VELTECH HIGHTECH Dr.RR & Dr.SR ENGINEERING COLLEGE, AVADI, CHENNAI

RETAIL STORE STOCK INVENTORY ANALYTICS

Team ID - PNT2022TMID22243

A PROJECT REPORT

Submitted by

MARIMUTHU RAJA M	**113019205029**
GOWTHAM R	**113019205012**
JAGADESHWARAN S	**113019205020**
VIJAY R	**113019205058**

Under the guidance of

Industry Mentor: **Ms.Shivani Kapoor** Faculty Mentor: **Dr.P.Shanmugapriya**

Project Report Format

1. **INTRODUCTION**
    a. Project Overview
    b. Purpose
2. **LITERATURE SURVEY**
    a. Existing problem
    b. References
    c. Problem Statement Definition
3. **IDEATION & PROPOSED SOLUTION**
    a. Empathy Map Canvas
    b. Ideation & Brainstorming
    c. Proposed Solution
    d. Problem Solution fit
4. **REQUIREMENT ANALYSIS**
    a. Functional requirement
    b. Non-Functional requirements
5. **PROJECT DESIGN**
    a. Data Flow Diagrams
    b. Solution & Technical Architecture
    c. User Stories
6. **PROJECT PLANNING & SCHEDULING**

a. Sprint Planning & Estimation

b. Sprint Delivery Schedule

c. Reports from JIRA

7. **CODING & SOLUTIONING (Explain the features added in the project along with code)**

a. Feature 1

b. Feature 2

c. Database Schema (if Applicable)

8. **TESTING**

a. Test Cases

b. User Acceptance Testing

RESULTS

c. Performance Metrics

9. **ADVANTAGES & DISADVANTAGES**

10. **FUTURE SCOPE**

11. **APPENDIX**

a. Source Code & Github Link

b. Project Demo Link

Introduction :

a. ***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 with which to run their businesses

b. ***Purpose:***

Store Stock Inventory management is vital for retailers because the practice helps them increase profits. They are more likely to have enough inventory to capture every possible sale while avoiding overstock and minimizing expenses.

From a strategic point of view, retail inventory management increases efficiency. The practice:

- **Decreases Inventory Costs**
- **Minimizes Out-of-Stocks**
- **Improves Profit Margins**
- **Prevents Spoilage and Obsolescence**
- **The primary purpose of inventory management is to ensure that there is enough goods or materials to meet demand without creating overstock or excess inventory**
- **Improves Multi-Channel and Omni-channel Performance and**

2.Literature Survey:

2.1 Existing Problem:

Unclear Communication

- Even in straightforward business processes, miscommunication can cause irreversible damage to efficiency. You can only imagine the far-reaching impact it would have on a complex and multifarious process, like inventory management.

Inadequate Access

- Generally, insufficient access to information would lead to miscommunication issues. Every department needs to have access to data that is crucial to their processes. Hence, the impact of the lack of proper access is not limited to individual processes. But it also affects the complete retail inventory management.

Inefficient Warehouse Management

1. Warehouse management is a core component of brick-and-mortar retail inventories. Hence, ineffective warehouse management would affect the complete retail inventory process. A decentralized inventory management system would comprise the accuracy of the operations.

2. Many aspects of warehouse management would be vulnerable to errors without integrated software. Inept warehouse management could lead to lost orders, delays in order fulfillment, and errors in shipment. It also causes incorrect stock counts, inaccurate barcodes and labels, increased storage costs, and misplaced products. The problem will only deteriorate if multiple warehouses support your retail operations.

a. ***Problem Statement Definition:***

In recent years, the correct management of inventories has become a fundamental pillar for achieving success in enterprises. Unfortunately, studies suggesting the investment and adoption of advanced inventory management and control systems are not easy to find. In this context, this article aims to analyse and present an extensive literature concerning inventory management, containing multiple definitions and fundamental concepts for the retail sector. A systematic literature review was carried out to determine the main trends and indicators of inventory management in Small and Medium-sized Enterprises (SMEs). This research

covers five years, between 2015 and 2019, focusing specifically on the retail sector. The primary outcomes of this study are the leading inventory management systems and models, the Key Performance Indicators (KPIs) for their correct management, and the benefits and challenges for choosing or adopting an efficient inventor.

In recent years, the correct management of inventories has become a fundamental pillar for achieving success in enterprises. Unfortunately, studies suggesting the investment and adoption of advanced inventory management and control systems are not easy to find. In this context, this article aims to analyze and present an extensive literature concerning inventory management, containing multiple definitions and fundamental concepts for the retail sector. A systematic literature review was carried out to determine the main trends and indicators of inventory management in Small and Medium-sized Enterprises (SMEs). This research covers five years, between 2015 and 2019, focusing specifically on the retail sector. The primary outcomes of this study are the leading inventory management systems and models, the Key Performance Indicators (KPIs) for their correct management, and the benefits and challenges for choosing or adopting an efficient inventor.

b. ***References:***

The following are the references used:

i. “Inventory management for retail store: A literature review and current trends” by Jorge Andrés Espinoza Aguirre Industrial Engineering, Faculty of Chemical Sciences, University of Cuenca Cuenca, Ecuador.

ii. “Inventory management for retail store: RESEARCH
METHODOLOGY” by Cinthya Vanessa Mufioz Macas
Industrial Engineering, Faculty of Chemical Sciences, University of Cuenca Cuenca, Ecuador.

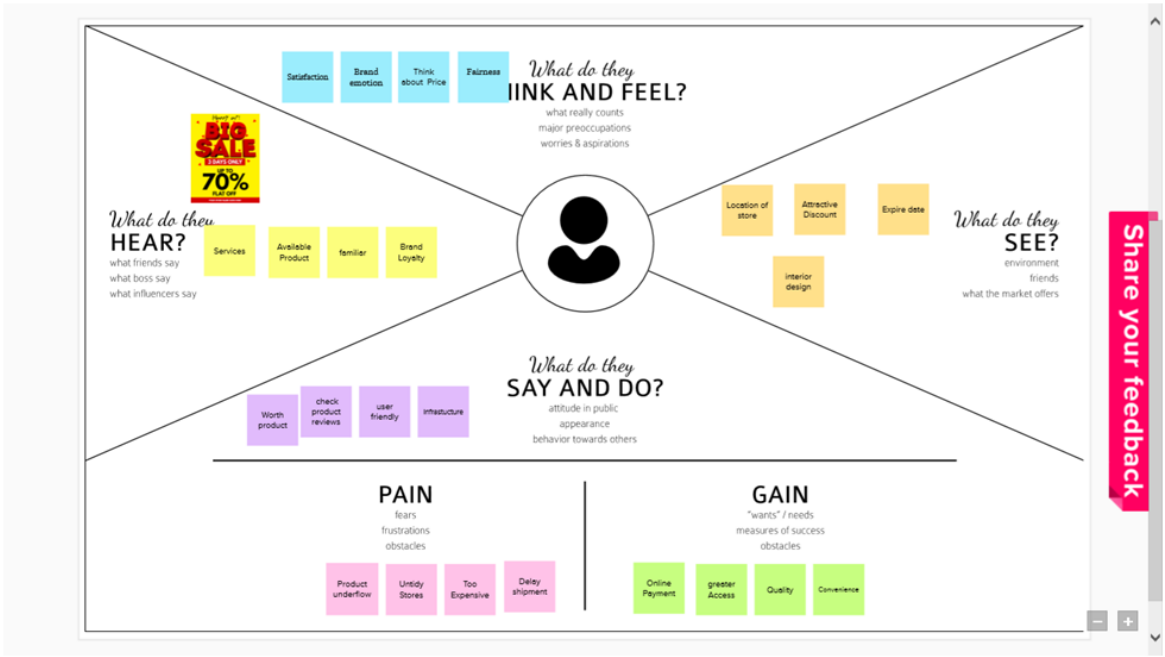
iii. ” Inventory management for retail store: Content Analysis” by Rodrigo Arcentales-Carri6n Research Group in Accounting, Finance, and Taxation, Faculty of Economics and Administrative Sciences.

iv. “Inventory management for retail store: Metadata Analysis” by Mario Pena Research Department (DIUC) , Ecuador.

