accurate and reliable counts,you'll help lead
		promote customer satisfaction and a thriving and growing customer base
NFR-4	Performance	To improve inventory performance we have to calculate inventory stock outs frequently, also keep track of inactive stocks and lost sales
NFR-5	Availability	Stock availability is a key success factor for retailers but also one of the biggest inventory management challenges
NFR-6	Scalability	Scalable inventory management solution will help you stay up to date on inventory movements in real time Inventory management system must be scalable for large number of customers

5.PROJECT DESIGN

5.1.DATA FLOW DIAGRAM:



5.2.SOLUTION AND TECHNICAL ARCHITECTURE:

Solution Architecture:**5.3.USER STORIES:**

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the inventory application by entering my customerID, password, and confirming my password.	I can access my account / dashboard
		USN-2	As a user, I will receive confirmation email once I have registered for the inventory application software	I can receive confirmation email click confirm
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard via Facebook Login
		USN-4	As a user, I can register for the application through Gmail	
	Login	USN-5	As a user, I can log into the	

			application by entering email & password	
	Dashboard			
Customer (Web user)			As a user,I can register in inventory management website by entering customerId and password	
Customer Care Executive			As a Customer Care Executive,I can resolve customer problems in login web page and other problems also	
Administrator			As a Administrator,I can manage creation and maintenance of inventory objects,including locations,inventory items,inventory batches,inventory groups,and cost items	

6.PROJECT PLANNING AND SCHEDULING:

6.1.SPRINT PLANNING AND ESTIMATION:

Setting up the application environment	M-01	Setting up the needed resources in the local machine
Integrating send grid service	M-02	To send emails from the application, we need to integrate the SendGrid Service.
Deployment of the app in IBM Cloud	M-03	Containerize a Flask application by using Docker and deploy it to the IBM Cloud Kubernetes Service
Ideation Phase	M-04	Collecting information by referring to previous research on a topic and Prepare Literature Survey on the selected Project and Information Gathering, empathy map and ideation
Project Design Phase - I	M-05	Prepare the proposed solution, the problem-solution fit, and the Solution Architecture.

Project Design Phase - II	M-06	Create a customer journey, functional requirements, a data flow diagram, and a technology architecture
Project Planning Phase	M-07	Make a list of milestones, an activity list, and a sprint delivery plan.
Project Development Phase	M-08	Develop and submit Sprint 1,Sprint 2,Sprint 3 and Sprint 4

6.2.SPRINT DELIVERY SCHEDULE:

Activity Number	Activity	Sub Activity	Assigned To	Status
1.	Setting up Application Environment	<ol style="list-style-type: none"> 1. Create Flask Project 2. Create IBM Cloud Account 3. Install IBM Cloud CLI 4. Docker CLI Installation 5. Create An Account In Sendgrid 	All Members	In Progress
2.	Implementing Web Application	<ul style="list-style-type: none"> • Create UI To Interact With Application 	All Members	In Progress
3.	Integrating SendGrid Service	<ul style="list-style-type: none"> • SendGrid Integration With Python Code 	All Members	In Progress

4.	Deployment of App In IBM Cloud	<ol style="list-style-type: none"> 1. Containerize The App 2. Upload Image To IBM Container Registry 3. Deploy in Kubernetes 	All Members	In Progress
5.	Ideation Phase	<ol style="list-style-type: none"> 1. Literature Survey On The Selected Project & Information Gathering 2. Prepare Empathy Map 3. Ideation 	All Members	Completed
6.	Project Design Phase – I	<ol style="list-style-type: none"> 1. Proposed Solution 2. Problem Solution Fit 3. Solution Architecture 	All Members	Completed
7.	Project Planning Phase	<ul style="list-style-type: none"> • Prepare Milestone & Activity List • Sprint Delivery Plan 	All Members	Completed
8.	Project Development Phase	<ol style="list-style-type: none"> 1. Delivery Of Sprint-1 2. Delivery Of Sprint-2 3. Delivery Of Sprint-3 	All Members	In Progress Completed

4. Delivery Of Sprint-4

6.3.REPORTS FROM JIIRA:

The screenshot displays the Jira Software interface for the project 'INVENTORY MANAGEMENT SYSTEM FOR RETAILERS'. The left sidebar shows the project navigation menu with options like Roadmap, Backlog, Board, Code, Project pages, Add shortcut, and Project settings. The main area shows the 'Backlog' view with a list of sprints and a 'Create sprint' button. The right sidebar features a 'Quickstart' panel with options to create a project, deliver more often with scrum, and create an issue.

Below the screenshot, a timeline view of the sprints is shown:

	OCT							NOV							NOV							NOV						
	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Sprints	IMSFR Sprint 1							IMSFR Sprint 2							IMSFR Sprint 3							IMSFR Sprint 4						
+ Create Epic																												

At the bottom, there are tabs for 'Today', 'Weeks', 'Months', and 'Quarters', with 'Weeks' currently selected.

