PROJECT REPORT

Team ID	**TEAM ID - PNT2022TMID39249**
Project Name	**INVENTORY MANAGEMENT SYSTEM FOR RETAILERS**

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. In today's more turbulent environment there is no longer any possibility of manufacturing and marketing acting independently of each other. It is now generally accepted that the need to understand and meet customer requirements is a prerequisite for survival. At the same time, in the search for improved cost competitiveness, manufacturing management has been the subject of massive renaissance. The last decade has seen the rapid introduction of flexible manufacturing systems, of new approaches to inventory based on materials requirement planning (MRP) and just in time (JIT) methods, a sustained emphasis on quality. Equally there has been a growing recognition of the critical role that procurement plays in creating and sustaining competitive advantage as part of an integrated logistics process.In this scheme of things, logistics is therefore essentially an integrative concept that seeks to develop a system wide view of the firm. It is fundamentally a planning concept that seeks to create a framework through which the needs of the manufacturing strategy and plan, which in turn link into a strategy and plan for procurement.

1.2 Purpose:

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. In the industries there will be a competitor who will be a low cost producer and will have greater sales volume in that sector. This is partly due to economies of scale, which enable fixed costs to spread over a greater volume but more particularly to the impact of the experience curve.It is possible to identify and predict improvements in the rate of output of workers as they become more skilled in the processes and tasks on which they work. Bruce Henderson extended this concept by demonstrating that all costs, not just production costs, would decline at a given rate as volume increased. This cost decline applies only to value added, i.e. costs other than bought in supplies. Traditionally it has been suggested that the main route to cost reduction was by gaining greater sales volume and there can be no doubt about the close linkage between relative market share and relative costs. However it must also be recognized that logistics management can provide a multitude of ways to increase efficiency and productivity and hence contribute significantly to reduced unit costs

1.3 Problem Statement Definition

Problem Statement (PS)	**I am (Customer)**	**I'm tryingto**	**But**	**Because**	**Which makes me feel**
PS-1	I am a rice shop owner who keeps his stock updated	Update the current stock in my inventory according to the customer's purchases	I 'm unable to upload and update the data	The serveris very baddue to the network in remote areas	Frustrated and unableto update the products which users needed.
PS-II	I am Murugesan, who is a customer toa shop.	Update the products which are not available at the store.	the datahas beenentered wrongly	heavy network traffic to update	to go for alternative decisions like searching on another shop, leave the product out etc.

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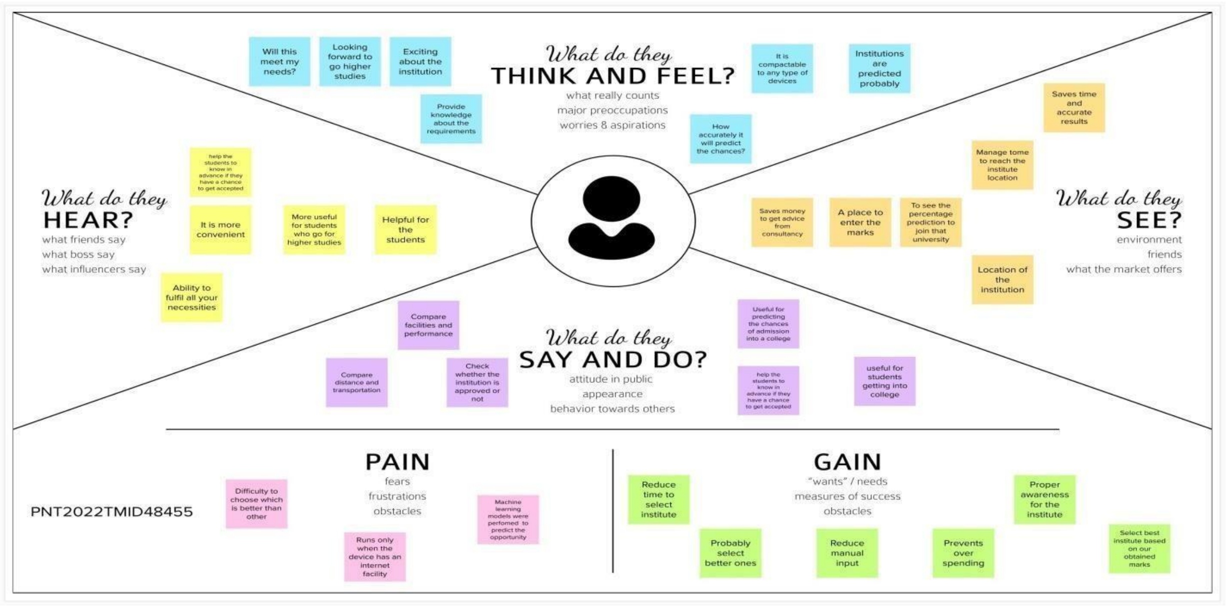
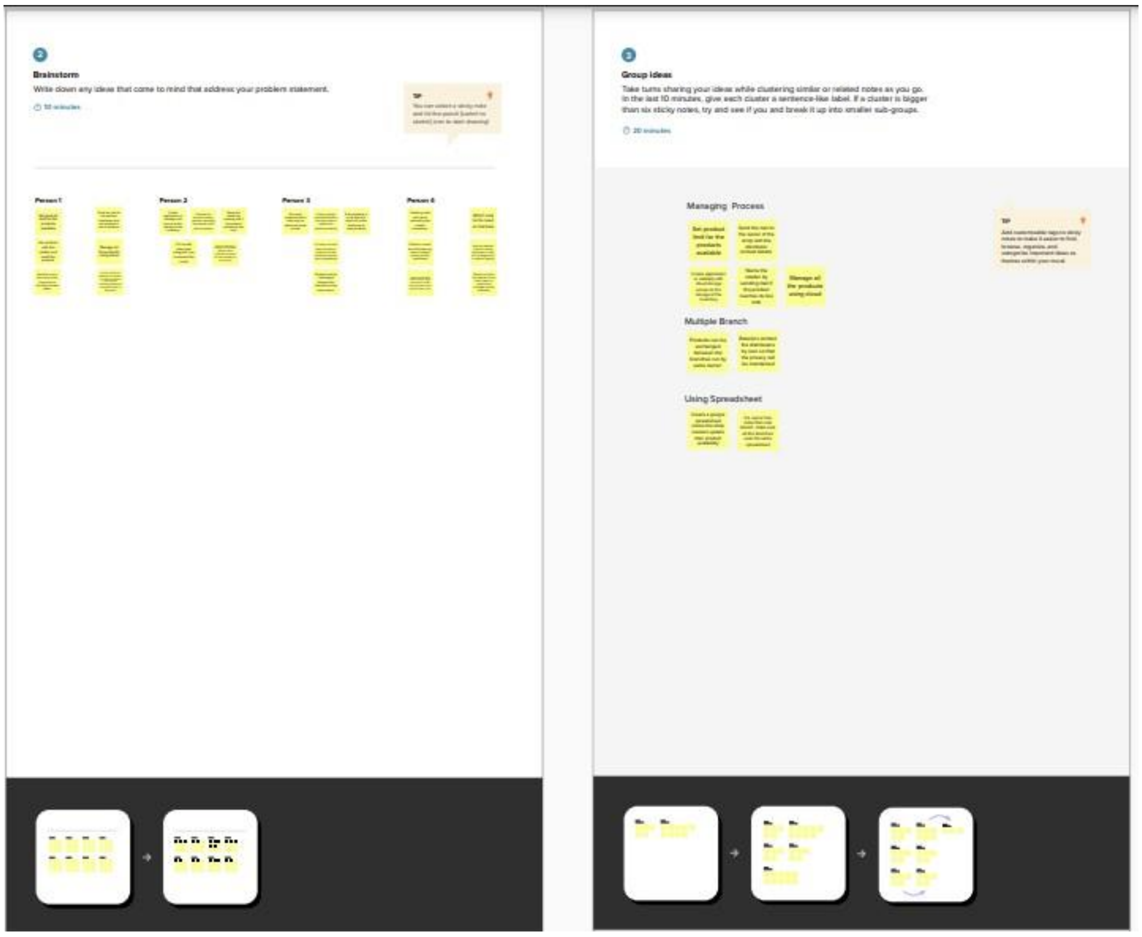
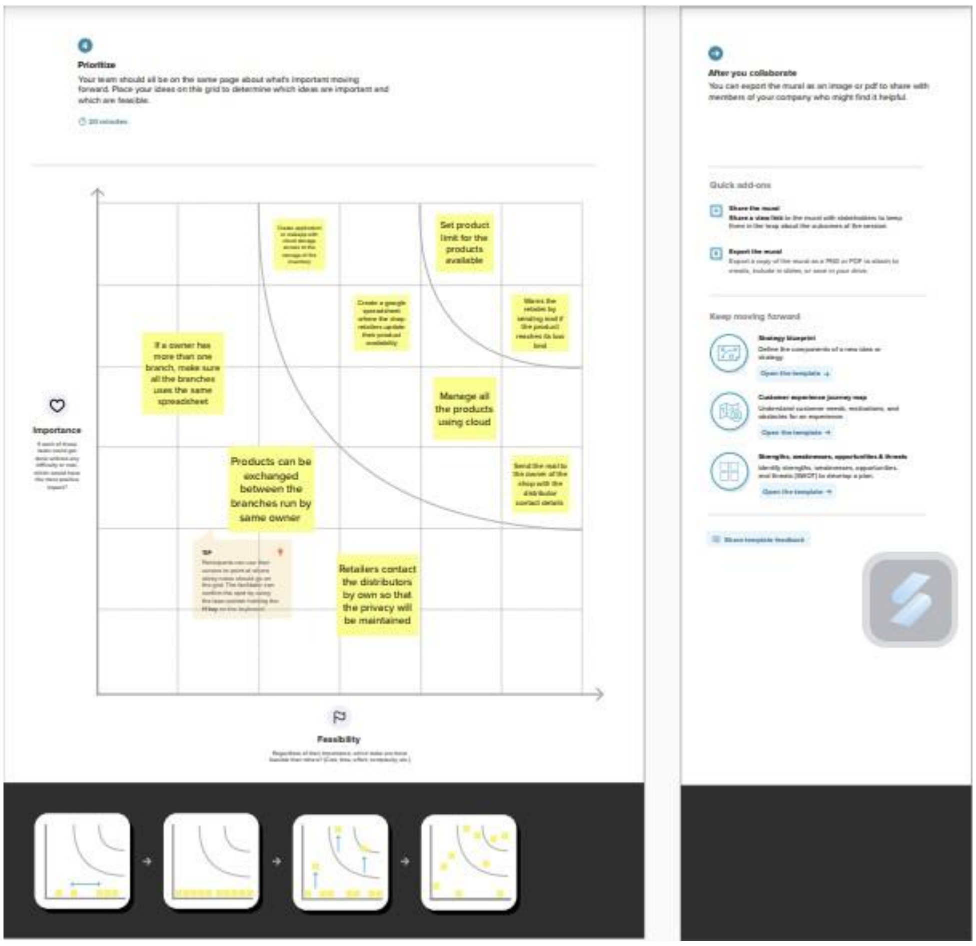
2.IDEATION & PROPOSED SOLUTION

