

INVENTORY MANAGEMENT SYSTEM FOR RETAILERS

19I039 PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

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TABLE OF CONTENTS

1. INTRODUCTION

1. Project Overview
2. Purpose

2. LITERATURE SURVEY

1. Existing problem
2. References
3. Problem Statement Definition

3. IDEATION & PROPOSED SOLUTION

1. Empathy Map Canvas
2. Ideation & Brainstorming
3. Proposed Solution
4. Problem Solution fit

4. REQUIREMENT ANALYSIS

1. Functional requirement
2. Non-Functional requirements

5. PROJECT DESIGN

1. Data Flow Diagrams
2. Solution & Technical Architecture
3. User Stories

6. PROJECT PLANNING & SCHEDULING

1. Sprint Planning & Estimation
2. Sprint Delivery Schedule
3. Reports from JIRA

7. CODING & SOLUTIONING

1. Generates alert mail upon product shortage (Using Sendgrid)
2. Dashboard changes upon adding Product movements
3. User Credentials are secured using encryption algorithms

8. TESTING

1. Test Cases
2. User Acceptance Testing

9. ADVANTAGES & DISADVANTAGES

10. CONCLUSION

11. FUTURE SCOPE

12. APPENDIX

CHAPTER 1

INTRODUCTION

1. INTRODUCTION

Retail inventory management is the process of ensuring to 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

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.

1.2. Purpose

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.

CHAPTER 2

LITERATURE SURVEY

2.1. Existing Problems

- **Design of a Computerized Inventory Management System for Supermarkets[1]**

This system handles the new stock, Stock order, Stock update, Product or Item

Search to check availability and Stock Report are electronically handled.

- A login page is created to ensure security.
- If it is successful, it will display the splash screen after which it will automatically display the main menu form.
- The user has the option of choosing from the on-screen menu options- New Stock, Update Stock, Search and View options.
- The user form will capture records regarding stock details. Which are stored in the database, retrieved and viewed later.

- **The inventory management system for auto mobile spare parts in a central warehouse[2]**

The Proposed system is of three components.

- Hierarchical structure development of the fuzzy AHP The domain experts are interviewed about the part factors, demand factors, time factors, sales factors and associated factors that affect the supply of the spare parts.
- Weights determination Another questionnaire based on the proposed structure is formulated. The questionnaire surveys are used to compare pairs of elements of each level with respect to each element in the next higher level. A 7-point scale is used.
- Decision making based on EFNN. 3 EFNN - a 5 layered hybrid neural network with the feature to self-organize its activation function is implemented to get better accuracy.

- **Automated Inventory Management Systems and its impact on Supply Chain Risk Management in Manufacturing firms of Pakistan [3]**

The previous studies about Automated Inventory Management Systems are studied and their models are reviewed. The study involved quantitative research and developed a conceptual framework to increase the understanding of interrelationships between automated inventory management systems (AIMS), Employee training and development (ETD) and supply chain risk management (SCRM).

- **Design of a smart inventory management system for the construction sector based on IoT and cloud computing. [4]**

The proposed model is a novel Aluminum Shuttering Inventory Management System (ASIMS) consisting of barcodes, Arduino-based IoT devices, wireless sensor networks and Cloud Computing to track Aluminum form-work shuttering components under actual field conditions.

- Upon receipt of Aluminum formwork shuttering components from the vendor at site, a Goods Receipt Note (GRN) entry is passed in the system.
- Physical verification of the received items and GRN process have needed to be completed.
- The barcode labels for the items are generated and printed. The printed barcode labels are then affixed on the form-work shuttering components.
- Using our proposed application, the component is labelled and then mapped with corresponding geolocal coordinates to enable tracking.
- Movement of materials within site and for intra-site stock transfers have to be tracked and recorded using our proposed model for scanning barcodes affixed to items.
- Aluminum formwork shuttering components are often cut and resized according to localized requirements. During such process of resizing, the created new items have to be checked, verified physically and logged using our proposed software. Again, new

barcode labels have been generated for the new components derived from the parent item.

- **Design of smart inventory management system for construction sector based on IoT and cloud computing.[5]**

The Routine Activity of a Particular Company and Firms is about Management of Inventory and Working Capital Management. Inventory is one of the most important Components of Current assets and Current assets, Generally, Part of Working Capital, so it is very important to know the amount locked up in Inventory and to manage the inventory at a very optimal manner. Here in this Research Segment, we analysed and studied inventory Management practices followed by Steel Authority of India Limited. Stock of Raw Material, WIP, FG etc. is a very crucial matter in the short-term liquidity position and its impact significantly on long term profitability. In this Research Work, Last five Years data five is collected from Annual reports of the company and based on such data various ratios are applied in order to measure efficiency of Inventory and here we also used various Statistical tools in order to examine the behaviour of selected ratios.

- **A study on Inventory management in Tamil Nādu State Transport Corporation Limited, Kumbakonam.[6]**

The purpose of Inventory Management is to ensure availability of materials in sufficient quantity as and when requested, also to minimize the investment in inventories and to know about how to maintain stock of the company. In this paper analysing Inventory Management in TNSTC - Kumbakonam was done using different tools such as ABC, FSN, EOQ and VED analysis. From the analysis, the fast-moving inventory, class A inventory and a beneficial category of items were found and appropriate suggestions were given to the company.

- **Impact of Inventory Management on the Profitability of SMES in Tanzani**

A well-designed and implemented Inventory management is expected to contribute positively to the SMEs profitability. The purpose of this paper is to examine the relationship between inventory conversion period and SMEs profitability and determine the impact of inventory management on SMEs profitability.

The dependent variable, gross operating profit, is used as a measure of profitability and the relation between inventory management and SMEs profitability is investigated for a sample of 26 Tanzania SMEs, using annual financial statements data analysis for the period 2006 -2011. This study employs Regression analysis to determine the impact of inventory conversion period over gross operating profit taking current ratio, size of the firm, financial debt ratio as control variables.

The results indicate that there is a significant negative linear relationship between inventory conversion period and profitability. The relationship between two control variables viz; current ratio, financial debt ratio and gross operating profit indicate the expected negative relationship whereas the firm size indicates unexpected positive relationship. This may be due to managerial failure.

- **An assessment of the Inventory Management Practices of Small and Medium Enterprises (SMEs) in the Northern Region of Ghana. [8]**

The purpose of this study was to assess inventory management practices and its effect on the financial performance of SMEs in the Northern Region of Ghana. The study adopted a descriptive cross-sectional survey research design which allowed the collection of primary quantitative data through structured questionnaires. The target population was 1000 owner/ managers of SMEs. Stratified random sampling technique was used to obtain a sample of 300 SMEs comprising 164 trading, 26 manufacturing, 10 hairstyling, 62 dressmaking, and 38 carpentry enterprises. The data was analyzed using both descriptive and inferential statistics. The study revealed that SME financial

performance was positively related to efficiency of inventory management (EIM) at 1 percent significance level. The study concluded that stock management practices have influence on the financial performance of SMEs, hence there was a need for SME managers to embrace efficient stock management practices as a strategy to improve their financial performance and survive in the uncertain business environment.

- **Relationship Between Inventory Management and Profitability: An Empirical Analysis of Indian Cement Companies.[9]**

The purpose of this paper is to examine the relationship between inventory conversion period and firms' profitability. The dependent variable, gross operating profit, is used as a measure of profitability and the relation between inventory management and profitability is investigated for a sample of five top Indian cement companies over a period of ten years from 2001-2010. This study employs Regression analysis to determine the impact of inventory conversion period over gross operating profit taking current ratio, size of the firm, financial debt ratio as control variables. The results indicate that there is a significant negative linear relationship between inventory conversion period and profitability. The results of this research are in line with the previous findings. The findings indicate that

Inventory conversion period has an inverse relationship with firm profitability i.e. when the ICP days increase the profitability of firm decreases and vice versa. It was found that the firm profitability as measured by the GOP has a negative relationship with the financial debt ratio. This implied that profitability increases with decrease in financial debt ratio. Further in this study the relationship between the firm size and GOP was positive which indicates that profitability increases with an increase in firm size. The relationship between current ratio and the GOP was negative.

- **A Study on Inventory Management with Reference to Carborundum Universal Limited (CUMI) in Murugappa Group.[10]**

The study of inventory management is a vital part in the manufacturing organization to be more competitive. Inventory are raw materials, work-in-process goods and finished goods that are considered to be the portion of business assets that are ready or will be ready for sale. Formulating a suitable inventory is one of the major concerns for an inventory. Therefore, the purpose of this research is to identify the problem of inventory management faced by the manufacturing of an enterprise. The study concluded that the performance of carborundum universal limited is excellent in inventory management and their increase in productivity and sales indicates the good sign for the company.