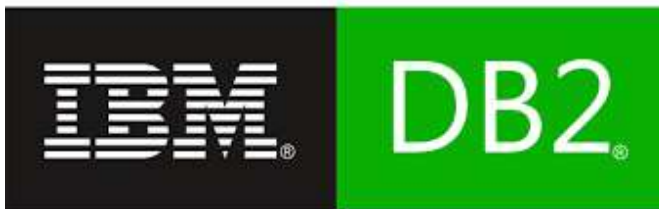
7.CODING AND SOLUTIONING

7.1.FEATURE:

- 1.Centralized inventory management
- 2.Tagging and barcoding
- 3.Reporting of the business activities
- 4.Forecasting of the inventory
- 5.Alerts regarding the inventory details
- 6.Backup and security of the inventory

7.3.DATABASE SCHEMA:

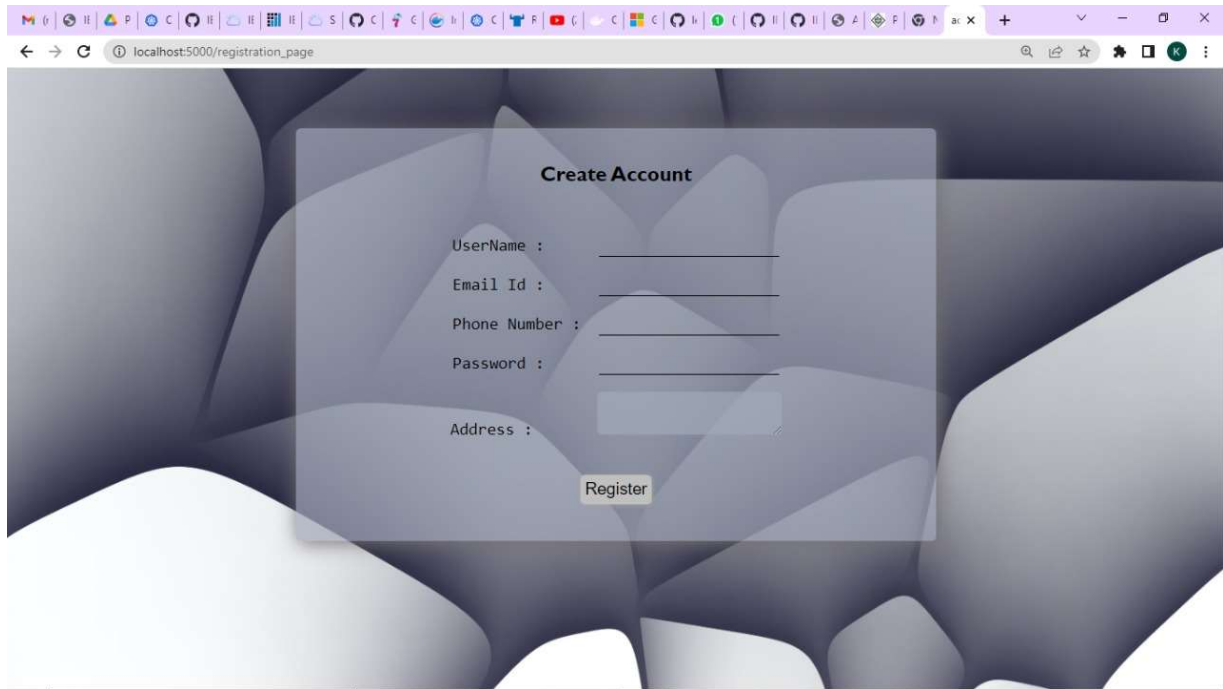
- 1.We have to create a table to store user(retailer) information while registration of the inventory management website using ibm db cloud.
- 2.For per user we have to create a table for maintaining the stocks.
- 3.These tables are created using ibm db2 which is presented in following link
<https://www.ibm.com/in-en/products/db2>