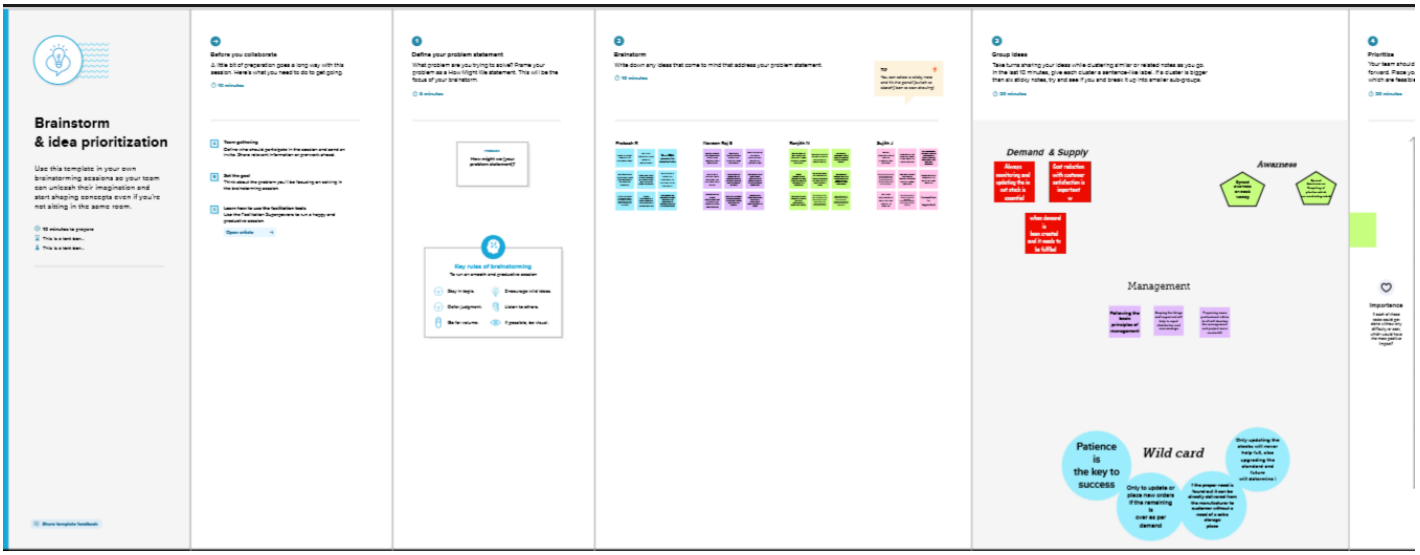
v. “Inventory management for retail store: Product reordering or replenishment” by Mario Pefia Research Department (DIUC) ,Ecuador.

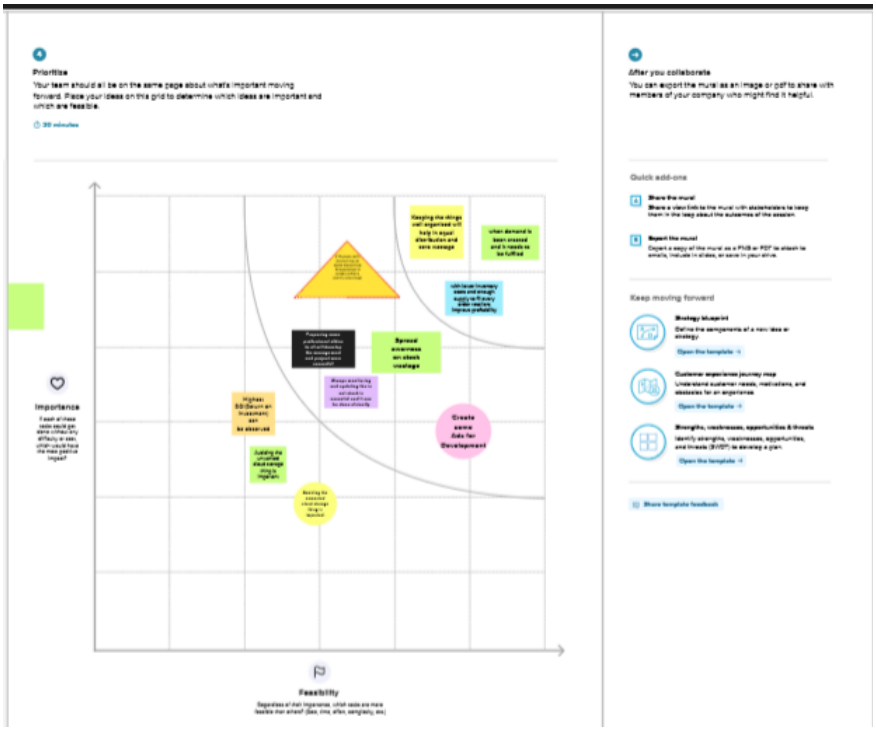
1. ***Ideation and Proposed Solution:***

a. ***Empathy Map Canvas:***



b. ***Ideation and Brainstorming:***





c. ***Proposed Solution:***

Project Design Phase-I
Proposed Solution

Project Name	Retail Store Stock Inventory Analytics

S.No	**PARAMETER**	**DESCRIPTION**
1.	Problem Statement (Problem to be solved)	Retail Store Stock Inventory analytics is basically used to maintain the inventory. The biggest FAQ's of a retailer are How much amount of inventory should they carry, because this involves Capital and Operational costs. Lack of these costs will lead into the complex problem of making loss of costs, damaged brand which makes the Customer unhappy. Forecasting intermediate inventory and tracking is a complex problem to be solved because the stock rotation depends seasonally.
2.	Idea / Solution description	Our Proposed System consists of the following special features: • Our Inventory software contain the Real-time dashboard automation • It mainly does the predication based on sales history of seasonal on-demands • The software will automatically determine the goods and service taxes like GSTs etc., • It will periodically generate the inventory reports that will enhance the retailer's knowledge on stock rotation • Our system will create unique barcodes for the products which enhances the billing process. • Instant invoice generation for the purchase
3.	Novelty / Uniqueness	• Our software will have the high accuracy and feasibility among the existed market products • It gives the solid predication based on sales history that will give certainty among the retail industry • It will notify retailers before the date of the expired products and will suggest dynamic discounts that will reduce the loss of the Retailer. • Credit-point based system with enhanced marketing Bots
4.	Social Impact / Customer Satisfaction	• By this solution, it gives the major impact on the retailer satisfaction and confidentiality • And it will give appropriate predication on the inventory sales • It will reduce the wastage of goods and services because of the stock maintenance
5.	Business Model (Revenue Model)	• Our idea will increase the revenue among the retailers due to the uncertainty among the seasonal ondemands • Forecasting intermediate inventory will raise the whole business model because it will determine the up and down of the goods predication among the traditional system • It will create the engaging environment for retailers that is used to optimize their counter space efficiently and generates revenues by analysing the customer movement
6.	Scalability Solution of the	The Scalability and feasibility of our solution is comparatively high from the existing market model. It will ensure the retailers to engage the environment very easily and user friendly. It will allow the retailers to add or edit the bulk goods and inventory. It will make use of the environment space efficiently due to the appropriate prediction of the inventory sales goods.

d. ***Problem Solution Fit:***

Project Design Phase-I
Solution Fit

Project Name Retail Store Stock Inventory Analytics

Problem – Solution Fit:

Problem-solution fit is a term used to describe the point validating that the base problem resulting in a business idea really exists and the proposed solution actually solves that problem. Various aspects and requirement of the customer is initially identified to develop a better solution. Based on the problem, triggers, causes, constrains the proposed model is developed with the use of data analysis, image processing and data science. Inventory management, channel of communication, marketing strategy are deduced based on prediction and automation.

Design:

References:

https://www.canva.com/design/DAFODBKRXrM/qbnBkO0ta5_w-gYKGz-cw-A/edit?utm_source=shareButton&utm_medium=email&utm_campaign=designshare

e.***Solution Architecture:***

Project Design Phase-I
Solution Architecture

Project Name	Retail Store Stock Inventory Analytics

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions.

- Find the best tech solution to solve existing business problems.

  With the use of Data Analysis, Data Science, and Image Processing a tech solution is developed to solve the existing business problem and to improve the efficiency of the existing solution models.

- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.