2.2. References

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10. Sangeetha, M. G., Praveena, M. D., & Rathika, M. S. A STUDY ON INVENTORY MANAGEMENT WITH REFERENCE TO CARBORUNDUM UNIVERSAL LIMITED (CUMI) IN MURUGAPPA GROUP.

2.3. Problem Statement Definition

Inventory management is a challenging problem in supply chain management. The problem faced by the company is that they do not have any system to keep track of inventory data. It is difficult for the retailer to record the inventory data. Every inventory stock manager's main problem is keeping track of how much stock is purchased and how much stock is spent.

A tool or system to aid inventory management would be a beneficial tool in this area. Inventory management refers to managing the quantity, quality, location and transportation of various products utilized in manufacturing by various industrial organizations or in sales by various retailers.

Usually, Inventory Management systems are limited and fixed to a selected range of

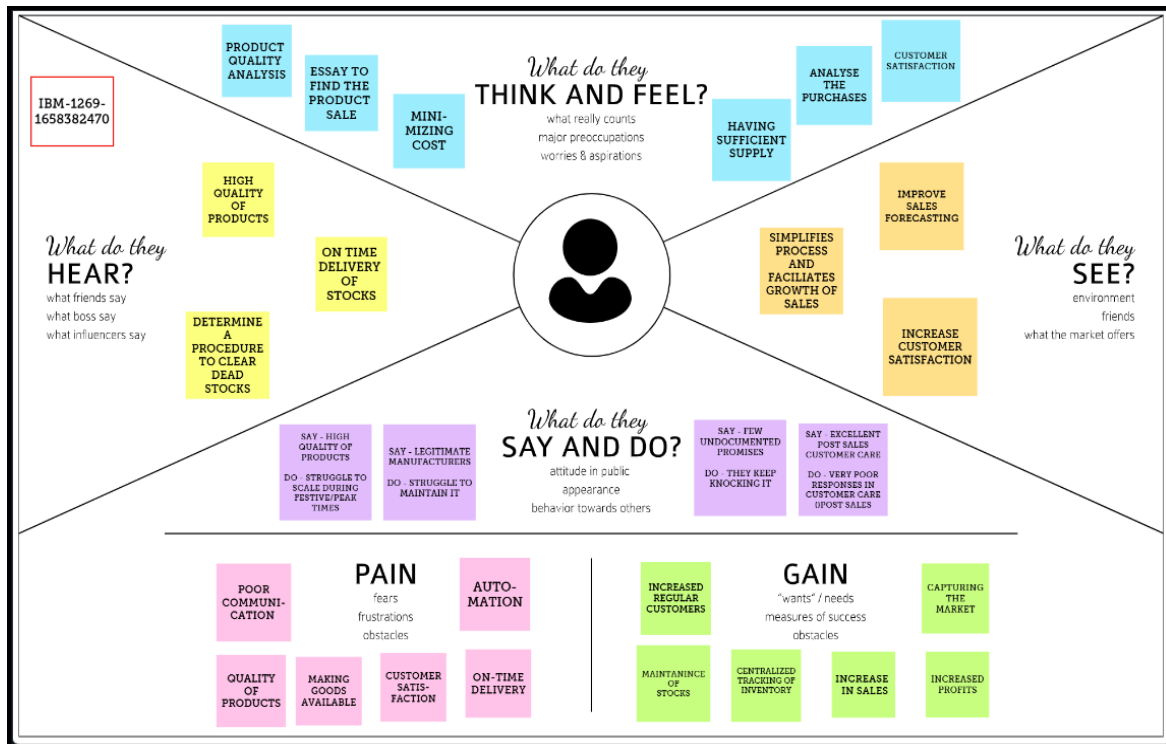
items and cannot be modified and extended based on the customer's needs. The Inventory Management System focuses on making it expandable and usable easily by the end user and with constant customer support to alter the use. Unlike other software that provides similar functionalities, Inventory Management System focuses on making it easier by adding details of various other entities that are a part of the organization.

CHAPTER 3

IDEATION AND PROPOSED SOLUTION

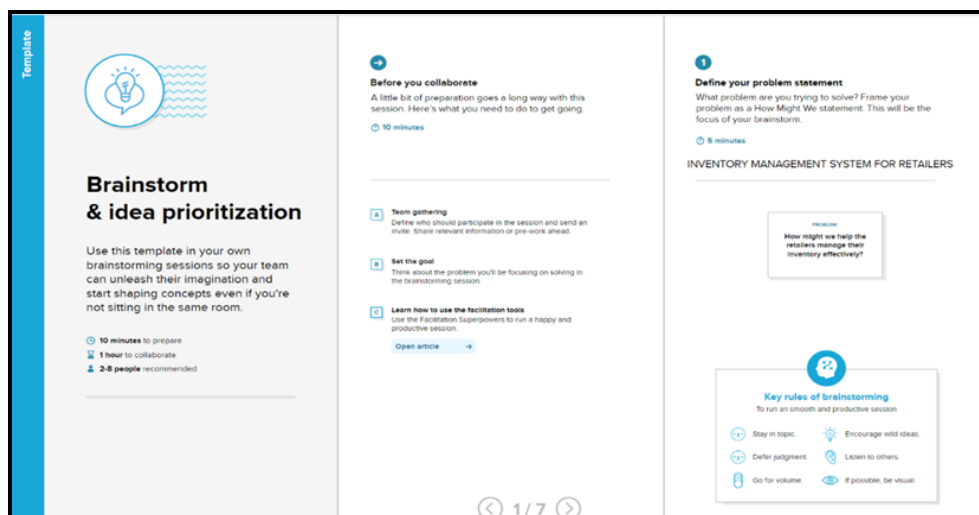
3.1. Empathy Map Canvas

The empathy map for the project is shown in figure 3.1.



3.2. Ideation and Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement (figure 3.2)

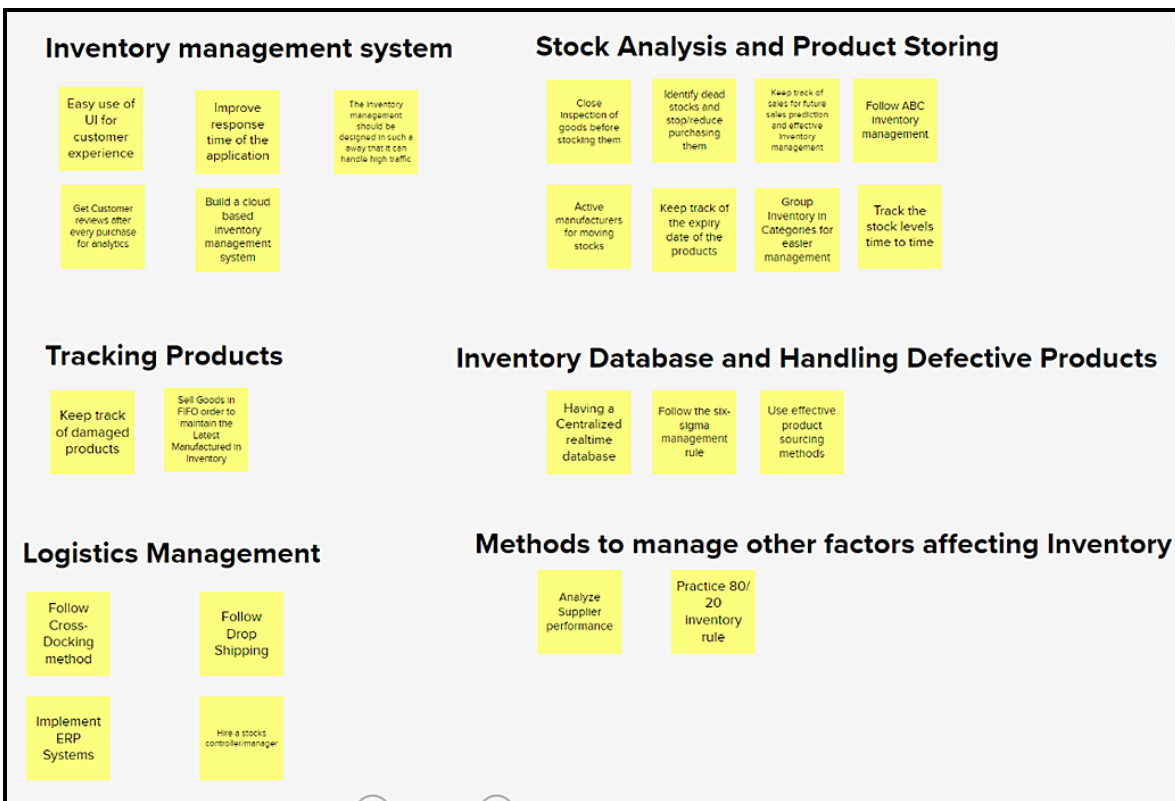
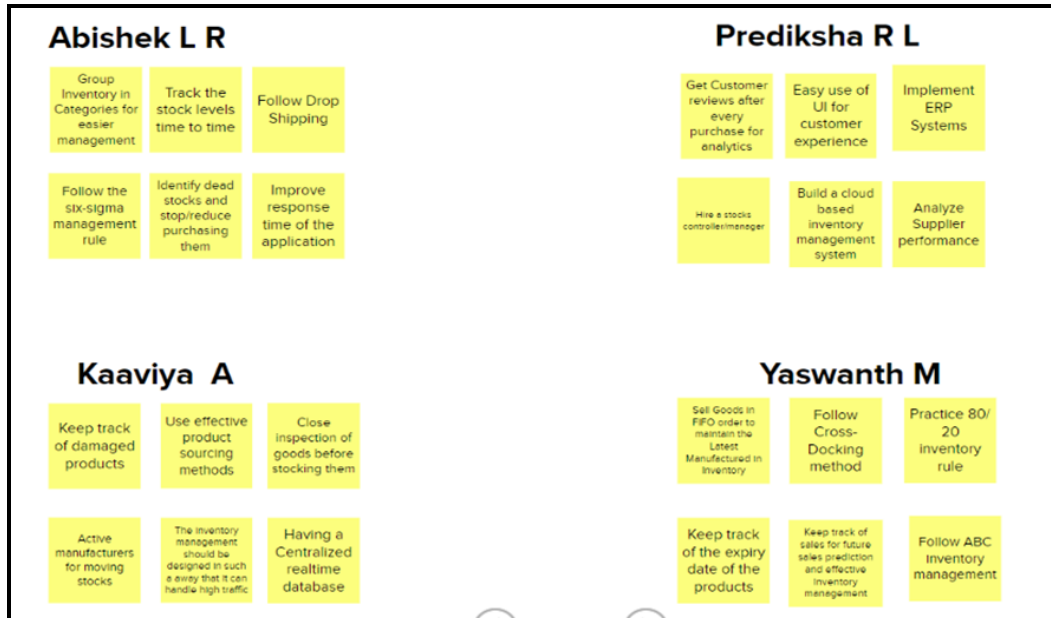