2.1 Empathy Map Canvas


What do they
THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
Will this meet my needs?
Looking forward to go higher studies
Exciting about the institution
Provide knowledge about the requirements
It is compactable to any type of devices
Institutions are predicted probably
How accurately it will predict the chances?
What do they
HEAR?
what friends say
what boss say
what influencers say
help the students to know in advance if they have a chance to get accepted
It is more convenient
More useful for students who go for higher studies
Helpful for the students
Ability to fulfil all your necessities
What do they
SEE?
environment
friends
what the market offers
Saves time and accurate results
Manage tome to reach the institute location
Saves money to get advice from consultancy
A place to enter the marks
To see the percentage prediction to join that university
Location of the institution
What do they
SAY AND DO?
attitude in public
appearance
behavior towards others
Compare facilities and performance
Compare distance and transportation
Check whether the institution is approved or not
Useful for predicting the chances of admission into a college
help the students to know in advance if they have a chance to get accepted
useful for students getting into college
PAIN
fears
frustrations
obstacles
PNT2022TMID48455
Difficulty to choose which is better than other
Runs only when the device has an internet facility
Machine learning models were perfomed to predict the opportunity
GAIN
"wants" / needs
measures of success
obstacles
Reduce time to select institute
Probably select better ones
Reduce manual input
Prevents over spending
Proper awareness for the institute
Select best institute based on our obtained marks

2.2 Ideation & Brainstorming


Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
Person 1
Person 2
Person 3
Person 4
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
Managing Process
Multiple Branch
Using Spreadsheet



4

Prioritize

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

20 minutes

Create application or webapp with cloud storage access to the manage of the inventory

Set product limit for the products available

Create a google spreadsheet where the shop retailers update their product availability

Warns the retailer by sending mail if the product reaches its low limit

If a owner has more than one branch, make sure all the branches uses the same spreadsheet

Manage all the products using cloud

Products can be exchanged between the branches run by same owner

Send the mail to the owner of the shop with the distributor contact details

TIP [illegible]

Retailers contact the distributors by own so that the privacy will be maintained

Importance

[illegible]

Feasibility

[illegible]