  Characteristics & Behaviour:

  ₀ User-friendly ₀ Real-time dashboard ₀ Detailed & Periodic Generation of Inventory Report ₀ Automatic Credit Point based Discount System ₀ Enhanced Billing Process with Barcodes

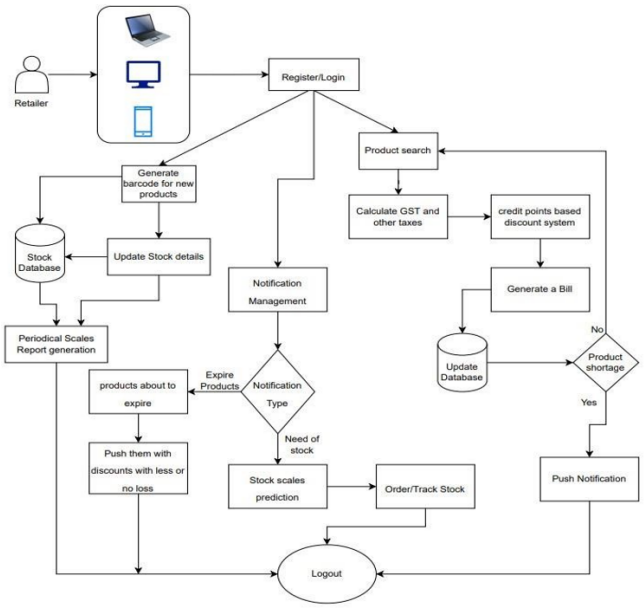
- Define features, development phases, and solution requirements.

  ₀ Features:
  - Instant Invoice Generation
  - Automatic Determination of GST & other taxes
  - Easy Categorisation and Product Search
  - Effective Notification System
  - Real-time dashboard updation
  - Efficient Report generation & visualisation

  ₀ Solution Requirements:
  - Data set
  - Data model
  - Data processing tools.

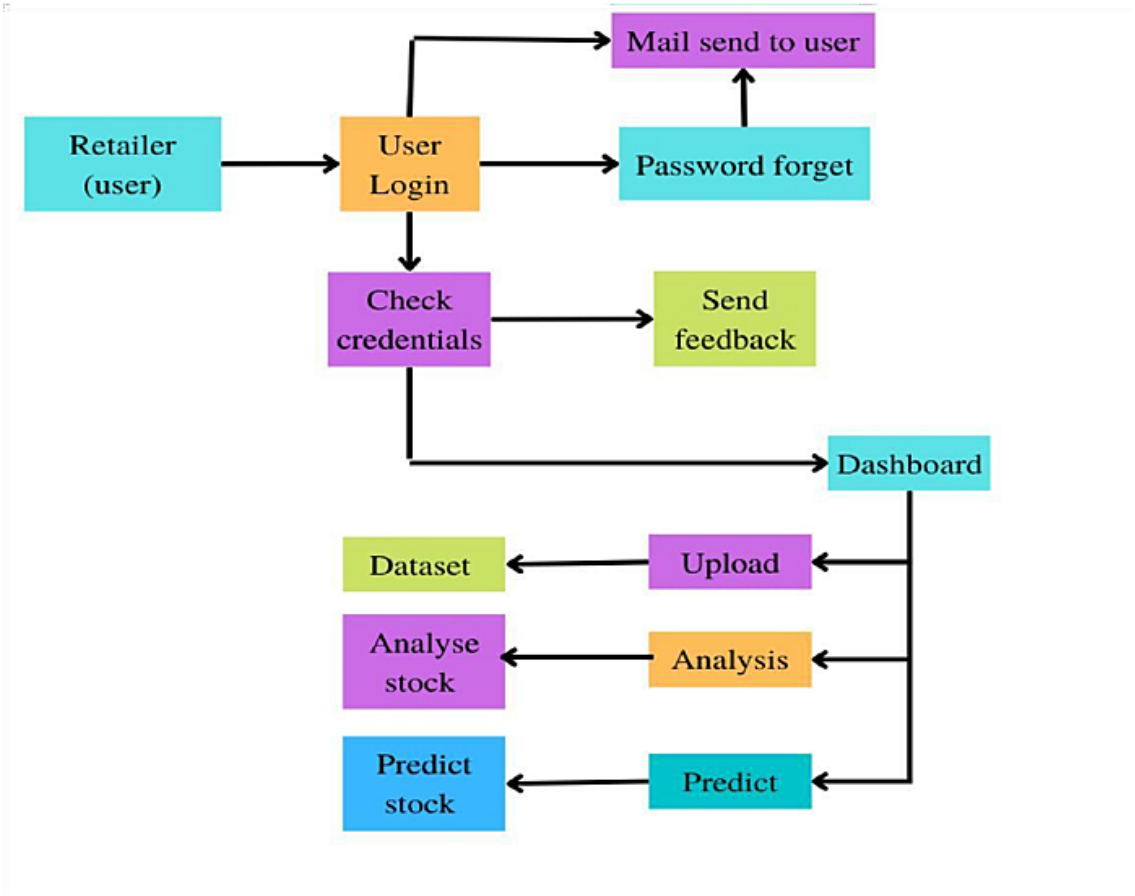
- Provide specifications according to which the solution is defined, managed, and delivered.

  The proposed solution is defined, managed, and delivered by ₀ Analysing the technology environment ₀ Analysing and documenting requirements ₀ Participating in technology selection ₀ Creating a solution prototype ₀ Supporting project management.



2. ***Project Design:***

   a. ***Data Flow Diagram***



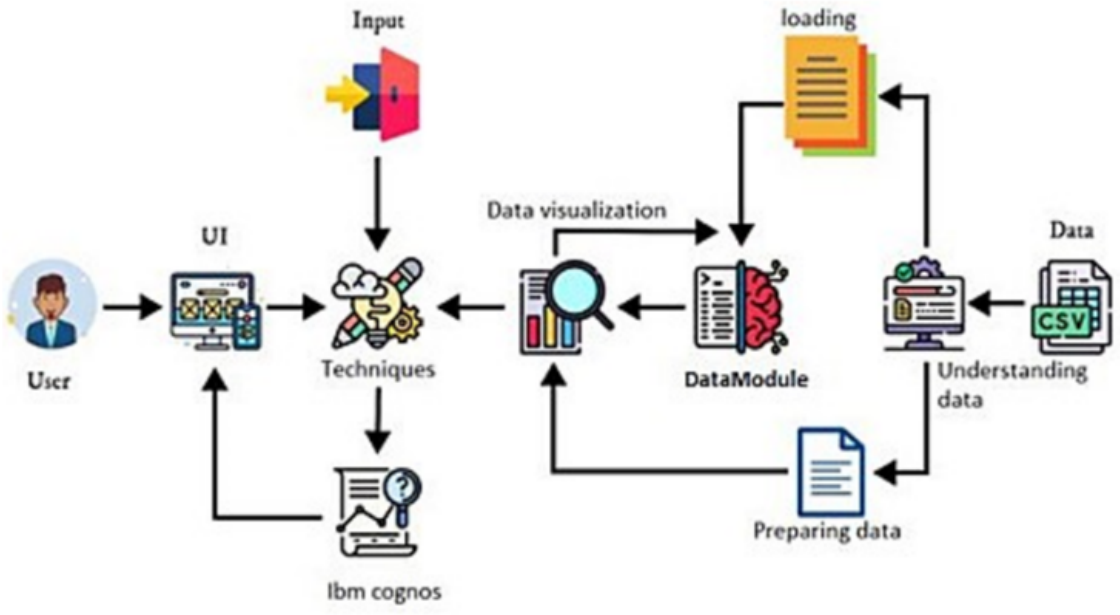
User Stories:

User Stories :

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the web application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, after completing the registration I will receive confirmation email once I have registered for the web application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the web application through LinkedIn	I can register & access the dashboard with LinkedIn Login	Low	Sprint-2
		USN-4	As a user, I can register for the web application through Google account	I can register & access the dashboard with Gmail login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password after installing the web application	I can access the dashboard by login into the application	High	Sprint-1
	Dashboard	USN-6	As a user, I can view the charts and graphs representation of the dataset and the information shown in the dashboard	I can analyse the stocks in my retail store.	High	Sprint-1
Customer (Web user)		USN-1	As a user, I can register for the web application entering my email, password,confirming my password.	I can access my account / dashboard	High	Sprint-1
Customer Care Executive		USN-2	As a user, after completing the registration I will receive confirmation email once I have registered for the web application	I can receive confirmation email & click confirm	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Administrator		USN-3	As a user, I can register for the web application through LinkedIn	I can register & access the dashboard with LinkedIn Login	Low	Sprint-2
		USN-4	As a user, I can register for the web application through Google account	I can register & access the dashboard with Gmail login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the web application by entering email & password after installing the application.	I can access the dashboard by login into the application	High	Sprint-1
	Dashboard	USN-6	As a user, I can view the charts and graphs representation of the dataset and the information shown in the dashboard.	I can analyse the stocks in my retail store.	High	Sprint-1
Customer Care Executive		CCE-1	As a customer care executive, I will always be available for the interaction with the customer to clarify the queries.	An executive will analyse the customer complaints, rectify their problems	High	Sprint-2
Administrator		ADMIN-1	As an administrator, I will manage backup and recovery, data modelling and design, distributed computing, database system, and a data security	Administrator can evaluate, design, review and implementing a data,they are also responsible for updating and maintaining the data.	High	Sprint-2