Brainstorm

Write down any ideas that come to mind that address your problem statement.

 10 minutes

Step-2: Brainstorm (figure 3.3), Idea Listing and Grouping (figure 3.4)



3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, 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

Step-3: Idea Prioritization



3.3. Proposed Solution

S.NO	PARAMETER	DESCRIPTION
1	Problem Statement	<ul style="list-style-type: none"> • The retailer's one of the challenging problems is that they face a lot of issues in keeping track of the inventory [1]. • The retailers must know the expiry date of the products to avoid wastage of products and loss of money [2]. • The retailers should also keep track of the fast-moving goods and also the dead stocks to avoid going out of stocks for fast moving goods and also surplus incoming of dead goods [3]. • Due to problems [3], The customers lose satisfaction and reliability over the retailers as there is a high chance the product is not delivered on time or it may be an ancient one (in case of dead goods).
2	Idea/Solution Description	<ul style="list-style-type: none"> • This proposed system/app will keep track of the details of every incoming and outgoing goods. • The system will notify or alert the retailer over the expiry date of the products. • The availability of stocks of each product is kept on track and the retailer is notified when it goes below the threshold limit. • All the customers will have their own account on the app which they can use to buy products from the retailers. • Each customer can see the details of retailers available in their zone, check for product availability and order their product. • Both the retailers and the customers can track the order easily with this application.

3	Novelty / Uniqueness	<ul style="list-style-type: none"> • Notifications will be sent to the retailers if any product that the customers have been looking for is not available so that the product can be stocked up soon. • Also retailers will be notified about the dead stocks in the inventory so that they could stop stocking them since customers are not preferring them. • Notification will be sent to the customers who buy certain products regularly when the new arrivals are stocked up. • Notifications are sent to the customer for the products in their wish-list to inform them that the product is available or about any discounts on those products. • Exclusive discounts and offers are given for regular customers to keep them engaged with the store regularly.
4	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> • One important reason, the customers are highly satisfied with this app is that they won't waste time on the product which is unavailable. They can check availability from the app itself. • Since the app is automated and it is constantly updating after every purchase the work of keeping track of products is almost NIL for retailers. • The customer satisfaction is improved reasonably due to the timely service offered to them. • The money wasted on expired and dead goods is greatly reduced which helps the retailers a lot.

5	Business Model(Revenue Model)	<ul style="list-style-type: none"> Hereby we can provide a robust and most reliable inventory management system by using: <ol style="list-style-type: none"> Can deploy the most appropriate business advertising models. Can implement loss preventing strategies with this model. This model also ensures all time, anywhere availability of products. Usage of discounts/exclusive discounts business strategy for increasing the customer base.
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3.4. Problem Solution Fit

Problem-Solution fit canvas 2.0

Inventory Management System for Retailers

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS <ul style="list-style-type: none"> ❖ Customers are retailers, shop owners, business people who are struggling to keep track of their inventory. ❖ Due to this issue, they face many issues like: <ul style="list-style-type: none"> ✓ Loss due to dead products in the inventory, unavailability of fast moving products, etc. ✓ Unnecessary headache due to improper maintenance of inventory. 	6. CUSTOMER CONSTRAINTS CC <ul style="list-style-type: none"> ❖ Since most of the softwares like these will be a subscription model, the customer must be paying as they use them. This may be against their budget. ❖ To use this software the customer must be trained or he must hire a person to do that for him. ❖ To deploy this software, the customer must have a powerful device which is compatible with the software. 	5. AVAILABLE SOLUTIONS AS <ul style="list-style-type: none"> ❖ Solution: The traditional solution for the inventory management problem is to track the incoming and outgoing goods with a pen and paper. ❖ Pros: <ul style="list-style-type: none"> ✓ Easy to use ✓ Less cost ❖ Cons: <ul style="list-style-type: none"> ✓ Error rate is high ✓ Manual tracking is a tedious work 	Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS J&P <ul style="list-style-type: none"> ❖ The objective of the software is to make the inventory tracking easier by automating the inventory. Example, the initial stocks information is fed to the software and from there it tracks the details of incoming and outgoing products. ❖ This can generate automatic alerts/notifications to help the user in their work. Example, Alert for dead stocks in inventory, Alert for the goods which is to be refilled, Notifications for the user defined conditions like if sales go higher than certain limits etc... ❖ Graphical representation of sales is also possible. 	9. PROBLEM ROOT CAUSE RC <ul style="list-style-type: none"> ❖ The primary reason for this problem to exist is the periodic change in demand of the customers. ❖ This indirectly affects the inventory as change in customers needs is proportional to the sale of a particular products. ❖ This keeping track of inventory effectively helps in managing the dead and fast moving products. 	7. BEHAVIOUR BE <ul style="list-style-type: none"> ❖ The customer must find a effective inventory tracking software. ❖ He must implement it in his business to streamline his work and make more profit. ❖ He must volunteer himself to learn to use the software or be ready to hire a person who can do it for him. 	Focus on J&P, tap into BE, understand RC
Identify strong TR & EM	3. TRIGGERS TR <ul style="list-style-type: none"> ❖ Understanding the fact that using a software to automate inventory system helps him to make more money and also make his work easier. Also seeing other retailers making more money using this software. 4. EMOTIONS: BEFORE / AFTER EM <p>Before: They feel lost due to losses which occur due to improper management of inventory (Manual pen and paper tracking).</p> <p>After: They feel like success after making increased profits, reducing the mistakes that happen in manual process.</p>	10. YOUR SOLUTION SL <ul style="list-style-type: none"> ✓ Design a flask based Inventory management system application. ✓ Enable email based alerts for dead and fast moving products using sendgrid framework. ✓ Provide a option for graphical view of sales 	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE <p>Online Inventory trackers which come for free may steal personal information of users and it may also contains a lot of ads.</p> 8.2 OFFLINE <p>Manual logs can be maintained. Employees can be hired to maintain the inventory system logs when the business grows.</p>	Extract online & offline CH of BE

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CHAPTER 4

REQUIREMENT ANALYSIS

4.1. Functional Requirement

The functional requirements of the proposed solution are mentioned in the table 4.1.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story/Sub-Task)
FR-1	User Registration	<ul style="list-style-type: none"> Registration through registration form. Registration through One-Tap Google Sign-in.
FR-2	User Authentication and Confirmation	<ul style="list-style-type: none"> Authentication via Google Authentication. Confirmation via Email. Confirmation via OTP.
FR-3	Product Management	<ul style="list-style-type: none"> Easily track product information. Quickly produce reports for single or multiple products. Track information of dead and fast-moving products. Track information of suppliers and manufacturers of the product.
FR-4	Audit Monitoring	<ul style="list-style-type: none"> The technique of tracking crucial data is known as audit tracking. Monitor the financial expenses carried out throughout the whole time (from receiving order of the product to delivery of the product).
FR-5	Historical Data	<ul style="list-style-type: none"> Specify the amount of storage you need to handle this expansion. Data of everything should be stored for analytics and forecasting

FR-6	Customer Relationship Management(CRM)	<ul style="list-style-type: none"> Track the customer experience via ratings given by them. Get customer reviews regularly or at least at the time of product delivery to work on customer satisfaction. User-friendly GUI to increase the customer base from only techies to normal people. Special offers for regular customers have to be provided through credits in the web-app itself.
FR-7	Security Policy	<ul style="list-style-type: none"> User data collected must be as secure as possible. User data must not be misused. They can only be used for user preferred advertising purposes.