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

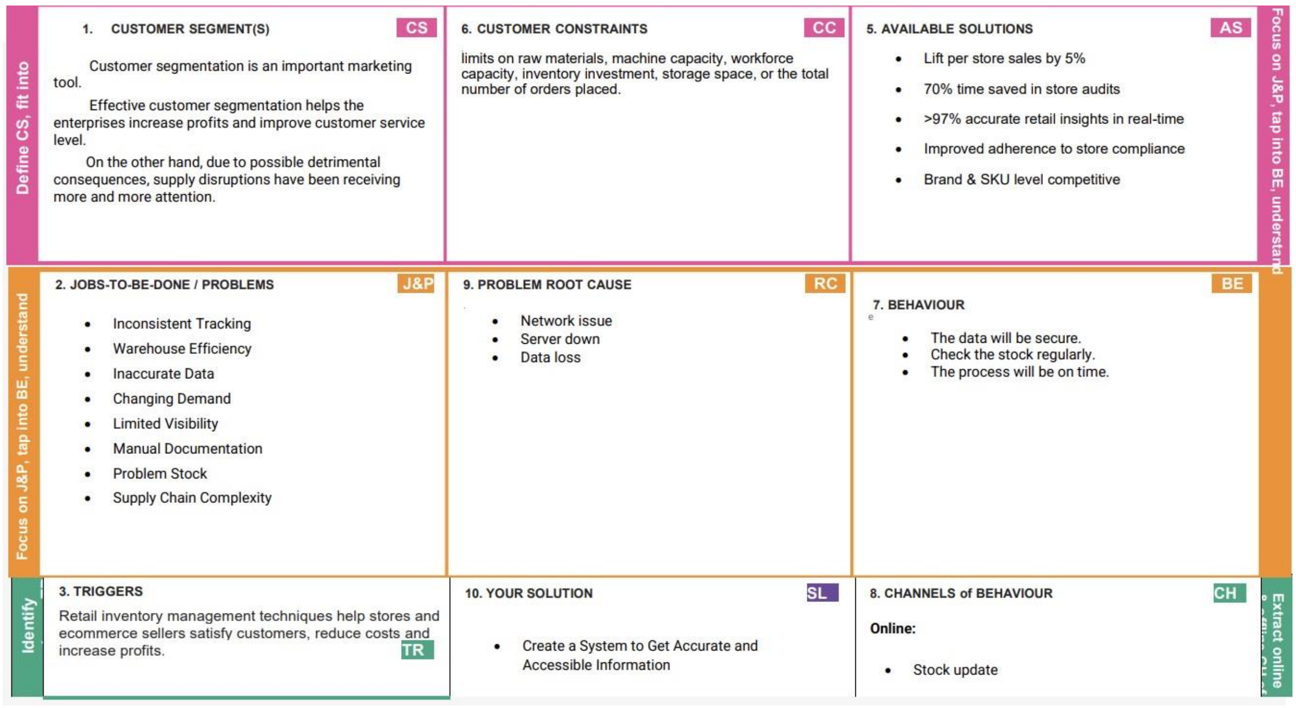
Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

Share template feedback

2.3 Proposed Solution

S. No.	Parameter	Description
1	Problem Statement	To solve the need that the shopkeepers doesn’t have the systematic way to keep theirrecord of inventory data.
2	Idea / Proposed Solution	An application which retailers successfully log in to the application, that they can updatetheir inventory details, also users will be ableto 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 the stock reduced to the limited amount found in the inventory. So that they can order new stock.
3	Novelty / Uniqueness	With this inventory management system, the shopkeeper not only can fill the inventory butalso reduce the wastage of goods. The users can register the stocks that they need by logging in from their account.
4	Social Impact / CustomerSatisfaction	Customer Satisfaction is entirely depend onthe services which they expected. If the retailer’s system exceeds with customer’s expectation, the customers will be satisfied.
5	Business Model	With the better inventory management system, Update the inventory without any need of manpower. Retailer can live up withuser’s need and be on the flow with current sale products and they can update the inventory with that products.
6	Scalability of the Solution	To create a scalable inventory managementsystem, the retailer have to 1. Keeping low inventory levels asmuch as possible 2. Keep an eye on Sales Projections 3. Use ODM (On-Demand Manufacturing). ODM refers to manufacture or in this case, update the products which are highly indemand.

2.4 Problem Solution fit



Define CS, fit into

1. CUSTOMER SEGMENT(S) CS

Customer segmentation is an important marketing tool.

Effective customer segmentation helps the enterprises increase profits and improve customer service level.

On the other hand, due to possible detrimental consequences, supply disruptions have been receiving more and more attention.

6. CUSTOMER CONSTRAINTS CC

limits on raw materials, machine capacity, workforce capacity, inventory investment, storage space, or the total number of orders placed.

5. AVAILABLE SOLUTIONS AS

- Lift per store sales by 5%
- 70% time saved in store audits
- >97% accurate retail insights in real-time
- Improved adherence to store compliance
- Brand & SKU level competitive

Focus on J&P, tap into BE, understand

Focus on J&P, tap into BE, understand

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

- Inconsistent Tracking
- Warehouse Efficiency
- Inaccurate Data
- Changing Demand
- Limited Visibility
- Manual Documentation
- Problem Stock
- Supply Chain Complexity

9. PROBLEM ROOT CAUSE RC

- Network issue
- Server down
- Data loss

7. BEHAVIOUR BE

- The data will be secure.
- Check the stock regularly.
- The process will be on time.

Identify

3. TRIGGERS

Retail inventory management techniques help stores and ecommerce sellers satisfy customers, reduce costs and increase profits. TR

10. YOUR SOLUTION SL

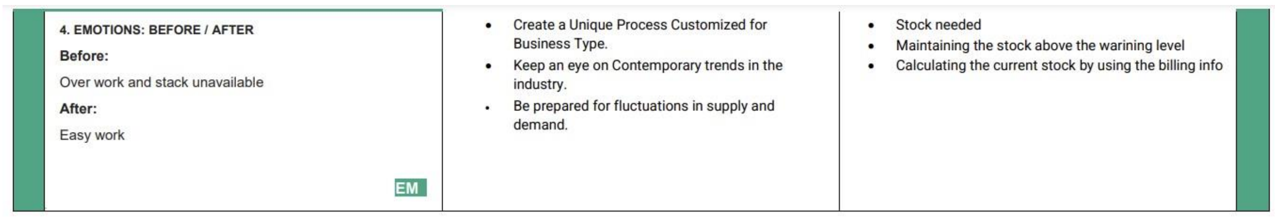
- Create a System to Get Accurate and Accessible Information

8. CHANNELS of BEHAVIOUR CH

Online:

- Stock update

Extract online



4. EMOTIONS: BEFORE / AFTER

Before:

Over work and stack unavailable

After:

Easy work

EM

- Create a Unique Process Customized for Business Type.
- Keep an eye on Contemporary trends in the industry.
- Be prepared for fluctuations in supply and demand.

- Stock needed
- Maintaining the stock above the warining level
- Calculating the current stock by using the billing info

Solution Architecture

3.REQUIREMENT ANALYSIS

3.1 Functional requirement

Followingarethefunctionalrequirementsoftheproposedsolution.