Solution Architecture:



Technical Architecture:

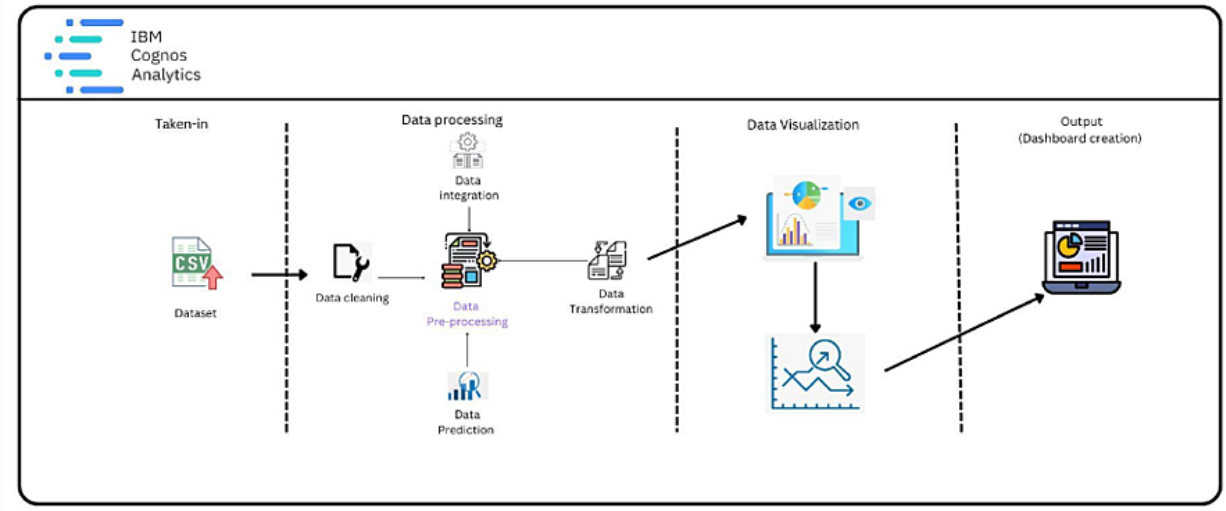


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	The user interacts with application using Web UI	HTML, CSS, JavaScript
2.	Data Processing	The data from the dataset is pre-processed	IBM Cognos Analytics
3.	Cloud Database	The clean dataset is stored on IBM Cloud	IBM Cloud
4.	Data visualization	The data is visualized into different forms	IBM Cognos Analytics, Python
5.	Prediction	These Algorithm techniques are used to predict the proper way to make the stock in store.	ML algorithms –Logistic Regression, Linear Regression, Random Forest ABC Techniques.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Open-source frameworks used	IBM Cognos Analytics, Python
2.	Security Implementations	Request authentication using Encryptions	Encryptions
3.	Scalable Architecture	Scalability consists of 3-tiers	Web Server – HTML, CSS, Javascript Application Server – Python Database Server – IBM Cloud
4.	Availability	The application is available for cloud users	IBM Cloud Hosting
5.	Performance	The user can know how to maintain the inventory to increase profits.	ML algorithms

Functional Requirement:

Functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	They are more likely to have enough inventory to capture every possible sale while avoiding overstock and minimizing expenses.
NFR-2	**Security**	This can be used only by the users who have their proper login credentials

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Login	Login with username Login with password
FR-4	Profile update	Update the user credentials Update the Contact details
FR-5	Uploading Data	Collect the customer details as well as product details Upload the product details This model predicts the best sold products and also it analysis the available stocks
FR-6	Recommendation	User will request for Item Get the Item recommendations
FR-7	Ratings and Reviews	The user i.e retailer of any shop can give their ratings and view of this models

Sprint Planning & Estimation :

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data preprocessing	USN-1	As a developer, I should fill in missing values	5	High	Saranya B Preethi Kumari U
Sprint-1		USN-2	As a developer, I should remove extraneous data and outliers	5	High	Saranya B Preethi Kumari U

Sprint-1		USN-4	As a developer, I should mask private or sensitive data entries	5	High	Saranya B Preethi Kumari U
Sprint-1	Exploratory data analytics	USN-5	Identification of variables and data types	3	High	Nivetha S Sowndar ya D
Sprint-1		USN-6	Analyzing the basic metrics	3	Medium	Nivetha S Sowndar ya D
Sprint-1		USN-7	Using Visualization tools like Scatterplot, detect the outliers	6	Medium	Nivetha S Sowndarya D
Sprint-1		USN-8	Using IQR, remove the outliers	6	Medium	Nivetha S Sowndarya D
Sprint-1		USN-9	Correlation Analysis	6	Medium	Nivetha S Sowndar ya D
Sprint-2	Interactive Dashboard	USN-10	To calculate Year Wise Price Using Line Graph	2	Medium	Preethi Kumari U Nivetha S
Sprint-2		USN-11	To calculate Year Wise Stock Using Line Graph	2	Medium	Preethi Kumari U Nivetha S

Sprint-2		USN-12	To calculate Top 10 Sales By Year Using Line Graph	2	Medium	Preethi Kumari U Nivetha S
Sprint-2		USN-13	To calculate Top 10 Revenue by Year Using Line Graph	2	Medium	Preethi Kumari U Nivetha S
print2		USN-14	To calculate Monthly Stock Using Heat Map	2	Medium	Preethi Kumari U Nivetha S
Sprint-2		USN-15	To calculate Monthly Sales Using Tree Map	2	Medium	Preethi Kumari U Nivetha S
Sprint-2		USN-16	To calculate Monthly Revenue by Pie Chart	2	Medium	Preethi Kumari U Nivetha S
Sprint-2		USN-17	Dashboard Creation	10	Medium	Preethi Kumari U
						Nivetha S
Sprint-3	Story	USN-18	Summary Cards of Total Revenue, Sales, Stock, Price	3	Medium	Sowndarya D Saranya B

Sprint-3		USN-19	As a user, I can generate the story of the analysis	3	Medium	Sowndarya D Saranya B
Sprint-4	Report	USN-20	As a user, I can generate the report of my analysis	6	Medium	Sowndarya D Saranya B

Sprint Delivery Schedule:

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	44	6 Days	24 Oct 2022	29 Oct 2022		
Sprint-2	24	6 Days	31 Oct 2022	05 Nov 2022		
Sprint-3	6	3 Days	07 Nov 2022	12 Nov 2022		
Sprint-4	6	3 Days	14 Nov 2022	19 Nov 2022		

Velocity:

Sprint-1:

$$AV = \frac{\text{sprint duration}}{\text{velocity}}$$

$$= 44/6 = 7.3$$

AV = *sprint duration* / velocity = 24 / 6

= 4

Sprint-3 & Sprint-4:

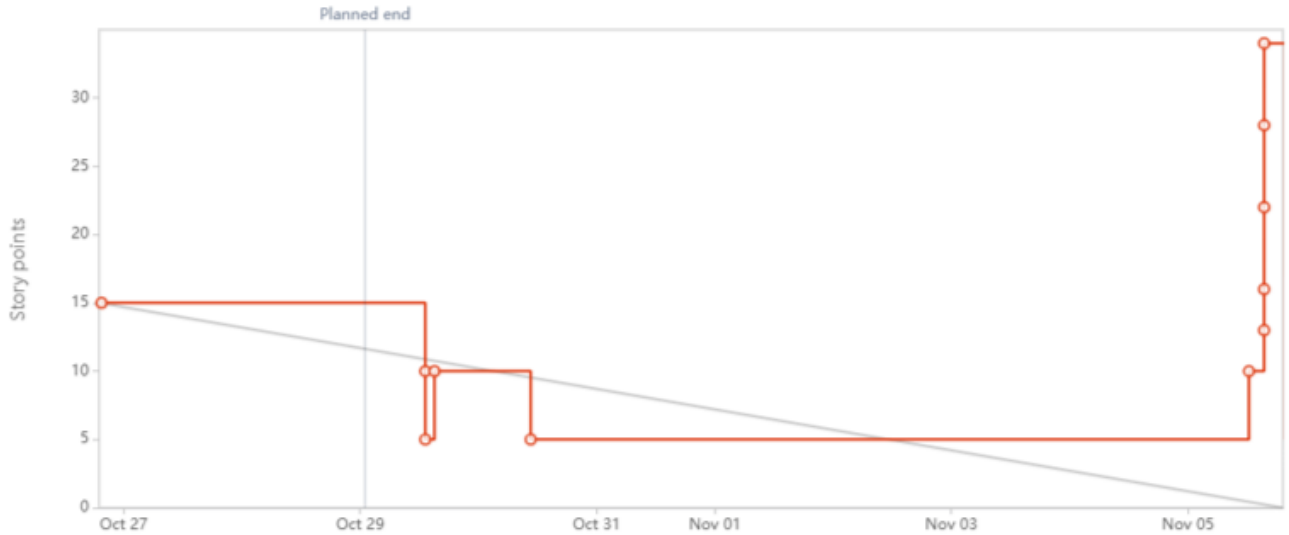
AV = *sprint duration* / velocity

= 6 / 3

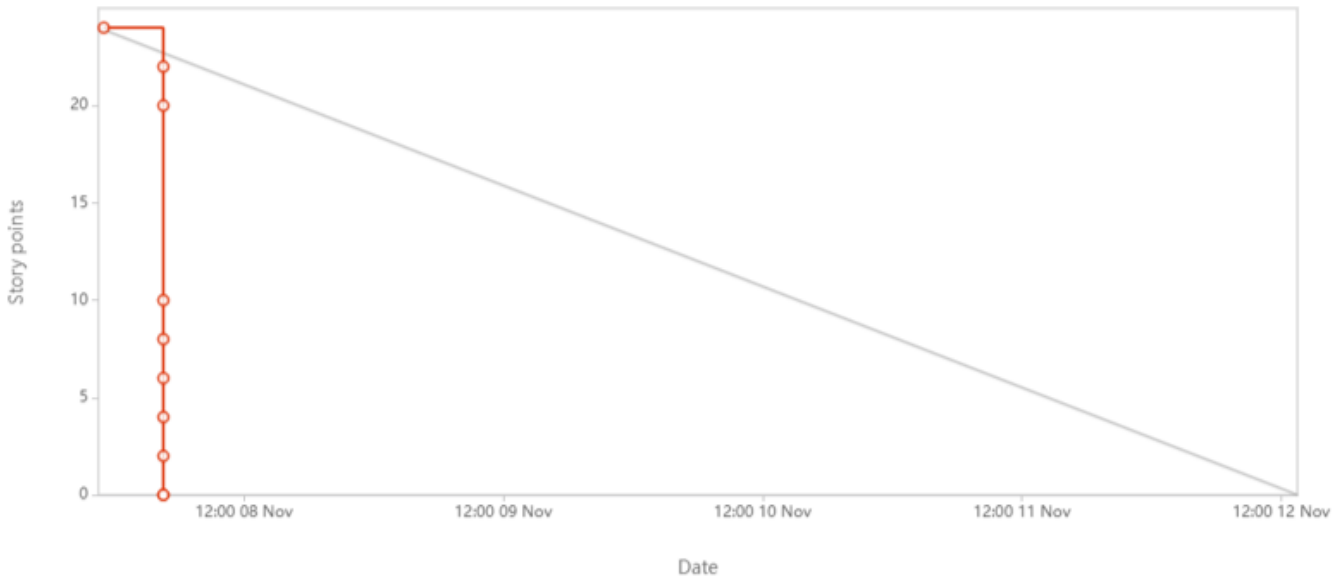
= 2

JIRA Reports:

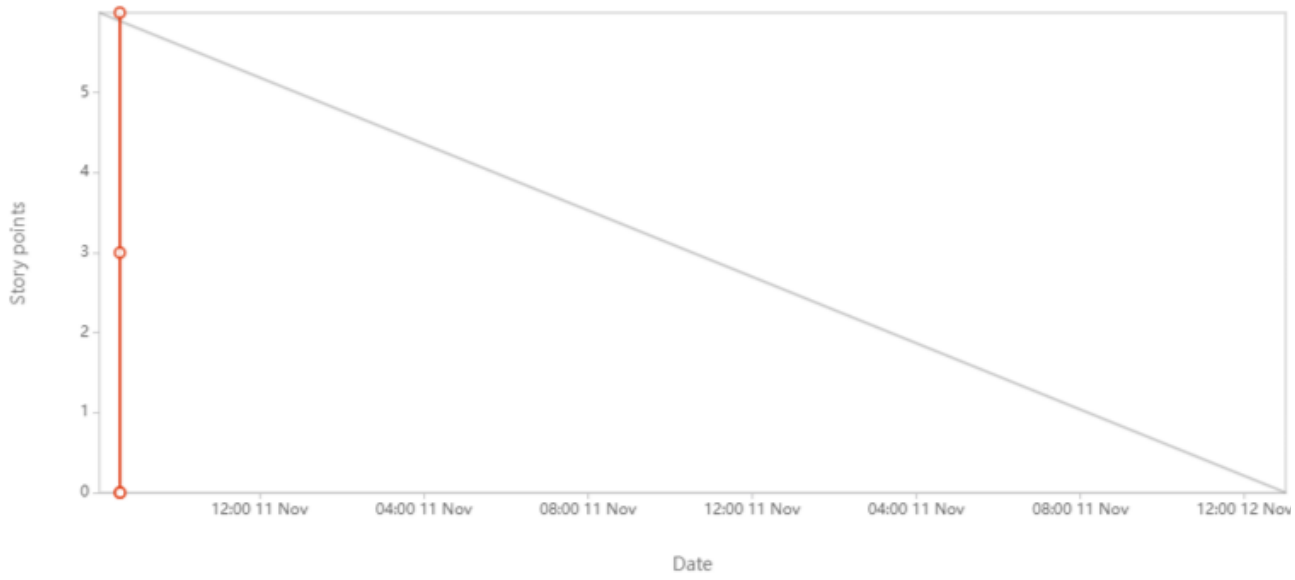
Sprint-1:



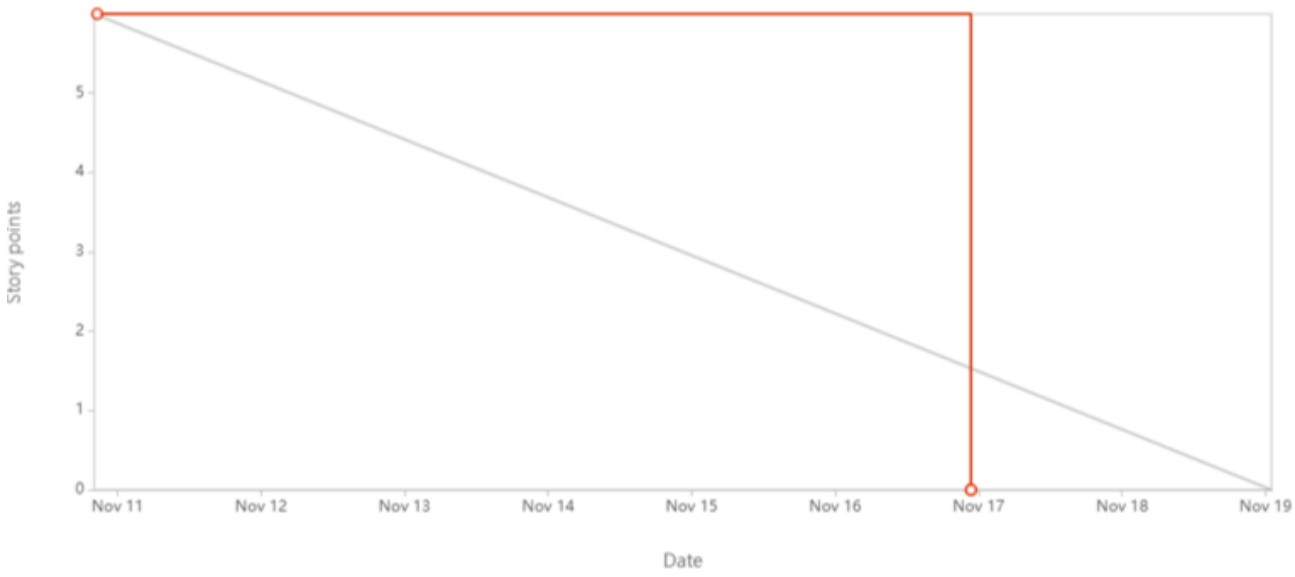
Sprint-2:



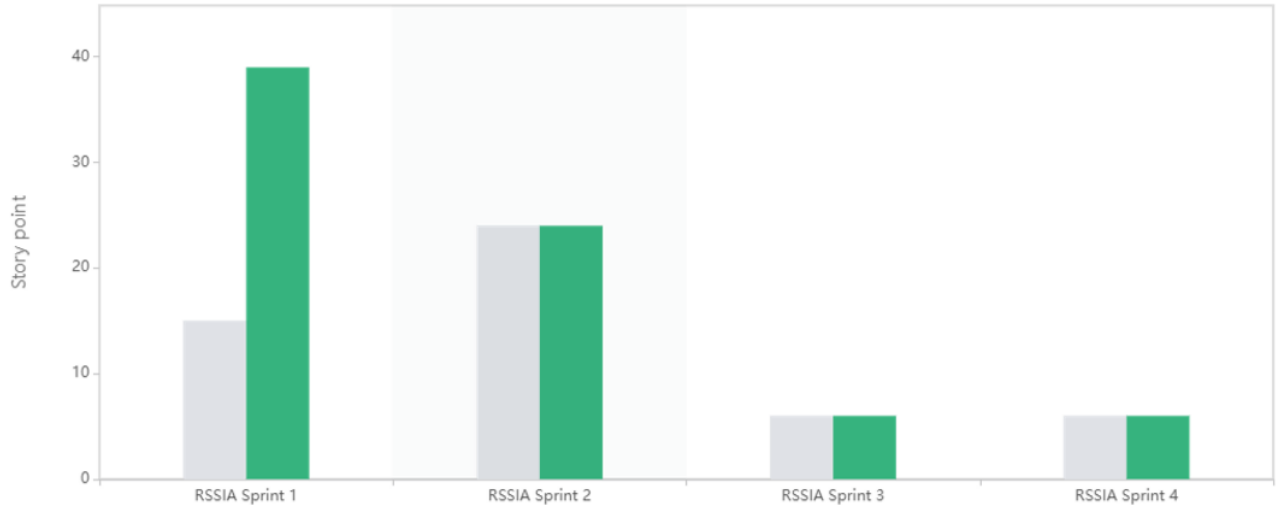
Sprint-3:



Sprint-4:



Velocity Report:



Coding and Solutioning:

Data Preprocessing:

The dataset was transferred to cognos via IBM cloud db2, where it was collaborated on and linked with cognos analytics.

The next step is to create a data module and carry out the following data pretreatment steps.

- *Complete any blank values.*
- *Eliminate unused information and outliers.*
- *Adjusting data to a predetermined pattern.*
- *Enter sensitive or private data behind a mask.*

Exploratory Data Analytics:

- *In exploratory data analysis, the dataset is examined*

to comprehend the following:

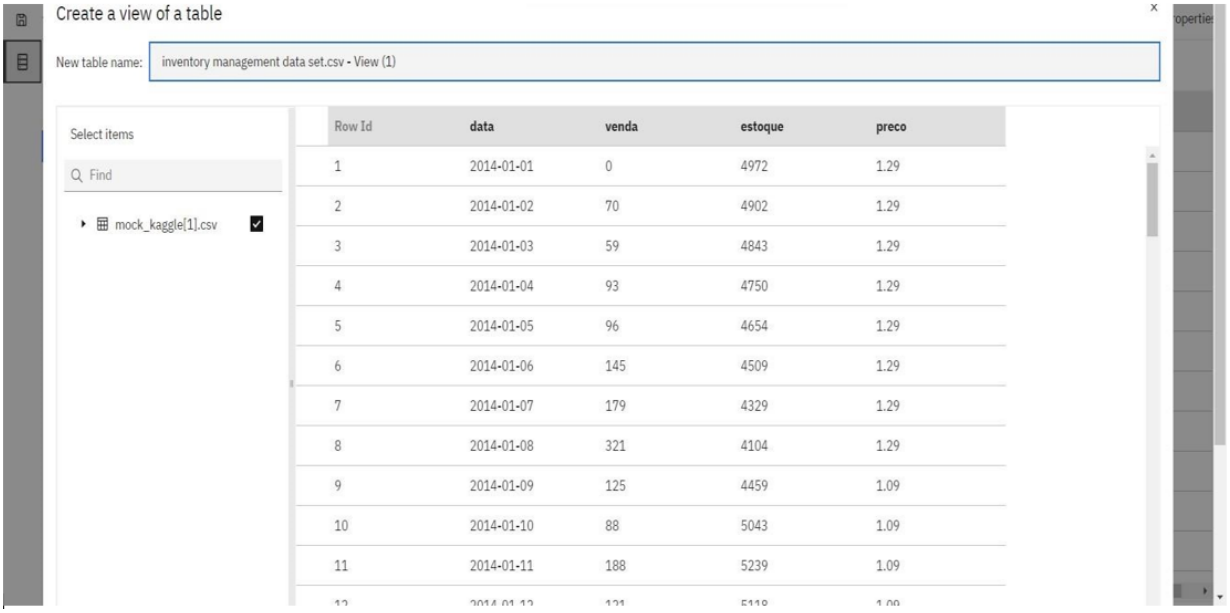
1. *Classification of data types and variables.*
2. *Examining the fundamental metrics*

- *Perform correlation analysis and outlier detection utilising visualisation tools like scatterplot and IQR.*

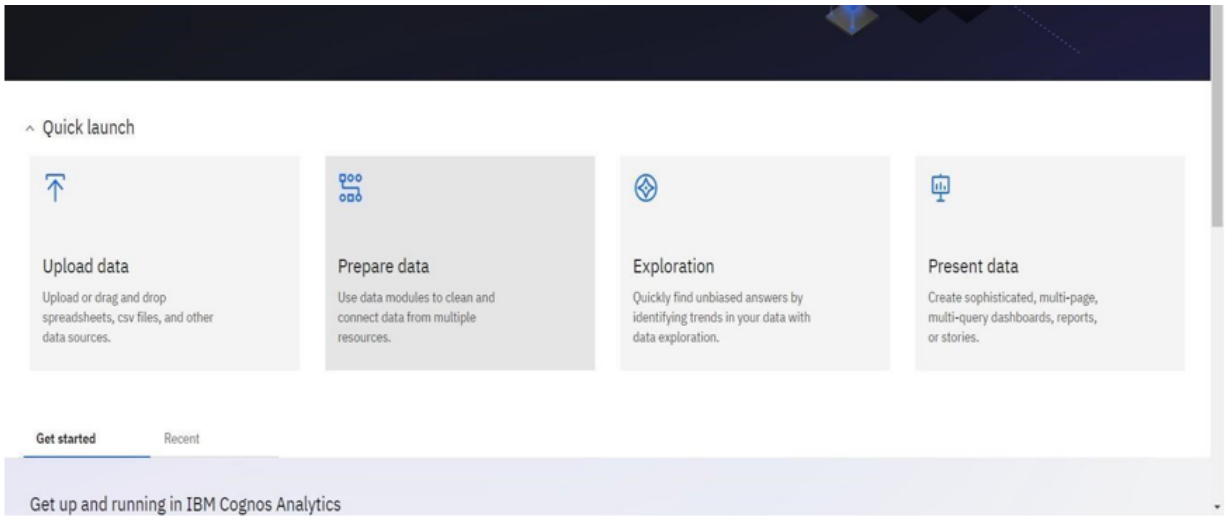
Feature 1: Data Visualizations

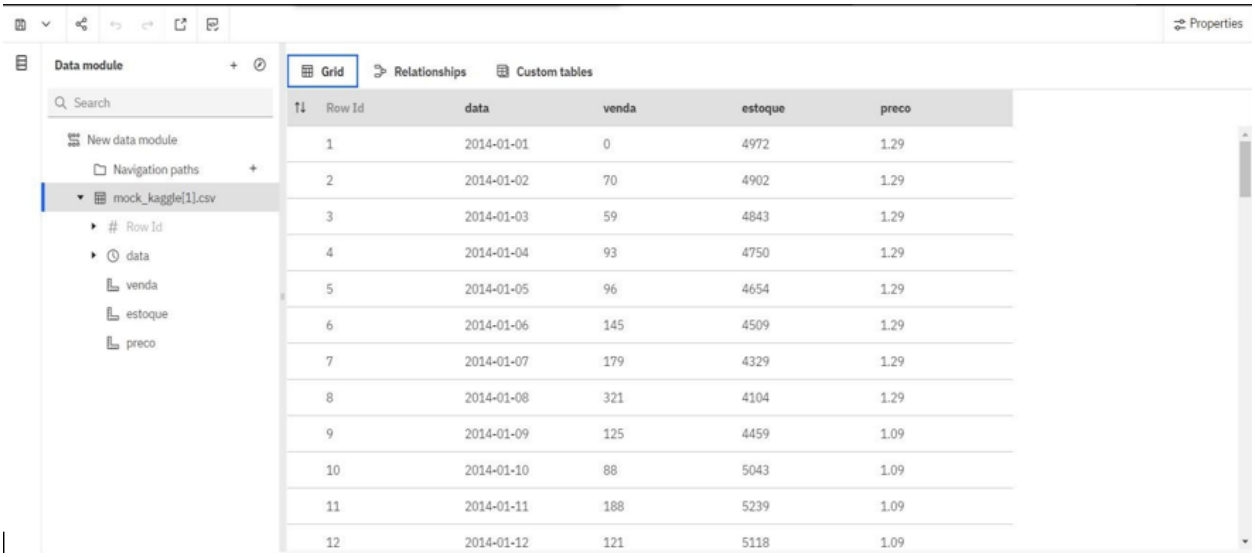
Tool Used : IBM Cognos Analytics

The Dataset and its Contents:



Row Id	data	venda	estoque	preco
1	2014-01-01	0	4972	1.29
2	2014-01-02	70	4902	1.29
3	2014-01-03	59	4843	1.29
4	2014-01-04	93	4750	1.29
5	2014-01-05	96	4654	1.29
6	2014-01-06	145	4509	1.29
7	2014-01-07	179	4329	1.29
8	2014-01-08	321	4104	1.29
9	2014-01-09	125	4459	1.09
10	2014-01-10	88	5043	1.09
11	2014-01-11	188	5239	1.09

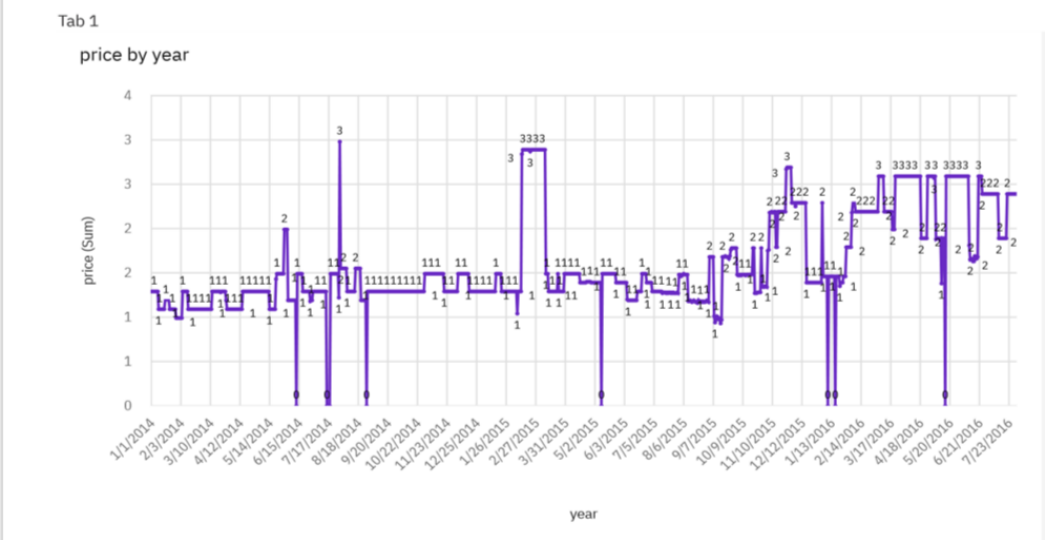




Row Id	data	venda	estoque	preco
1	2014-01-01	0	4972	1.29
2	2014-01-02	70	4902	1.29
3	2014-01-03	59	4843	1.29
4	2014-01-04	93	4750	1.29
5	2014-01-05	96	4654	1.29
6	2014-01-06	145	4509	1.29
7	2014-01-07	179	4329	1.29
8	2014-01-08	321	4104	1.29
9	2014-01-09	125	4459	1.09
10	2014-01-10	88	5043	1.09
11	2014-01-11	188	5239	1.09
12	2014-01-12	121	5118	1.09

Data Visualizations

Some visualizations are done for the dataset:



Feature 2:

Dashboard Creation, Story and Reports:

Interactive Dashboard:

The Dashboard Tab includes data visualisation charts that construct a whole dashboard and offer a solution to

the issue at hand.

- *1. Year-by-year price on a line graph*
- *2. Year-Wise Stock using a Line Graph*
- *3. Using a line graph, the top 10 sales by year*
- *4. Top10 Revenue Using Line Graph by Year*
- *5. Heat Map of Monthly Stock*
- *6. Tree-Mapped Monthly Sales*
- *7. Pie Chart of Monthly Revenue*
- *8. Summary Cards of Total Sales, Stock, Price, and Revenue.*

Story:

- *The story displays the summary cards for the dataset's total revenue, sales, stock, and price that have already been investigated.*
- *The ultimate story is developed and exhibited through the open timeline.*

Report:

- *The Report presents the visualization of data modules which have been performed in the particular dataset which used previously.*

Testing:

Test Cases Feature	Description	Steps to Execute	Expected Results
TC-001 Exploration	Verify users are able to view the exploration.hidd en relationship and identify patterns that turn your data into insights.	Navigate to a Dataset which has been explored.	The exploration data source.
TC-002 Dashboa rd	Verify that users are able to view the responsive Data analytics dashboard and view the data about the current scenario	Click on each tab field to view all data visualizatio ns created in it.	Displaying the responsive Dashboard.
TC-003 Story	Verify whether the story is functioned on the analytics dashboard	View the ibm embedded story about the data visualized in the html page.	A story is a type of view that contains a set of scenes that are displayed in sequence over time.
TC-004 Report	Verify user is able to view and run the reports	View the ibm embedded report about the data visualized in the html page .	explore data and create and developers use to build sophisticated,multipl e-page,multiple-query report against multiple database

Purpose of Document:

The purpose of the document is we can analysis the data easily and the method of analysis are detailed in the document we can create an analytics Report, Dashboard and even the slide show story for Data analytics using cognos we can analysis the data using the Python all the data are elaborated in the document. It is the main Purpose of the document.

Defect Analysis:

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	5	3	2	0	10
Duplicate	0	0	0	1	1
External	2	0	0	1	3
Fixed	5	5	0	0	10
Not Reproduced	0	0	0	0	0
Skipped	1	0	0	0	1
Won't Fix	0	5	2	1	8
Totals	13	13	4	3	33

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	1	0	0	1
Client Application	2	0	0	2
Security	1	0	0	1
Outsource Shipping	1	0	0	1
Exception Reporting	1	0	0	1
Final Report Output	2	0	0	2
Version Control	2	0	0	2

Results:

Model Perfomance Testing:

S.No	Parameter	Screenshot / Values
1.	Dashboard design	The dashboard is created with four categories. They are Sales, Stock, Price and Revenue.
2.	Data Responsiveness	The data is downloaded from an external API and uploaded in the IBM Cognos Analytics with Watson and a data module is created.
3.	Amount Data to Rendered (DB2 Metrics)	The dataset which is downloaded from the external API and uploaded is rendered from the DB2 Metrics.
4.	Utilization of Data Filters	The data filters are used for preprocessing the data. The unwanted columns are removed from the dataset and the additional data which are required are added to the dataset. Utilization of Data Filters - 13
5.	Effective User Story	No of Scene Added – 5

6.	Descriptive Reports	No of Visualizations / Graphs – 5

Advantages and Disadvantages:

Advantages:

- *Businesses can employ data analytics to inform decision-making and reduce financial losses. Prescriptive analytics can propose how the firm should respond to these changes while predictive analytics can predict what might happen as a result of these changes.*
- *Data analytics can help organisations increase operational effectiveness. Data collection and analysis regarding the supply chain can reveal the source of production delays or bottlenecks and aid in the prediction of potential future issues. An organisation could supplement or replace this vendor if a demand projection indicates that they won't be able to handle the*

volume needed for the holiday season. This would prevent production delays.