4.2. Non-Functional Requirement

The non-functional requirements are given in the table 4.2.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	<ul style="list-style-type: none"> The UI should be accessible to everybody despite their diversity in languages. People with some impairments should also be able to use the application with ease. (Example, integrate google assistant so that blind people can use it). The app and UI should be platform and device independent. It should be compatible with a wide range of devices possible.
NFR-2	Security	<ul style="list-style-type: none"> The security requirements deal with the primary security. Only authorized users can access the system with their credentials. Administrator or the concerned security team should be alerted on any unauthorized access or data breaches to rectify it immediately.

NFR-3	Reliability	<ul style="list-style-type: none">• The software should be able to connect to the database in the event of the server being down due to a hardware or software failure.• The recovery of the application should be immediate such that the downtime of the application should be negligible.• The users must be intimidated by the periodic maintenance break of the server so that they will be aware of it.
NFR-4	Performance	<ul style="list-style-type: none">• Performance of the app should be reliable with high-end servers on which the software is running.
NFR-5	Availability	<ul style="list-style-type: none">• The software should be available to the users 24/7 with all functionalities working.• New module deployment should not impact the availability of existing modules and their functionalities.
NFR-6	Scalability	<ul style="list-style-type: none">• The whole software deployed must be easily scalable as the customer base increases.

CHAPTER 5

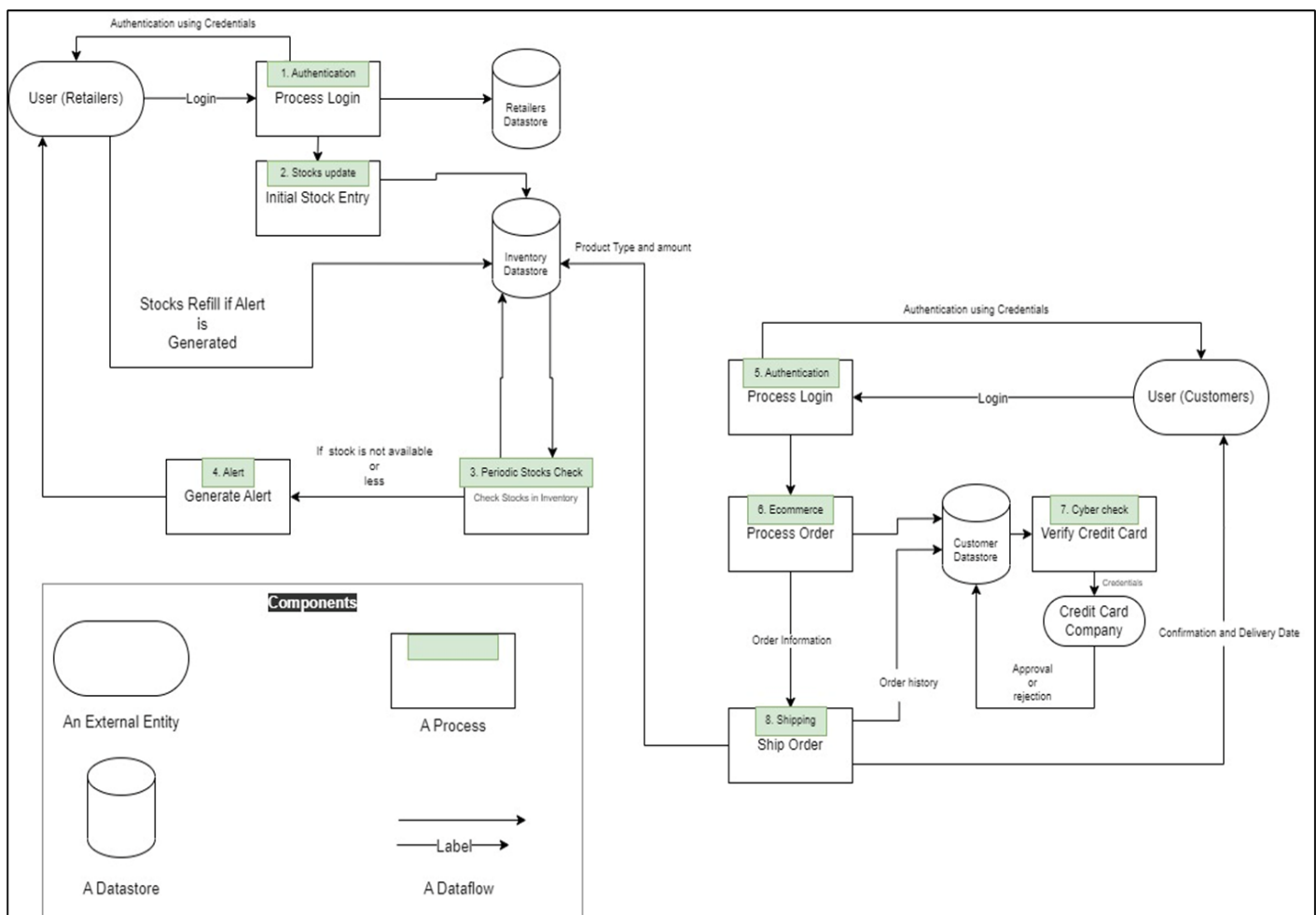
PROJECT DESIGN

5.1. Data Flow Diagrams

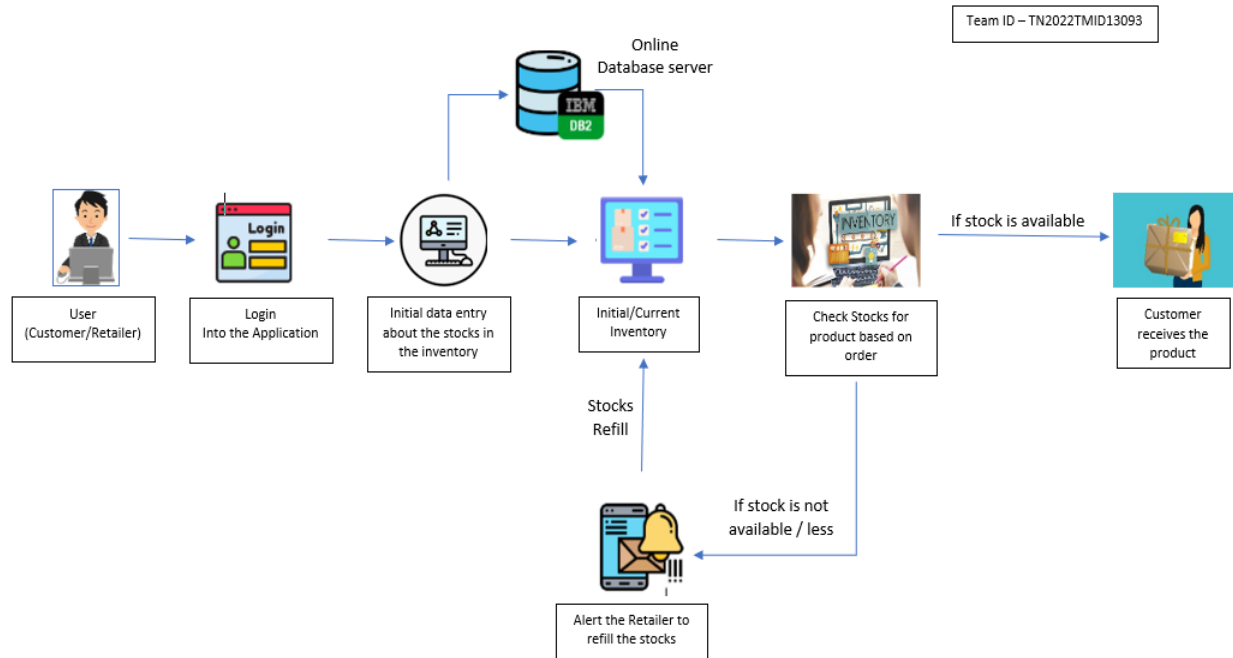
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Four components of Data Flow Diagrams are,