FR No.	Functional Requirement(Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Email
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Login	Log into the application by entering theEmail and Password
FR-4	Dashboard	View the products availability
FR-5	Add items to cart	Users they wish to buy products, they canadd it to the cart.
FR-6	Stock Update	If the desired product is unavailable, theycan update the products into the list for buying products.

3.2 Non-Functional requirements

Followingarethenon-functionalrequirementsoftheproposedsolution.

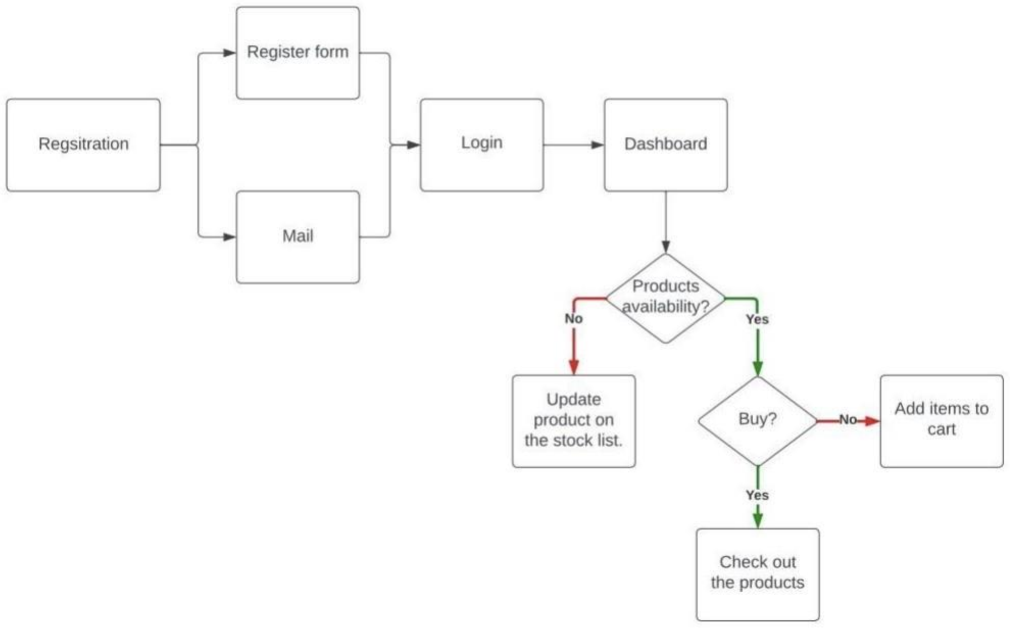
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	While usability determines how effective implementing an inventory tracking system is in your business. If it takes hours for your staff to learn the ins and outs of the software, then it’s probably not worth buying.
NFR-2	**Security**	The process of ensuring the safety and optimum management control of storedgoods. It is of central importance for optimum warehouse management because the performance of a companystands or falls with the safety and efficiency of a warehouse.
NFR-3	**Reliability**	Relying on manual inventory counts to know what you have will only guaranteehigh inefficiencies and a loss of customers.

NFR-4	**Performance**	Creating systems to log products, receivethem into inventory, track changes whensales occur, manage the flow of goods from purchasing to final sale and check stock counts.
NFR-5	**Availability**	Whether a specific item is available for customer orders. Additional informationprovided by retailers may include the quantity available.
NFR-6	**Scalability**	They should use an automated inventory management system for inventory tracking. This will make your business much more scalable so that you can continue building consistent growth and take advantage of increased sales.

4.PROJECT DESIGN

4.1 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.



4.2 Solution & Technical Architecture:

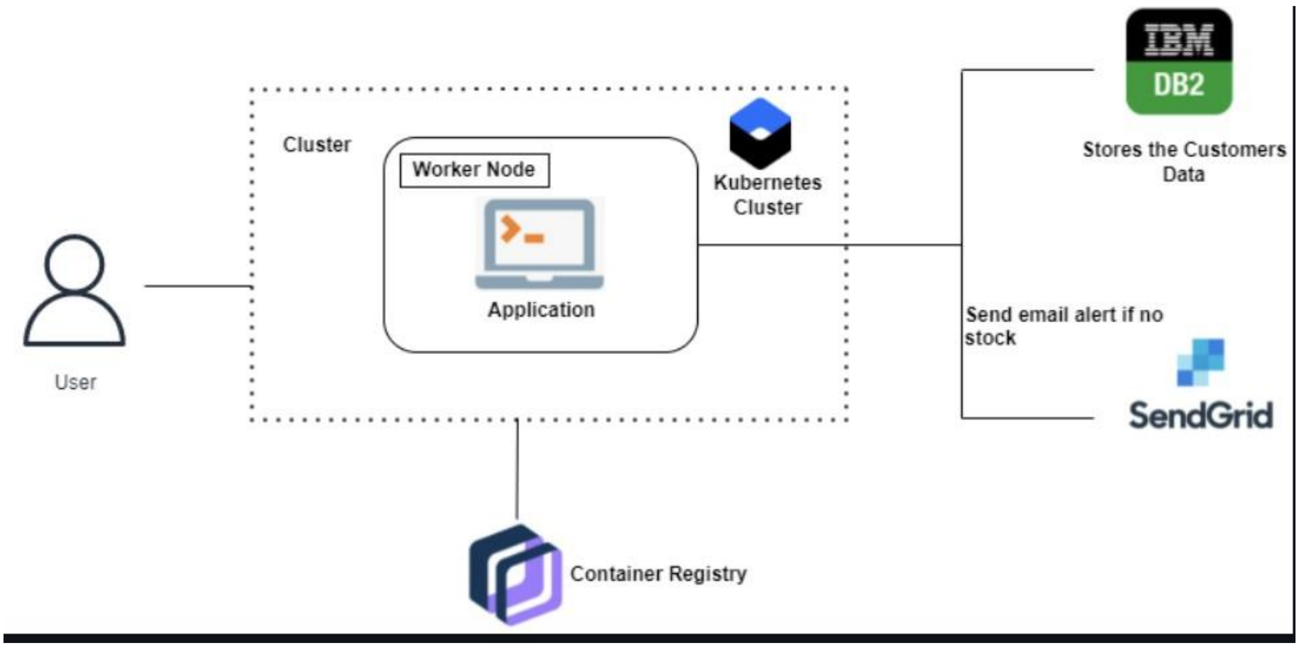


Table-1:Components&Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g.Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / AngularJs / React Js etc.
2.	Application Logic	Logic for a process in the application	Python-Flask
3.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
4.	Cloud Database	Database Service on Cloud	IBM DB2
5.	File Storage	File storage requirements	IBM Cloud Object Storage
6.	App Container	Contain the whole application in a singlecontainer	Docker Container / IBMContainer Registry
7.	Infrastructure (Server / Cloud)	Application Deployment on Local System /Cloud Local Server Configuration: Cloud Server Configuration:	Local, Cloud Foundry, Kubernetes, etc.
8.	Send Mails	Sending mails about stocks available in theInventory to the Retailer	SendGrid