8.TESTING

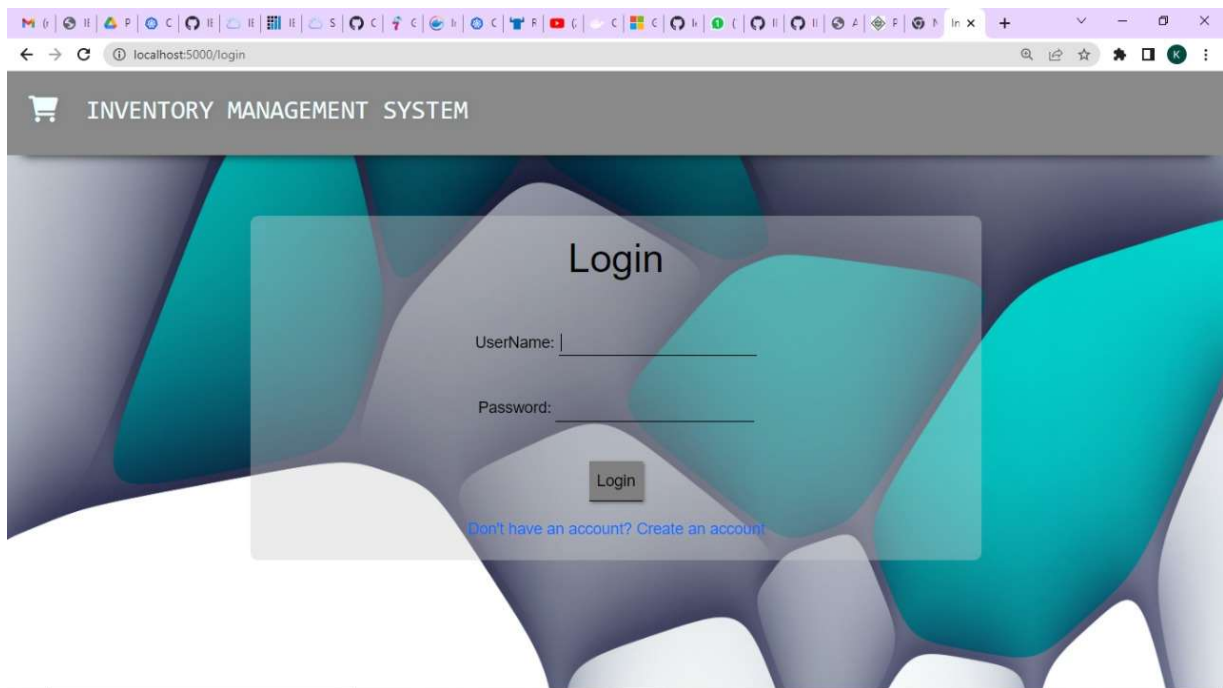
8.2.USER ACCEPTANCE TEST CASES:

User acceptance interface to create account for new retailers



The screenshot shows a web browser window with the address bar displaying 'localhost:5000/registration_page'. The page features a 'Create Account' form with the following fields: 'UserName', 'Email Id', 'Phone Number', 'Password', and 'Address'. Each field is represented by a text input box. Below the 'Address' field is a 'Register' button. The background of the page is a dark, abstract, wavy pattern.

Below is the User interface for logging in to the dashboard which shows the available stocks.



The screenshot shows a web browser window with the address bar displaying 'localhost:5000/login'. The page has a header with a shopping cart icon and the text 'INVENTORY MANAGEMENT SYSTEM'. The main content area features a 'Login' form with 'UserName:' and 'Password:' labels, each followed by a text input box. Below the password field is a 'Login' button. At the bottom of the form, there is a link that says 'Don't have an account? Create an account'. The background is a dark, abstract, wavy pattern.

9.RESULTS

9.1.PERFORMANCE METRICS:

- 1.Inventory turnover rate
- 2.Days and weeks on hand
- 3.Stock to sales ratio
- 4.Sell through rate
- 5.Backorder rate
- 6.Accuracy of forecast demand
- 7.Rate of return
- 8.Product sales
- 9.Revenue per unit
- 10.Cost per unit

10.ADVANTAGES AND DISADVANTAGES:

Advantages:

- 1.It helps to maintain the right amount of stocks.
 - 2.It leads to more organized warehouse
 - 3.It saves time and money
 - 4.Improves efficiency and productivity
 - 5.Leads to improve customer retention
 - 6.Avoids lawsuits and regulatory fines
 - 7.Schedule maintenance
 - 8.Reduction in holding costs
- 9.Flexibility and increased information transparency, will be key to effective inventory management.
- 4.The nature of globalization will change, impacting inventory deployment decisions dramatically.
- 5.Increased focus on supply chain security, and concerns about the quality of inventory itself, will be primary motivators to changing supply chain and inventory strategy.

Disadvantages:

- 1.Bureaucracy
- 2.Impersonal touch
- 3.Production problem
- 4.Increased space is need to hold the inventory
- 5.Complexity
- 6.High implementation costs

11.CONCLUSION

Therefore,we have created the web application which asks for user information

to login and shows the dashboard which contains the information about stocks. There is also option for add and delete stocks and email notification service when stocks are emptied.

12.FUTURE SCOPE

1.The Fourth Industrial Revolution will continue to drive technological change that will impact the way that we manage inventories.

2.Successful companies will view inventory as a strategic asset, rather than an aggravating expense or an evil to be tolerated.

3.Collaboration with supply chain partners, coupled with a holistic approach to supply chain management

13.APPENDIX:

Github Link-[GitHub - IBM-EPBL/IBM-Project-30572-1660149468: Inventory Managment System for Retailers](https://github.com/IBM-EPBL/IBM-Project-30572-1660149468:Inventory_Managment_System_for_Retailers)