- An External Entity – (Retailers, End Users(Customers))
- A process – The Business process (Functional Requirements)
- A data store – IBM cloud
- A data flow – Indicated by arrow marks



5.2. Solution and Technical Architecture



5.3. User Stories

The user stories of the project are mentioned in the table 5.1.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Retailer	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 and click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register and access dashboard with Facebook Login	Low	Sprint-3
		USN-4	As a user, I can register for the application through Gmail	I can register and access dashboard	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email and password	Successful login into the application	High	Sprint-1
		USN-4	As a user, I can login into the application through Google one Tap Sign in	I can login and access the dashboard with Google One Tap Login	Medium	Sprint-2

	Dashboard	USN-5	As a user, I must be able to see my details on the dashboard.	I can see the profile details.	High	Sprint-1
		USN-6	As a user, I should be able to change passwords whenever I prefer.	I can see the change password feature on the dashboard.	Medium	Sprint-2
	Inventory	USN-7	As a retailer, I should be able to alter product details in the app	Successful edit of product details	High	Sprint-1
		USN-8	As a retailer, I should be able to add or remove a quantity of products in the app.	Successful edit of product quantity	High	Sprint-1
		USN-9	As a retailer, I should get alert to stock shortage or unavailability.	Successful alert generation	Medium	Sprint-2

Custom er (End 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 and click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register and access the dashboard with Facebook Login	Low	Sprint-3
		USN-4	As a user, I can register for the application through Gmail	I can register and access dashboard	Medium	Sprint-1

	Login	USN-5	As a user, I can log into the application by entering email and password	Successful login into the application	High	Sprint-1
		USN-4	As a user, I can login into the application through Google one Tap Sign in	I can login and access the dashboard with Google One Tap Login	Medium	Sprint-2
	Dashboard	USN-5	As a user, I must be able to see my details on the dashboard.	I can see the profile details.	High	Sprint-1
		USN-6	As a user, I should be able to change passwords whenever I prefer.	I can see the change password feature on the dashboard.	Medium	Sprint-2
	Order	USN-7	As a user, I should be able to order items on the app	Successful order placement	High	Sprint-1

		USN-8	As a user, I should be able to verify and pay in a secure payment gateway	Integration of secure payment gateway	High	Sprint-1
Administrator	Maintenance	USN-1	As an administrator, I should be able to edit details of the users of the app.	Successful access privileges granted	High	Sprint-1
		USN-2	Termination user accounts temporarily or permanently if needed.	Termination of user account.	Medium	Sprint-2
Customer Care	Feedback	USN-1	As a customer care team member, I should be able to get feedback from the users.	User feedbacks	Medium	Sprint-3
		USN-2	As a customer care team member, I should be available 24/7 to increase customer base	Integration of Chatbot which can work 24/7	Low	Sprint-3

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

6.1. Sprint Planning and Estimation

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	Yaswanth M Abishek L R
Sprint-2		USN-2	As a user, I will receive confirmation email once I have registered for the application	3	Medium	Prediksha R L Kaaviya A
Sprint-4		USN-3	As a user, I can register for the application through Facebook	8	Low	Abishek L R Prediksha R L
Sprint-3		USN-4	As a user, I can register for the application through Gmail	8	High	Yaswanth M Kaaviya A
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email and password	5	High	Yaswanth M Abishek L R
Sprint-2		USN-4	As a user, I can login into the application through Google one Tap Sign in	3	Medium	Prediksha R L Kaaviya A
Sprint-1	Dashboard	USN-5	As a user, I must be able to see my details on the dashboard.	3	High	Yaswanth M Abishek L R

Sprint-2		USN-6	As a user, I should be able to change passwords whenever I prefer.	2	Medium	Yaswanth M Kaaviya A
Sprint-1	Inventory	USN-7	As a retailer, I should be able to alter product details in the app	2	Medium	Yaswanth M Abishek L R
Sprint-2		USN-8	As a retailer, I should be able to add or remove a quantity of products in the app.	3	Medium	Abishek L R Prediksha R L
Sprint-2		USN-9	As a retailer, I should get alert to stock shortage or unavailability.	5	Medium	Prediksha R L Kaaviya A
Sprint-1	Order	USN-7	As a user, I should be able to order items on the app	2	High	Yaswanth M Abishek L R
Sprint-1		USN-8	As a user, I should be able to verify and pay in a secure payment gateway	3	High	Yaswanth M Kaaviya A
Sprint-3		USN-9	As a user, I should be able to get the product on time.	5	Low	Yaswanth M Abishek L R
Sprint-4	Maintenance	USN-1	As an administrator, I should be able to edit details of the users of the app.	8	High	Abishek L R Prediksha R L
Sprint-4		USN-2	Termination user accounts temporarily or permanently if needed.	5	Low	Yaswanth M Abishek L R
Sprint-2	Feedback	USN-1	As a customer care team member, I should be able to get feedback from the users.	2	High	Prediksha R L Kaaviya A
Sprint-3		USN-2	As a customer care team member, I should be available 24/7 to increase customer base	8	Medium	Abishek L R Prediksha R L

6.2. Sprint Delivery Schedule

This is the sprint delivery schedule which includes the details of requirements to be satisfied assigned to each member of the team within the deadline.

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	Yaswanth M Abishek L R
Sprint-2		USN-2	As a user, I will receive confirmation email once I have registered for the application	3	Medium	Prediksha R L Kaaviya A
Sprint-4		USN-3	As a user, I can register for the application through Facebook	8	Low	Abishek L R Prediksha R L
Sprint-3		USN-4	As a user, I can register for the application through Gmail	8	High	Yaswanth M Kaaviya A
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email and password	5	High	Yaswanth M Abishek L R
Sprint-2		USN-4	As a user, I can login into the application through Google one Tap Sign in	3	Medium	Prediksha R L Kaaviya A
Sprint-1	Dashboard	USN-5	As a user, I must be able to see my details on the dashboard.	3	High	Yaswanth M Abishek L R

Sprint-2		USN-6	As a user, I should be able to change passwords whenever I prefer.	2	Medium	Yaswanth M Kaaviya A
Sprint-1	Inventory	USN-7	As a retailer, I should be able to alter product details in the app	2	Medium	Yaswanth M Abishek L R
Sprint-2		USN-8	As a retailer, I should be able to add or remove a quantity of products in the app.	3	Medium	Abishek L R Prediksha R L
Sprint-2		USN-9	As a retailer, I should get alert to stock shortage or unavailability.	5	Medium	Prediksha R L Kaaviya A
Sprint-1	Order	USN-7	As a user, I should be able to order items on the app	2	High	Yaswanth M Abishek L R
Sprint-1		USN-8	As a user, I should be able to verify and pay in a secure payment gateway	3	High	Yaswanth M Kaaviya A
Sprint-3		USN-9	As a user, I should be able to get the product on time.	5	Low	Yaswanth M Abishek L R
Sprint-4	Maintenance	USN-1	As an administrator, I should be able to edit details of the users of the app.	8	High	Abishek L R Prediksha R L
Sprint-4		USN-2	Termination user accounts temporarily or permanently if needed.	5	Low	Yaswanth M Abishek L R
Sprint-2	Feedback	USN-1	As a customer care team member, I should be able to get feedback from the users.	2	High	Prediksha R L Kaaviya A

Sprint-3		USN-2	As a customer care team member, I should be available 24/7 to increase customer base	8	Medium	Abishek L R Prediksha R L
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Project Tracker:

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	18	6 Days	31 Oct 2022	05 Nov 2022	18	05 Nov 2022
Sprint-3	21	6 Days	07 Nov 2022	12 Nov 2022	21	12 Nov 2022
Sprint-4	21	6 Days	14 Nov 2022	19 Nov 2022	21	19 Nov 2022

6.3. Reports from JIRA

The usage of JIRA helped us to keep track of the project. SCRUM template has been used in JIRA software to manage the progress of the application.

Steps followed in JIRA software are,

- Create a new JIRA Board using SCRUM Template.

Inventory Management System For Retailers

IMSR Sprint 1

To create the initial basic functionalities of the product for the end users.