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	React Js / Flask
2.	Security Implementations	List all the security / access controlsimplemented, use of firewalls etc.	IBM Cloud Security
3.	Availability	Justify the availability of application (e.g., use of load balancers, distributedservers etc.)	Python-Flask

4.3 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
Custoer (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 can register for the application through E-mail	I can access my account / dashboard	Medium	Sprint-1
	Confirmation	USN-3	As a user, I will receive confirmation email once I haveregistered for the application	I can get confirmation for myemail and passwordand create authent icated accoun t.	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password	I can log onto the application with verified email and password	High	Sprint-1
	Dashboard	USN-5	As a user, I can view the products which are available	Once I log on to the application, I can view products to buy.	High	Sprint-2

User Type	Functional Requiremen t(Epic)	User Story Numbe r	User Story / Task	Acceptance criteria	Priority	Release
	Add items tocart	USN-6	As a user, I can add the products Iwish to buy to the carts.	As a user, I can buyany products or addit to my cart for buying it later.	Medium	Sprint-2

	Stock Update	USN-7	As a user, I can add products whichare not available in the dashboard to the stock list.	If any of the products which are not available, as a user I can update the inventory and send mail to the owner.	Medium	Sprint-3
Custom erCare Executi ve	Request to Custome r Care	USN-8	As a user, I can contact the Customer Care Executive and request any services I want fromthe customer care.	As a user, I can contact Customer Care and get supportfrom them.	Low	Sprint-4
Administrator	Contact Administrato r	USN-9	I can be able to report any difficulties I experience as a report	As user, I can givemy support in my possible ways to administrator and the administration.	Medium	Sprint-4

5. PROJECT PLANNING & SCHEDULING

5.1 Sprint Planning & 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.	2	High	vethanathan
Sprint-1		USN-2	As a user, I can register for theapplication through E-mail	1	Medium	Vignesh Shree Kishore
Sprint-1	Confirmation	USN-3	As a user, I will receive confirmation email once I have registered for theapplication	2	Medium	Srivatsan, Vethanathan

Sprint	Functional Requirement(Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	2	High	Srivatsan
Sprint-2	Dashboard	USN-5	As a user, I can view the productswhich are available	4	High	vethanathan
Sprint-2	Add items to cart	USN-6	As a user, I can add the products Iwish to buy to the carts.	5	Medium	Vethanathan
Sprint-3	Stock Update	USN-7	As a user, I can add products which are not available in the dashboard tothe stock list.	5	Medium	Vignesh Shree Kishore
Sprint-4	Request to Customer Care	USN-8	As a user, I can contact the Customer Care Executive and requestany services I want from the customer care.	5	Low	Vethanathan
Sprint-4	Contact Administrator	USN-9	I can be able to report any difficultiesI experience as a report	5	Medium	Shree kishore Srivatsan

6.2. Sprint Delivery Schedule

Sprint	**Total Story Points**	**Duratio n**	**Sprint StartDate**	**Sprint End Date(Planned)**	**Story Points Completed (ason Planned End Date)**	**Sprint Release Date(Actual)**
Sprint-1	7	6 Days	24 Oct 2022	29 Oct 2022	7	29 Oct 2022
Sprint-2	9	6 Days	31 Oct 2022	05 Nov 2022	9	05 Nov 2022
Sprint-3	5	6 Days	07 Nov 2022	12 Nov 2022	5	12 Nov 2022
Sprint-4	10	6 Days	14 Nov 2022	19 Nov 2022	10	19 Nov 2022