- *Threats to data security exist for all companies. By analysing and displaying pertinent data, organisations may employ data analytics to identify the root causes of previous data breaches. For instance, the IT department can employ data analytics programmes to analyse, analyse, and display audit records in order to pinpoint the direction and starting point of an attack. IT may use this data to find vulnerabilities and patch them.*
- *Business users can recognise relationships and patterns in the data through visualization, which also gives the data more significance. Users may identify the relevance of these areas to advance their business by focusing on certain regions in the data that require attention by analysing these patterns.*

Disadvantages:

- *Loss of items.*
- *Scanning errors.*
- *Improper inventory tracking.*
- *Hacking.*
- *Theft.*

Future scope:

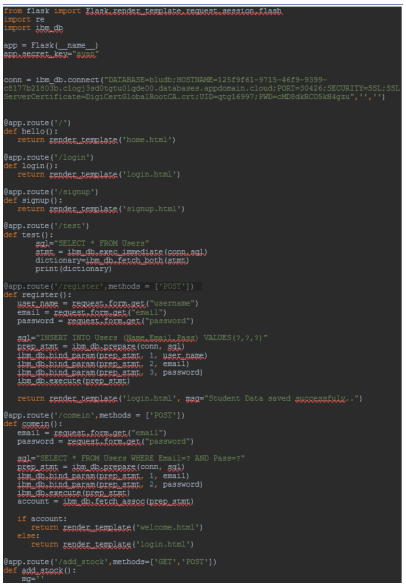
- *Stock will be seen as a strategic asset by successful businesses rather than a burdensome expenditure or an unavoidable evil.*
- *Effective inventory management will depend on collaboration with supply chain partners and a holistic approach to supply chain management.*

- *The main drivers for modifying supply chain and inventory strategies will be an increased emphasis on supply chain security and worries about the quality of inventory itself.*
- *More than ever before, professionals like journalists will be expected to base their conclusions on data in the future. Journalismic narrative is becoming undercut by data in an era of "fake news." The book "America's Retail Apocalypse" provides a good illustration.*

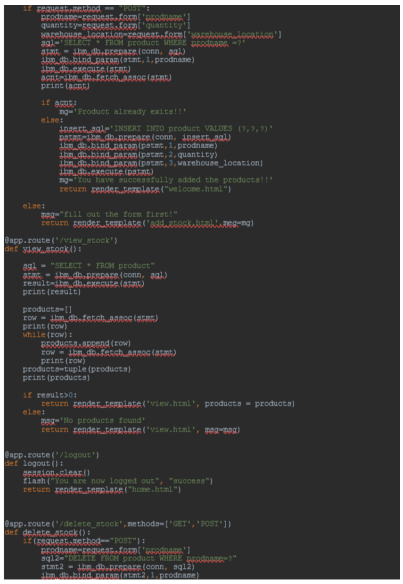
Appendix:

Source Code & Github Link:

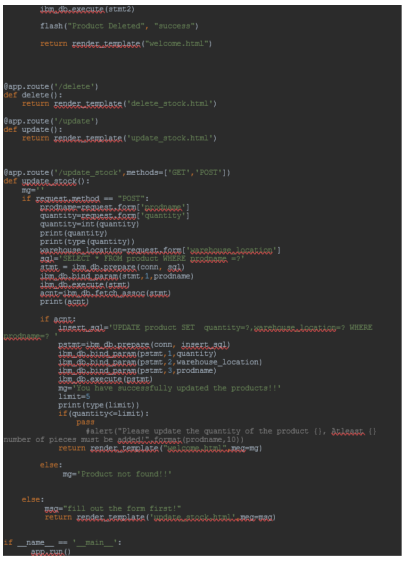
Source Code:



```
from flask import Flask,render_template,request,session,flash
import re
import ibm_db

app = Flask(__name__)
app.secret_key="asdf"

conn = ibm_db.connect("DATABASE=bludb;HOSTNAME=125f9f61-9715-46f9-9399-
c8177b21803b.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud;PORT=30426;SECURITY=SSL;SSL
ServerCertificate=DigiCertGlobalRootCA.crt;UID=qtg16997;PWD=cMD8dkSCO5kH4qsu",'','')


@app.route('/')
def hello():
    return render_template('home.html')

@app.route('/login')
def login():
    return render_template('login.html')

@app.route('/signup')
def signup():
    return render_template('signup.html')

@app.route('/test')
def test():
        sql="SELECT * FROM Users"
        stmt = ibm_db.exec_immediate(conn,sql)
        dictionary=ibm_db.fetch_both(stmt)
        print(dictionary)

@app.route('/register',methods = ['POST'])
def register():
    user_name = request.form.get("username")
    email = request.form.get("email")
    password = request.form.get("password")

    sql="INSERT INTO Users (Name,Email,Pass) VALUES(?,?,?)"
    prep_stmt = ibm_db.prepare(conn, sql)
    ibm_db.bind_param(prep_stmt, 1, user_name)
    ibm_db.bind_param(prep_stmt, 2, email)
    ibm_db.bind_param(prep_stmt, 3, password)
    ibm_db.execute(prep_stmt)

    return render_template('login.html', msg="Student Data saved successfully..")

@app.route('/comein',methods = ['POST'])
def comein():
    email = request.form.get("email")
    password = request.form.get("password")

    sql="SELECT * FROM Users WHERE Email=? AND Pass=?"
    prep_stmt = ibm_db.prepare(conn, sql)
    ibm_db.bind_param(prep_stmt, 1, email)
    ibm_db.bind_param(prep_stmt, 2, password)
    ibm_db.execute(prep_stmt)
    account = ibm_db.fetch_assoc(prep_stmt)

    if account:
        return render_template('welcome.html')
    else:
        return render_template('login.html')

@app.route('/add_stock',methods=['GET','POST'])
def add_stock():
    msg=""
```



```
    if request.method == 'POST':
        prodname=request.form['prodname']
        quantity=request.form['quantity']
        warehouse_location=request.form['warehouse_location']
        sql="SELECT * FROM product WHERE prodname =?"
        stmt = ibm_db.prepare(conn, sql)
        ibm_db.bind_param(stmt,1,prodname)
        ibm_db.execute(stmt)
        acnt=ibm_db.fetch_assoc(stmt)
        print(acnt)

        if acnt:
            msg='Product already exits!!'
        else:
            insert_sql='INSERT INTO product VALUES (?,?,?)'
            pstmt=ibm_db.prepare(conn, insert_sql)
            ibm_db.bind_param(pstmt,1,prodname)
            ibm_db.bind_param(pstmt,2,quantity)
            ibm_db.bind_param(pstmt,3,warehouse_location)
            ibm_db.execute(pstmt)
            msg='You have successfully added the products!!'
            return render_template("welcome.html")

    else:
        msg="fill out the form first!"
        return render_template('add_stock.html',msg=msg)

@app.route('/view_stock')
def view_stock():

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

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

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


@app.route('/logout')
def logout():
    session.clear()
    flash("You are now logged out", "success")
    return render_template("home.html")


@app.route('/delete_stock',methods=['GET','POST'])
def delete_stock():
    if(request.method=="POST"):
        prodname=request.form['prodname']
        sql2="DELETE FROM product WHERE prodname=?"
        stmt2 = ibm_db.prepare(conn, sql2)
        ibm_db.bind_param(stmt2,1,prodname)
```



```
        ibm_db.execute(stmt2)

        flash("Product Deleted", "success")

        return render_template("welcome.html")



@app.route('/delete')
def delete():
    return render_template('delete_stock.html')

@app.route('/update')
def update():
    return render_template('update_stock.html')


@app.route('/update_stock',methods=['GET','POST'])
def update_stock():
    msg=''
    if request.method == 'POST':
        prodname=request.form['prodname']
        quantity=request.form['quantity']
        quantity=int(quantity)
        print(quantity)
        print(type(quantity))
        warehouse_location=request.form['warehouse_location']
        sql="SELECT * FROM product WHERE prodname =?"
        stmt = ibm_db.prepare(conn, sql)
        ibm_db.bind_param(stmt,1,prodname)
        ibm_db.execute(stmt)
        acnt=ibm_db.fetch_assoc(stmt)
        print(acnt)

        if acnt:
            insert_sql='UPDATE product SET  quantity=?,warehouse_location=? WHERE
prodname=? '
            pstmt=ibm_db.prepare(conn, insert_sql)
            ibm_db.bind_param(pstmt,1,quantity)
            ibm_db.bind_param(pstmt,2,warehouse_location)
            ibm_db.bind_param(pstmt,3,prodname)
            ibm_db.execute(pstmt)
            msg='You have successfully updated the products!!'
            limit=5
            print(type(limit))
            if(quantity<=limit):
                pass
                #alert("Please update the quantity of the product {}, Atleast {}
number of pieces must be added!".format(prodname,10))
            return render_template('welcome.html',msg=msg)

        else:
            msg='Product not found!!'


    else:
        msg="fill out the form first!"
        return render_template('update_stock.html',msg=msg)


if __name__ == '__main__':
    app.run()
```

Github Repo Link:

https://github.com/IBM-EPBL/IBM-Project-16799-1659622937