5 days remaining Complete sprint

GROUP BY: None Insights

Column	Issue ID	User Story	Label	Count
TO DO 3 ISSUES	IMSR-5	As a user, I must be able to see my details on the dashboard.	DASHBOARD	3
	IMSR-10	As a user, I should be able to order items on the app	ORDER	2
	IMSR-11	As a user, I should be able to verify and pay in a secure payment gateway	ORDER	3
IN PROGRESS 1 ISSUE	IMSR-3	As a user, I can log into the application by entering email & password	LOGIN	5
IN REVIEW 1 ISSUE	IMSR-7	As a retailer, I should be able to alter product details in the app	INVENTORY	2
DONE 1 ISSUE	IMSR-1	As a user, I can register for the application by entering my email, password, and confirming my password.	REGISTRATION	5

You're in a team-managed project. Learn more

- Add items to backlog and then transfer into Sprints.

Inventory Management System For Retailers

Backlog

IMSR Sprint 1 21 Oct - 29 Oct (6 issues)

To create the initial basic functionalities of the product for the end users.

Issue ID	User Story	Label	Status	Count
IMSR-1	As a user, I can register for the application by entering my email, password, and confirming my password.	REGISTRATION	DONE	5
IMSR-7	As a retailer, I should be able to alter product details in the app	INVENTORY	IN REVIEW	2
IMSR-3	As a user, I can log into the application by entering email & password	LOGIN	IN PROGRESS	5
IMSR-5	As a user, I must be able to see my details on the dashboard.	DASHBOARD	TO DO	3
IMSR-10	As a user, I should be able to order items on the app	ORDER	TO DO	2
IMSR-11	As a user, I should be able to verify and pay in a secure payment gateway	ORDER	TO DO	3

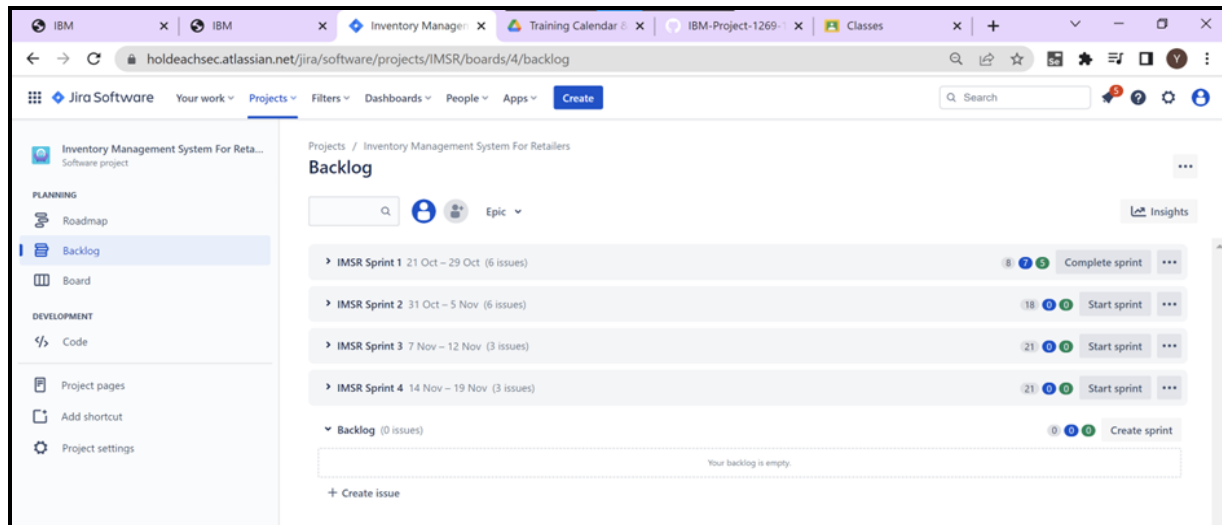
+ Create issue

IMSR Sprint 2 31 Oct - 5 Nov (6 issues)

Issue ID	User Story	Label	Status	Count
IMSR-2	As a user, I will receive confirmation email once I have registered for the application	REGISTRATION	TO DO	3
IMSR-4	As a user, I can log into the application through Google one Tap Sign in	LOGIN	TO DO	3
IMSR-6	As a user, I should be able to change password whenever I prefer.	DASHBOARD	TO DO	2
IMSR-8	As a retailer, I should be able to add or remove quantity of products in the app.	INVENTORY	TO DO	3
IMSR-9	As a retailer, I should get alert on stock shortage or unavailability.	INVENTORY	TO DO	5
IMSR-14	As a customer care team member, I should be able to get feedback from the users.	FEEDBACK	TO DO	2

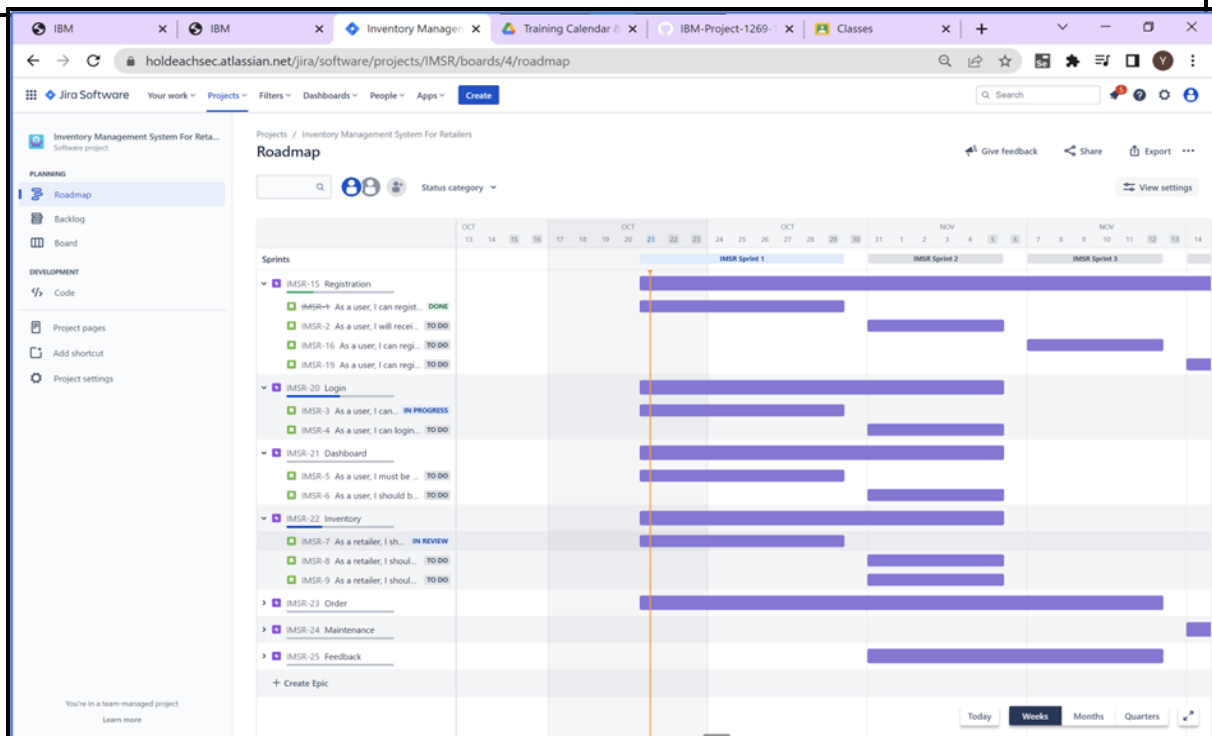
You're in a team-managed project. Learn more

Assign story points to each process.



- Assign each process to a epic.
- Start the Sprint-1 and then move cards in the scrum board when its finished.

Roadmap for the project:



Thus in this way SCRUM framework in JIRA can be used for the management of our project.

CHAPTER 7

CODING AND SOLUTIONING

The main features included in our project are,

- Generates alert mail upon product shortage (Using Sendgrid)
- Dashboard changes upon adding Product movements
- User Credentials are secured using encryption algorithms

7.1. Generates alert mail upon product shortage

This feature is the most important feature of the application. The working of this feature is that whenever a product movement is added, it checks for the product shortage and if the product availability goes below that 0, then an alert mail is sent to the user inbox so that he can fill the main inventory or the particular warehouse with the product which is short.