6. CODING & SOLUTIONING

6.1 Feature 1

```
from flask import Flask, render_template, flash, redirect, url_for, session, request, logging
from wtforms import Form, StringField, TextAreaField, PasswordField, validators, SelectField,
IntegerField
import ibm_db
from passlib.hash import sha256_crypt
from functools import wraps

from sendgrid import *

#creating an app instance
app = Flask(_name_)

app.secret_key='a'

conn = ibm_db.connect("DATABASE=bludb;HOSTNAME=0c77d6f2-5da9-48a9-81f8-
86b520b87518.bs2io90l08kqb1od8lcg.databases.appdomain.cloud;PORT=31198;SECURITY=SSL;SSLS
ererCertificate=DigiCertGlobalRootCA.crt;UID=ldy44383;PWD=iW50uSQCx3l7ckXh",",")

#Index
@app.route('/')
def index():
    return render_template('home.html')

#Products
@app.route('/products')
def products():
    sql = "SELECT * FROM products"
    stmt = ibm_db.prepare(conn, sql)
    result=ibm_db.execute(stmt)

    products=[]
    row = ibm_db.fetch_assoc(stmt)
    while(row):
        products.append(row)
        row = ibm_db.fetch_assoc(stmt)
    products=tuple(products)
    #print(products)

    if result>0:
        return render_template('products.html', products = products)
    else:
        msg='No products found'
        return render_template('products.html', msg=msg)

#Locations
@app.route('/locations')
def locations():

    sql = "SELECT * FROM locations"
    stmt = ibm_db.prepare(conn, sql)
    result=ibm_db.execute(stmt)
    locations=[]
    row = ibm_db.fetch_assoc(stmt)
    while(row):
        locations.append(row)
        row = ibm_db.fetch_assoc(stmt)
    locations=tuple(locations)
    #print(locations)

    if result>0:
        return render_template('locations.html', locations = locations)
    else:
        msg='No locations found'
        return render_template('locations.html', msg=msg)

#Product Movements
@app.route('/product_movements')
def product_movements():

    sql = "SELECT * FROM productmovements"
    stmt = ibm_db.prepare(conn, sql)
    result=ibm_db.execute(stmt)

    movements=[]
    row = ibm_db.fetch_assoc(stmt)
    while(row):
        movements.append(row)
        row = ibm_db.fetch_assoc(stmt)
    movements=tuple(movements)
    #print(movements)

    if result>0:
        return render_template('product_movements.html', movements = movements)
    else:
        msg='No product movements found'
        return render_template('product_movements.html', msg=msg)

#Register  Form Class
class RegisterForm(Form):
    name = StringField('Name', [validators.Length(min=1, max=50)])
    username = StringField('Username', [validators.Length(min=1, max=25)])
    email = StringField('Email', [validators.length(min=6, max=50)])
    password = PasswordField('Password', [
        validators.DataRequired(),
        validators.EqualTo('confirm', message='Passwords do not match')
    ])
    confirm = PasswordField('Confirm Password')

#user register
@app.route('/register', methods=['GET','POST'])
def register():
    form = RegisterForm(request.form)
    if request.method == 'POST' and form.validate():
        name = form.name.data
        email = form.email.data
        username = form.username.data
        password = sha256_crypt.encrypt(str(form.password.data))
        sql1="INSERT INTO users(name, email, username, password) VALUES(?,?,?,?)"
        stmt1 = ibm_db.prepare(conn, sql1)
        ibm_db.bind_param(stmt1,1,name)
        ibm_db.bind_param(stmt1,2,email)
        ibm_db.bind_param(stmt1,3,username)
        ibm_db.bind_param(stmt1,4,password)
        ibm_db.execute(stmt1)
        #for flash messages taking parameter and the category of message to be flashed
        flash("You are now registered and can log in", "success")

        #when registration is successful redirect to home
        return redirect(url_for('login'))
    return render_template('register.html', form = form)


#User login
@app.route('/login', methods = ['GET', 'POST'])
def login():
    if request.method == 'POST':
        #Get form fields
        username = request.form['username']
        password_candidate = request.form['password']

        sql1="Select * from users where username = ?"
        stmt1 = ibm_db.prepare(conn, sql1)
        ibm_db.bind_param(stmt1,1,username)
        result=ibm_db.execute(stmt1)
        d=ibm_db.fetch_assoc(stmt1)
        if result > 0:
            #Get the stored hash
            data = d
            password = data['PASSWORD']

            #compare passwords
            if sha256_crypt.verify(password_candidate, password):
                #Passed
                session['logged_in'] = True
                session['username'] = username

                flash("you are now logged in","success")
                return redirect(url_for('dashboard'))
            else:
                error = 'Invalid Login'
                return render_template('login.html', error=error)
            #Close connection
            cur.close()
        else:
            error = 'Username not found'
            return render_template('login.html', error=error)
    return render_template('login.html')

#check if user logged in
def is_logged_in(f):
    @wraps(f)
    def wrap(*args, **kwargs):
        if 'logged_in' in session:
            return f(*args, **kwargs)
        else:
            flash('Unauthorized, Please login','danger')
            return redirect(url_for('login'))
    return wrap

#Logout
@app.route('/logout')
@is_logged_in
def logout():
    session.clear()
    flash("You are now logged out", "success")
    return redirect(url_for('login'))

#Dashboard
@app.route('/dashboard')
@is_logged_in
def dashboard():
    sql2="SELECT product_id, location_id, qty FROM product_balance"
    sql3="SELECT location_id FROM locations"
    stmt2 = ibm_db.prepare(conn, sql2)
    stmt3 = ibm_db.prepare(conn, sql3)

    result=ibm_db.execute(stmt2)
    ibm_db.execute(stmt3)


    products=[]
    row = ibm_db.fetch_assoc(stmt2)
    while(row):
        products.append(row)
        row = ibm_db.fetch_assoc(stmt2)
    products=tuple(products)

    locations=[]
    row2 = ibm_db.fetch_assoc(stmt3)
    while(row2):
        locations.append(row2)
        row2 = ibm_db.fetch_assoc(stmt3)
    locations=tuple(locations)

    locs = []
    for i in locations:
        locs.append(list(i.values())[0])

    if result>0:
        return render_template('dashboard.html', products = products, locations = locs)
    else:
        msg='No products found'
        return render_template('dashboard.html', msg=msg)

#Product  Form Class
class ProductForm(Form):
    product_id = StringField('Product ID', [validators.Length(min=1, max=200)])
    product_cost = StringField('Product Cost', [validators.Length(min=1, max=200)])
    product_num = StringField('Product Num', [validators.Length(min=1, max=200)])
```

```
#Add Product
@app.route('/add_product', methods=['GET', 'POST'])
@is_logged_in
def add_product():
    form = ProductForm(request.form)
    if request.method == 'POST' and form.validate():
        product_id = form.product_id.data
        product_cost = form.product_cost.data
        product_num = form.product_num.data



        sql1="INSERT INTO products(product_id, product_cost, product_num) VALUES(?,?,?)"
        stmt1 = ibm_db.prepare(conn, sql1)
        ibm_db.bind_param(stmt1,1,product_id)
        ibm_db.bind_param(stmt1,2,product_cost)
        ibm_db.bind_param(stmt1,3,product_num)

        ibm_db.execute(stmt1)

        flash("Product Added", "success")

        return redirect(url_for('products'))

    return render_template('add_product.html', form=form)

#Edit Product
@app.route('/edit_product/<string:id>', methods=['GET', 'POST'])
@is_logged_in
def edit_product(id):
    sql1="Select * from products where product_id = ?"
    stmt1 = ibm_db.prepare(conn, sql1)
    ibm_db.bind_param(stmt1,1,id)
    result=ibm_db.execute(stmt1)
    product=ibm_db.fetch_assoc(stmt1)

    print(product)
    #Get form
    form = ProductForm(request.form)

    #populate product form fields
    form.product_id.data = product['PRODUCT_ID']
    form.product_cost.data = str(product['PRODUCT_COST'])
    form.product_num.data = str(product['PRODUCT_NUM'])

    if request.method == 'POST' and form.validate():
        product_id = request.form['product_id']
        product_cost = request.form['product_cost']
        product_num = request.form['product_num']

        sql2="UPDATE products SET product_id=?,product_cost=?,product_num=? WHERE product_id=?"
        stmt2 = ibm_db.prepare(conn, sql2)
        ibm_db.bind_param(stmt2,1,product_id)
        ibm_db.bind_param(stmt2,2,product_cost)
        ibm_db.bind_param(stmt2,3,product_num)
        ibm_db.bind_param(stmt2,4,id)
        ibm_db.execute(stmt2)

        flash("Product Updated", "success")

        return redirect(url_for('products'))

    return render_template('edit_product.html', form=form)

#Delete Product
@app.route('/delete_product/<string:id>', methods=['POST'])
@is_logged_in
def delete_product(id):

    sql2="DELETE FROM products WHERE product_id=?"
    stmt2 = ibm_db.prepare(conn, sql2)
    ibm_db.bind_param(stmt2,1,id)


    ibm_db.execute(stmt2)

    flash("Product Deleted", "success")

    return redirect(url_for('products'))

#Location  Form Class
class LocationForm(Form):
    location_id = StringField('Location ID', [validators.Length(min=1, max=200)])

#Add Location
@app.route('/add_location', methods=['GET', 'POST'])
@is_logged_in
def add_location():
    form = LocationForm(request.form)
    if request.method == 'POST' and form.validate():
        location_id = form.location_id.data

        sql2="INSERT into locations VALUES(?)"
        stmt2 = ibm_db.prepare(conn, sql2)
        ibm_db.bind_param(stmt2,1,location_id)
        ibm_db.execute(stmt2)

        flash("Location Added", "success")

        return redirect(url_for('locations'))

    return render_template('add_location.html', form=form)

#Edit Location
@app.route('/edit_location/<string:id>', methods=['GET', 'POST'])
@is_logged_in
def edit_location(id):

    sql2="SELECT * FROM locations where location_id = ?"
    stmt2 = ibm_db.prepare(conn, sql2)
    ibm_db.bind_param(stmt2,1,id)
    result=ibm_db.execute(stmt2)
    location=ibm_db.fetch_assoc(stmt2)
    #Get form
    form = LocationForm(request.form)
    print(location)

    #populate article form fields
    form.location_id.data = location['LOCATION_ID']

    if request.method == 'POST' and form.validate():
        location_id = request.form['location_id']

        sql2="UPDATE locations SET location_id=? WHERE location_id=?"
        stmt2 = ibm_db.prepare(conn, sql2)
        ibm_db.bind_param(stmt2,1,location_id)
        ibm_db.bind_param(stmt2,2,id)
        ibm_db.execute(stmt2)

        flash("Location Updated", "success")

        return redirect(url_for('locations'))

    return render_template('edit_location.html', form=form)



#Delete Location