Code:

```
1  import smtplib
2  from email.mime.multipart import MIMEMultipart
3  from email.mime.text import MIMEText
4  from email.mime.base import MIMEBase
5
6  def alert(main_msg):
7      mail_from = '19i361@psgtech.ac.in'
8      mail_to = '19i303@psgtech.ac.in'
9      msg = MIMEMultipart()
10     msg['From'] = mail_from
11     msg['To'] = mail_to
12     msg['Subject'] = '!Alert Mail On Product Shortage! - Regards'
13     mail_body = main_msg
14     msg.attach(MIMEText(mail_body))
15     try:
```

```

16     server = smtplib.SMTP_SSL('smtp.sendgrid.net', 465)
17     server.ehlo()
18     server.login('apikey', 'SENDGRID_APIKEY')
19     server.sendmail(mail_from, mail_to, msg.as_string())
20     server.close()
21     print("Mail sent successfully!")
22 except:
23     print("Some Issue, Mail not Sent :(")
24

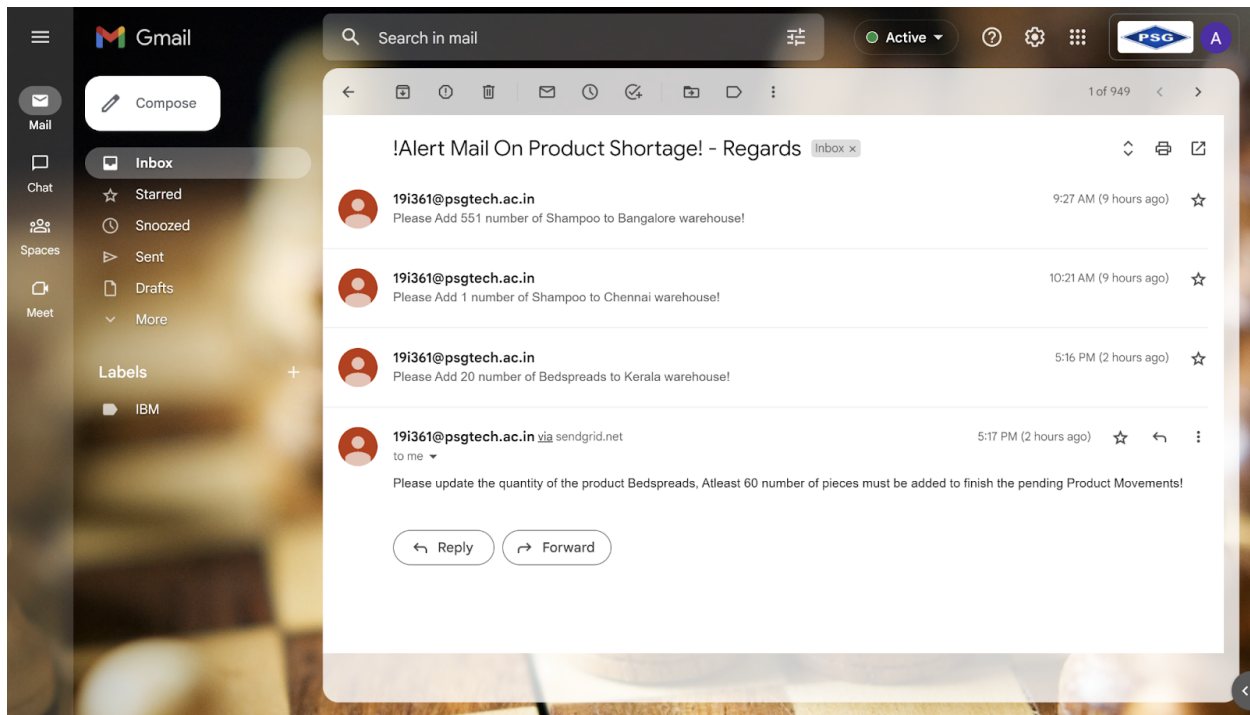
```

Output:

The screenshot shows a web application interface for managing products. The browser address bar indicates the URL is 169.51.207.105:30958/products. The application has a navigation bar with links to Home, Products, Location, and Product Movements, along with Logout and Dashboard options. The main content area is titled 'Products' and features an 'Add Product' button. Below this is a table with the following data:

Product ID	Product Cost	Product Quantity	Edit	Delete
Furnitures	20000	50	Edit	Delete
Bedspreads	600	-60	Edit	Delete
Shampoo	50	520	Edit	Delete

If the product has negative or 0 value then an email is generated to alert the user to refill the inventory with that particular product.



Solutioning:

Thus with this feature the user can refill the products in the inventory and also he won't lose the profits of that particular product movement.

7.2. Dashboard changes upon adding Product movements

Using this feature, users can track the amount of products available in each warehouse apart from the main inventory. Eventually users can fill up the warehouse with products if there is a need or shortage of products. Also this helps in prediction of future sales and analysis of dead and fast moving goods.

Code:

Front-end:

```
1 {% extends 'layout.html' %}
2
3 {% block body %}
4     <h1>Dashboard <small>Welcome {{session.username}}</small></h1>
```

```

5      <hr>
6      {% for location in locations %}
7      <div>
8          <h3 class="mt-4 text-primary" >{{location}}</h3>
9          <table class="table table-striped">
10             <thead>
11                 <tr>
12                     <th>Product</th>
13                     <th>Warehouse</th>
14                     <th>Qty</th>
15                 </tr>
16             </thead>
17             <tbody>
18                 {% for product in products %}
19                     {% if product.LOCATION_ID == location %}
20                     <tr>
21                         <td>{{product.PRODUCT_ID}}</td>
22                         <td>{{product.LOCATION_ID}}</td>
23                         <td>{{product.QTY}}</td>
24                     </tr>
25                     {% endif %}
26                 {% endfor %}
27             </tbody>
28         </table>
29         <hr>
30     </div>
31 {% endfor %}
32 {% endblock %}

```

Backend:

```
1  #Dashboard
2  @app.route('/dashboard')
3  @is_logged_in
4  def dashboard():
5      sql2="SELECT product_id, location_id, qty FROM product_balance"
6      sql3="SELECT location_id FROM locations"
7      stmt2 = ibm_db.prepare(conn, sql2)
8      stmt3 = ibm_db.prepare(conn, sql3)
9
10     result=ibm_db.execute(stmt2)
11     ibm_db.execute(stmt3)
12
13
14     products=[]
15     row = ibm_db.fetch_assoc(stmt2)
16     while(row):
17         products.append(row)
18         row = ibm_db.fetch_assoc(stmt2)
19     products=tuple(products)
20
21     locations=[]
22     row2 = ibm_db.fetch_assoc(stmt3)
23     while(row2):
24         locations.append(row2)
25         row2 = ibm_db.fetch_assoc(stmt3)
26     locations=tuple(locations)
27
28     locs = []
29     for i in locations:
```

```

30     locs.append(list(i.values())[0])
31
32     if result>0:
33         return render_template('dashboard.html', products =
products, locations = locs)
34     else:
35         message='No products found'
36         return render_template('dashboard.html', msg=msg)

```

Output:

IMSR Home Products Location Product Movements Logout Dashboard

you are now logged in

Dashboard Welcome Yaswanth

Chennai

Product	Warehouse	Qty
Bedspreads	Chennai	80

Kerala

Product	Warehouse	Qty
Bedspreads	Kerala	-20

Punjab

Product	Warehouse	Qty
Bedspreads	Punjab	100

Solutioning:

Thus this feature helps the users or retailers to keep in track of inventory and warehouses. They can also manage the inventory and warehouses efficiently with the information provided by this feature.

7.3. User Credentials are secured using encryption algorithms

This feature makes the application more secure. The user credentials are encrypted using strong encryption algorithms like SHA-256 which makes the data unbreachable. This is the vital feature which protects the user data from unauthorized access or being breached.

Code:

```

1  #secure user register
2  @app.route('/register', methods=['GET','POST'])
3  def register():
4      form = RegisterForm(request.form)
5      if request.method == 'POST' and form.validate():
6          name = form.name.data
7          email = form.email.data
8          username = form.username.data
9          #Encryption of user credentials
10         password = sha256_crypt.encrypt(str(form.password.data))
11
12         sql1="INSERT INTO users(name, email, username, password)
13         VALUES(?,?,?,?)"
14         stmt1 = ibm_db.prepare(conn, sql1)
15         ibm_db.bind_param(stmt1,1,name)
16         ibm_db.bind_param(stmt1,2,email)
17         ibm_db.bind_param(stmt1,3,username)
18         ibm_db.bind_param(stmt1,4,password)
19         ibm_db.execute(stmt1)
20         #for flash messages taking parameter and the category of
21         message to be flashed
22         flash("You are now registered and can log in", "success")
23
24         #when registration is successful redirect to home

```

```

23         return redirect(url_for('login'))
24     return render_template('register.html', form = form)

```

Output:

The picture__ shows the encrypted form of password given by the user while registering their account.

IBM Db2 on Cloud

Load Data Load History **Tables** Views Indexes Aliases MQTs Sequences Application objects

SWC17779.USERS Back

Export to CSV

ID	NAME	EMAIL	USERNAME	PASSWORD	REGISTER_DATE
1	Yaswanth M	19i361@psgtech.ac.in	Yaswanth	\$5\$rounds=535000\$BaV6TIPYheDv.wsJ\$729K4B73cS Ma12Ln9BwFCYAaOfX9aN5k9MSkm0JHuQ4	2022-11-11 03:22:31.377965
2	Abishek L R	19i303@psgtech.ac.in	Abishek	\$5\$rounds=535000\$6ss1Y6xfxCE.aOaw\$SX1ckHzPDaN 8sSIPNzIqb5HrAavJDmHRnQQ3dGEFT1.	2022-11-11 04:40:27.169944
3	Kaaviya A	19i325@psgtech.ac.in	Kaaviya	\$5\$rounds=535000\$aadVc0fehck2SaKW\$KqWMKIY7IU d.pDwAG08sBBy3RSh/gWN861Vt4GjNdSD	2022-11-11 07:04:24.785547
4	Prediksha R L	19i337@psgtech.ac.in	Prediksha	\$5\$rounds=535000\$6p8qALNUeEFD7Dun\$VjmUIZ8YyY krZDWdu2rMvHbvNckj/Xj99hh8RMx99D1	2022-11-12 07:49:52.242721
5	Xx	Xx@gmail.com	X	\$5\$rounds=535000\$LfQIEiE/fnmzw8bn\$8euF1kzRpxEV vDKxwB5W1a4oIJrYnWrMLPAoI4Z7np7	2022-11-14 10:00:38.88142
6	Admin	19i361@psgtech.ac.in	admin	\$5\$rounds=535000\$np/9EVvi8lAxEmss\$CBhdjoZxz7bY VyTbjgZTZxV1wLbgTkLE.XMr4WM61OC	2022-11-14 11:41:20.703704
7	Admin123	yas@gmail.com	admin1234	\$5\$rounds=535000\$GspGV3738DT0P4Cb\$Ll101iM6O7 qQoedhbAzmDi6LWQl1zoTgCYhtaiSTSh4	2022-11-14 12:06:58.857036

Solutioning:

In this way the password of the user is encrypted using the sha256 algorithm before it is saved in the database. Thus even when a hacker gets the encrypted password of the user, he will not be able to decrypt it. So, Security is preserved using this feature.

CHAPTER 8

TESTING

8.1. TestCases

There are numerous test cases in the application. Here are some test cases related to the login page. A detailed view on those test cases are given in the form of test case id, feature type, component, test scenarios of that particular test case id, steps to execute that particular test case, test data given as input, expected result of the test case, actual result if the test case, status.

Test Case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status
LoginPage_TC_OO1	Functional	Home Page	Verify user is able to see the Login/Signup pop-up when user clicked on My account button	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup pop-up displayed or not	http://169.51.207.105:30958/	Login/Signup pop-up should display	Working as expected	Pass
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements in Login/Signup pop-up	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup pop-up 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	http://169.51.207.105:30958/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Fail

LoginPage_TC_OO3	Functional	Home page	Verify user is able to log into application with Valid credentials	1.Enter URL 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: abisheklr66@gmail.com password: abi123	User should navigate to user account homepage	Working as expected	pass
LoginPage_TC_OO4	Functional	Login page	Verify user is able to log into application with Invalid credentials	1.Enter URL 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: abisheklr66@gmail.com password: abi123	Application should show 'Incorrect email or password ' validation message.	Working as expected	Fail
LoginPage_TC_OO4	Functional	Login page	Verify user is able to log into application with Invalid credentials	1.Enter URL and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: abisheklr66@gmail.com password: abi123has2	Application should show 'Incorrect email or password ' validation message.	Working as expected	pass

LoginPa ge_TC_ OO5	Functional	Login page	Verify user is able to log into application with Invalid credentials	1.Enter URL 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: abisheklr password: abi1233ha 82	Application should show 'Incorrect email or password ' validation message.		
--------------------------	------------	------------	--	---	--	---	--	--

Test Scenarios:**Login Page:**

- 1.Verify user can see login page
- 2.Verify if the user can login to the application or not?
- 3.Verify users can navigate to create your account page?
- 4.Verify user can recovery password
- 5.Verify login page elements

ADD Location:

- 1.Verify user can add location
- 2.Verify user can edit the location
- 3.Verify user can delete the location
- 4.Verify user is able to see locations in the dashboard
- 5.Verify user can see the locations in products movement page

Add Products:

- 1.Verify user can add products in product page
- 2.Verify user can edit the product
- 3.Verify user can delete the product
- 4.Verify user can edit the cost and quantity
- 5.Verify user is able to see the product in products movement page

Add Products Movement:

- 1.Verify user can add product movements
- 2.Verify user can edit the product Movement

3. Verify user can delete the product Movement
4. Verify user can see the quantity change in the locations after adding the movement
5. Verify user can see the product movement change in dashboard

8.2. User Acceptance Testing

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).

The table 8.1 shows the defect analysis, i.e., 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	8	7	1	2	18
Duplicate	2	0	2	0	4
External	2	3	1	2	8
Fixed	12	1	5	17	35
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	16	13	23	76

The table 8.2 shows the test case analysis, i.e., the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	6	0	0	6
Client Application	55	0	0	55
Security	4	0	0	4
Outsource Shipping	3	0	0	3
Exception Reporting	8	0	0	8
Final Report Output	4	0	0	4
Version Control	2	0	0	2

CHAPTER 9

ADVANTAGES AND DISADVANTAGES

Accurate inventory management is the key to a successful product business. Regular inventory tracking helps prevent inventory errors and other issues. The cost of storing unsold products increases, especially when goods are stored in large warehouses awaiting shipment. Depending on the location, large warehouses can be expensive due to high real estate prices. A well-managed inventory system reduces the number of products you need to stock and uses less storage space and storage space.

An effectively managed inventory system that uses continuous counting keeps up with the latest inventory numbers available. Knowing what you have in stock in your warehouse can help you avoid problems with customers purchasing out-of-stock items. This can lead to delivery delays and buyer dissatisfaction. Inventory management system facilitates tracking of ordered, produced and stocked products. This type of system allows managers to focus on running their business instead of receiving customer complaints about out of stock.

Information obtained from the inventory management system allows you to understand past sales trends. Manufacturers can use this data to make informed decisions about future production levels and avoid overproduction or underproduction. One of the main benefits of good inventory management with an inventory management system is the flexibility to adapt to all common management techniques. Some companies have preferred methods to ensure inventory levels meet demand.

Occasionally, orders are placed at irregular times, which may be inconvenient for the material manufacturer or supplier. You can't group items and order them all at once because you have less reorder points. If the order time is very long, the supplier may have 2-3 orders pending each

time, and may be able to deliver all orders at the same time. An EOQ can indicate an order quantity that is much less than the supplier's minimum quantity, and there is always the chance that the item's order quantity is met but not noticed, leading to out-of-stocks. The system assumes stable use and constant lead times. If these fluctuate significantly, new order quantities and points must be set, which is quite troublesome.

CHAPTER 10

CONCLUSION

In this project, we have created a web based application for Inventory management system for retailers using python, IBM cloud services such as IBM Database, IBM Container registry, IBM Kubernetes service and Send grid for generating alert mails. This application includes various features that support the users or retailers to manage their inventory with ease and efficiently. This application can easily be scaled as it is deployed in IBM cloud which supports easy scalability using Auto Scaling Technologies. Additionally these features, various other features can also be integrated as a part of future enhancement to improve the industrial value of the application.

CHAPTER 11

FUTURE SCOPE

This project can be enhanced in many ways. Some features that could be added are user authorization by the administrator, Automatic refill of products from the main inventory to warehouses on condition that main inventory has the products but the warehouse is in shortage. These are a few functionalities that could be added to improve the application. As of now the dashboard is only in view only mode but as a future enhancement, generation of report (Automation of PDF download) can be done using python. Thus these are the future enhancements that could be implemented in order to make our application more versatile and increase its usability and scalability.

CHAPTER 12

APPENDIX

Source Code:

To keep the documentation clean we are providing the github link where we uploaded our final code rather than putting the 1050 apprx. lines of code in this documentation.

The complete code of our project has been uploaded in our github repository. We will provide the link for the source code below where the entire code can be and used for future enhancements.

Source code link: <https://github.com/IBM-EPBL/IBM-Project-1269-1658382470/tree/main/Final%20Deliverables/Final%20Code>

Github link: <https://github.com/IBM-EPBL/IBM-Project-1269-1658382470>

Demonstration Video link: <https://vimeo.com/770710318>