@app.route('/delete_location/<string:id>', methods=['POST'])
@is_logged_in
def delete_location(id):
    sql2="DELETE FROM locations WHERE location_id=?"
    stmt2 = ibm_db.prepare(conn, sql2)
    ibm_db.bind_param(stmt2,1,id)
    ibm_db.execute(stmt2)

    flash("Location Deleted", "success")

    return redirect(url_for('locations'))

#Product Movement Form Class
class ProductMovementForm(Form):
    from_location = SelectField('From Location', choices=[])
    to_location = SelectField('To Location', choices=[])
    product_id = SelectField('Product ID', choices=[])
    qty = IntegerField('Quantity')

class CustomError(Exception):
    pass

#Add Product Movement
@app.route('/add_product_movements', methods=['GET', 'POST'])
@is_logged_in
def add_product_movements():
    form = ProductMovementForm(request.form)

    sql2="SELECT product_id FROM products"
    sql3="SELECT location_id FROM locations"
    stmt2 = ibm_db.prepare(conn, sql2)
    stmt3 = ibm_db.prepare(conn, sql3)
```

```
result=ibm_db.execute(stmt2)
ibm_db.execute(stmt3)


products=[]
row = ibm_db.fetch_assoc(stmt2)
while(row):
    products.append(row)
    row = ibm_db.fetch_assoc(stmt2)
products=tuple(products)

locations=[]
row2 = ibm_db.fetch_assoc(stmt3)
while(row2):
    locations.append(row2)
    row2 = ibm_db.fetch_assoc(stmt3)
locations=tuple(locations)

prods = []
for p in products:
    prods.append(list(p.values())[0])

locs = []
for i in locations:
    locs.append(list(i.values())[0])


form.from_location.choices = [(l,l) for l in locs]
form.from_location.choices.append(("Main Inventory","Main Inventory"))
form.to_location.choices = [(l,l) for l in locs]
form.to_location.choices.append(("Main Inventory","Main Inventory"))
form.product_id.choices = [(p,p) for p in prods]

if request.method == 'POST' and form.validate():
    from_location = form.from_location.data
    to_location =  form.to_location.data
    product_id = form.product_id.data
    qty = form.qty.data


    if from_location==to_location:
        raise CustomError("Please Give different From and To Locations!!")


    elif from_location=="Main Inventory":
        sql2="SELECT * from product_balance where location_id=? and product_id=?"
        stmt2 = ibm_db.prepare(conn, sql2)
        ibm_db.bind_param(stmt2,1,to_location)
        ibm_db.bind_param(stmt2,2,product_id)
        result=ibm_db.execute(stmt2)
        result=ibm_db.fetch_assoc(stmt2)
        print("----------------------")
        print(result)
        print("----------------------")
        app.logger.info(result)
```

```
            if result!=False:
                if(len(result))>0:
                    Quantity = result["QTY"]
                    q = Quantity + qty

                    sql2="UPDATE product_balance set qty=? where location_id=? and product_id=?"
                    stmt2 = ibm_db.prepare(conn, sql2)
                    ibm_db.bind_param(stmt2,1,q)
                    ibm_db.bind_param(stmt2,2,to_location)
                    ibm_db.bind_param(stmt2,3,product_id)
                    ibm_db.execute(stmt2)

                    sql2="INSERT into productmovements(from_location, to_location, product_id, qty)
      VALUES(?, ?, ?, ?)"
                    stmt2 = ibm_db.prepare(conn, sql2)
                    ibm_db.bind_param(stmt2,1,from_location)
                    ibm_db.bind_param(stmt2,2,to_location)
                    ibm_db.bind_param(stmt2,3,product_id)
                    ibm_db.bind_param(stmt2,4,qty)
                    ibm_db.execute(stmt2)
            else:

                sql2="INSERT into product_balance(product_id, location_id, qty) values(?, ?, ?)"
                stmt2 = ibm_db.prepare(conn, sql2)
                ibm_db.bind_param(stmt2,1,product_id)
                ibm_db.bind_param(stmt2,2,to_location)
                ibm_db.bind_param(stmt2,3,qty)
                ibm_db.execute(stmt2)





                sql2="INSERT into productmovements(from_location, to_location, product_id, qty)
      VALUES(?, ?, ?, ?)"
                stmt2 = ibm_db.prepare(conn, sql2)
                ibm_db.bind_param(stmt2,1,from_location)
                ibm_db.bind_param(stmt2,2,to_location)
                ibm_db.bind_param(stmt2,3,product_id)
                ibm_db.bind_param(stmt2,4,qty)
                ibm_db.execute(stmt2)



            sql = "select product_num from products where product_id=?"
            stmt = ibm_db.prepare(conn, sql)
            ibm_db.bind_param(stmt,1,product_id)
            current_num=ibm_db.execute(stmt)
            current_num = ibm_db.fetch_assoc(stmt)

            sql2="Update products set product_num=? where product_id=?"
            stmt2 = ibm_db.prepare(conn, sql2)
            ibm_db.bind_param(stmt2,1,current_num['PRODUCT_NUM']-qty)
            ibm_db.bind_param(stmt2,2,product_id)
            ibm_db.execute(stmt2)
            alert_num=current_num['PRODUCT_NUM']-qty

            if(alert_num<=0):
                alert("Please update the quantity of the product {}, Atleast {} number of pieces must be added to
finish the pending Product Movements!".format(product_id,-alert_num))

        elif to_location=="Main Inventory":
            sql2="SELECT * from product_balance where location_id=? and product_id=?"
            stmt2 = ibm_db.prepare(conn, sql2)
            ibm_db.bind_param(stmt2,1,from_location)
            ibm_db.bind_param(stmt2,2,product_id)
            result=ibm_db.execute(stmt2)
            result=ibm_db.fetch_assoc(stmt2)

            app.logger.info(result)
            if result!=False:
                if(len(result))>0:
                    Quantity = result["QTY"]
                    q = Quantity - qty

                    sql2="UPDATE product_balance set qty=? where location_id=? and product_id=?"
                    stmt2 = ibm_db.prepare(conn, sql2)
                    ibm_db.bind_param(stmt2,1,q)
                    ibm_db.bind_param(stmt2,2,to_location)
                    ibm_db.bind_param(stmt2,3,product_id)
                    ibm_db.execute(stmt2)

                    sql2="INSERT into productmovements(from_location, to_location, product_id, qty)
VALUES(?, ?, ?, ?)"
                    stmt2 = ibm_db.prepare(conn, sql2)
                    ibm_db.bind_param(stmt2,1,from_location)
                    ibm_db.bind_param(stmt2,2,to_location)
                    ibm_db.bind_param(stmt2,3,product_id)
                    ibm_db.bind_param(stmt2,4,qty)
                    ibm_db.execute(stmt2)

                    flash("Product Movement Added", "success")




                    sql = "select product_num from products where product_id=?"
                    stmt = ibm_db.prepare(conn, sql)
                    ibm_db.bind_param(stmt,1,product_id)
                    current_num=ibm_db.execute(stmt)
                    current_num = ibm_db.fetch_assoc(stmt)

                    sql2="Update products set product_num=? where product_id=?"
                    stmt2 = ibm_db.prepare(conn, sql2)
                    ibm_db.bind_param(stmt2,1,current_num['PRODUCT_NUM']+qty)
                    ibm_db.bind_param(stmt2,2,product_id)
                    ibm_db.execute(stmt2)

                    alert_num=q
                    if(alert_num<=0):
                        alert("Please Add {} number of {} to {} warehouse!".format(-q,product_id,from_location))
            else:
                raise CustomError("There is no product named {} in {}.".format(product_id,from_location))
```

```
else: #will be executed if both from_location and to_location are specified
    f=0
    sql = "SELECT * from product_balance where location_id=? and product_id=?"
    stmt = ibm_db.prepare(conn, sql)
    ibm_db.bind_param(stmt,1,from_location)
    ibm_db.bind_param(stmt,2,product_id)
    result=ibm_db.execute(stmt)
    result = ibm_db.fetch_assoc(stmt)

    if result!=False:
        if(len(result))>0:
            Quantity = result["QTY"]
            q = Quantity - qty

            sql2="UPDATE product_balance set qty=? where location_id=? and product_id=?"
            stmt2 = ibm_db.prepare(conn, sql2)
            ibm_db.bind_param(stmt2,1,q)
            ibm_db.bind_param(stmt2,2,from_location)
            ibm_db.bind_param(stmt2,3,product_id)
            ibm_db.execute(stmt2)
            f=1

            alert_num=q
            if(alert_num<=0):
                alert("Please Add {} number of {} to {} warehouse!".format(-q,product_id,from_location))

    else:
        raise CustomError("There is no product named {} in {}.".format(product_id,from_location))

    if(f==1):
        sql = "SELECT * from product_balance where location_id=? and product_id=?"
        stmt = ibm_db.prepare(conn, sql)
        ibm_db.bind_param(stmt,1,to_location)
        ibm_db.bind_param(stmt,2,product_id)
        result=ibm_db.execute(stmt)
        result = ibm_db.fetch_assoc(stmt)

        if result!=False:
            if(len(result))>0:
                Quantity = result["QTY"]
                q = Quantity + qty

                sql2="UPDATE product_balance set qty=? where location_id=? and product_id=?"
                stmt2 = ibm_db.prepare(conn, sql2)
                ibm_db.bind_param(stmt2,1,q)
                ibm_db.bind_param(stmt2,2,to_location)
                ibm_db.bind_param(stmt2,3,product_id)
                ibm_db.execute(stmt2)
            else:

                sql2="INSERT into product_balance(product_id, location_id, qty) values(?, ?, ?)"
                stmt2 = ibm_db.prepare(conn, sql2)
                ibm_db.bind_param(stmt2,1,product_id)
                ibm_db.bind_param(stmt2,2,to_location)
                ibm_db.bind_param(stmt2,3,qty)
                ibm_db.execute(stmt2)
            sql2="INSERT into productmovements(from_location, to_location, product_id, qty)
VALUES(?, ?, ?, ?)"
            stmt2 = ibm_db.prepare(conn, sql2)
            ibm_db.bind_param(stmt2,1,from_location)
            ibm_db.bind_param(stmt2,2,to_location)
            ibm_db.bind_param(stmt2,3,product_id)
            ibm_db.bind_param(stmt2,4,qty)
            ibm_db.execute(stmt2)

            flash("Product Movement Added", "success")

        render_template('products.html',form=form)


        return  redirect(url_for('product_movements'))

    return render_template('add_product_movements.html', form=form)

#Delete Product Movements
@app.route('/delete_product_movements/<string:id>',  methods=['POST'])
@is_logged_in
def delete_product_movements(id):

    sql2="DELETE FROM productmovements WHERE movement_id=?"
    stmt2 = ibm_db.prepare(conn, sql2)
    ibm_db.bind_param(stmt2,1,id)
    ibm_db.execute(stmt2)

    flash("Product Movement Deleted", "success")

    return redirect(url_for('product_movements'))

if__name__== '_main_':
    app.secret_key = "secret123"
    #when the debug mode is on, we do not need to restart the server again and again
    app.run(debug=True)
```

6.2 Feature 2

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

def alert(main_msg):
   mail_from = 'ucs19430@rmd.ac.in'
   mail_to = 'vethanathanvk@gmail.com'
   msg = MIMEMultipart()
   msg['From'] = mail_from
   msg['To'] = mail_to
   msg['Subject'] = '!Alert Mail On Product Shortage! - Regards'
   mail_body = main_msg
   msg.attach(MIMEText(mail_body))

   try:
      server = smtplib.SMTP_SSL('smtp.sendgrid.net', 465)
      server.ehlo()
      server.login('apikey', 'API_KEY')
      server.sendmail(mail_from, mail_to, msg.as_string())
      server.close()
      print("Mail sent successfully!")
   except:
      print("Some Issue, Mail not Sent :(")
```

6.3 User Acceptance Testing

User Acceptance Testing (UAT) is a type of testing performed by the end user or the client to verify/accept the software system before moving the software application to the production environment. UAT is done in the final phase of testing after functional, integration and system testing is done.

Purpose of UAT

The main Purpose of UAT is to validate end to end business flow. It does not focus on cosmetic errors, spelling mistakes or system testing. User Acceptance Testing is carried out in a separate testing environment with production-like data setup. It is kind of black box testing where twoor more end-userswill be involved.UAT is performed by -

- Client
- End users

Need of User Acceptance Testing arises once software has undergone Unit, Integration and System testing because developers might have built software based on requirements document by their own understanding and further required changes during development may not be effectively communicated to them, so for testing whether the final product is accepted by client/end-user, user acceptance testing is needed.

Developers code software based on requirements document which is their "own" understandingof the requirements and may not actually be what the client needs from the software.

Requirements changes during the course of the project may not be communicated effectively to the developers.

GitHub Link:
https://github.com/IBM-EPBL/IBM-Project-22937-1659861628
Video Demo Link:
https://drive.google.com/file/d/1oZxu4JYWUL972YmtMYHvFXRIHKpv7Jst/view?usp=share_link