PROJECT REPORT

DATA ANALYTICS BASED RETAIL STORE STOCK

INVENTORY ANALYTICS

TEAM ID:PNT2022TMID33849

TEAM MEMBERS:

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Pon shiva Haritha.E -950819106054
Elakiya.M- 950819106304

Introduction

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.
- ✓ 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.
- ✓ Inventory management helps retailers address another costly inefficiency that happens when products expire or become obsolete.

Literature survey:

Author: MD Imtiaz Uddin, Tanvir Ahmed, RedoyanRaz, AHM SaifulIslam

Global Journal of Computer Science and Technology, 2020

Data mining is one of the most essential tools for gathering information from different datasets in almost all recent industries. In this 21st-century, data mining gained attention because of its significance in decision making, and it has become a key component in various industries such as retail. Inventory management requires pre-planned goals and attention to detail, and prioritizing items that require less attention can be a waste of time and resources. Learning indications about customers' shopping patterns by showing associations among various provides significant value in managing retail inventory. In the present research paper, popular data mining techniques have been applied and analyzed for multi-item inventory management in retail sales stores to show how data mining techniques can optimize and organize the retail inventory.

Author:Puppala Sridhar, CR Vishnu, R Sridharan

Inventory management has become a key factor in today's world of uncertainty, particularly in the retail sector. Accordingly, there is a high requirement of managing and controlling the inventory with appropriate policies to elevate the organization's performance. In fact, a proper system has to be implemented for monitoring customer demand. This system will, in turn, assist in maintaining the right level of inventory. In this direction, the present research focuses on a retail store and explores a solution for an inventory-related problem experienced by the firm. A simulation model is developed and run for particular merchandise using Arena simulation software. Rigorous experimentation is conducted with the model by altering the inputs/model characteristics, and a more effective system is proposed. Compared with the existing traditional inventory management system, the proposed system will reduce the inventory level by 40% and lost sales by 87%.

Furthermore, the proposed system is optimized using the OptQuest module in Arena simulation software. As a result, the inventory level is further reduced by 73% compared to the existing system. Store managers in various organizations may utilize the proposed methodology for improving their inventory management system.

Author:GarimaMakkar

Data Management, Analytics and Innovation, 529-542, 2020

Be it a retailer, producer, or supplier, the weather has a substantial effect on each one of them. Climate variability and weather patterns have become critical success factors in retail these days. As a matter of fact, weather forecasting has become a $3 billion business now. One of the main reason behind this surge is the capability of the forecasters to sell weather-related information to businesses who then strategize their various decisions regarding inventory, marketing, advertising, etc. accordingly. Hence only those retailers who stay “ahead of the game” will be able to enjoy huge sales while others who do not would face the consequences. Various studies regarding change in consumer behavior occurring due to the change in weather conditions have shown that even a degree change in temperature affects the store’s traffic and reflect the growing importance of predictive analytics in this domain. However, these studies incorporate only the historical weather statistics into account. In this paper, we will propose our methodology for footfall analytics to see how the changes in weather conditions will impact the retail store’s traffic and thereby retailing value chain, using real-time weather forecasts and footfall data. This analysis provides a platform for retailers to make evidence-driven decisions and strategize their business plan which would help them to deepen the customer involvement and to get efficiency in the planning process.

Author: NehaVerma, Dheeraj Malhotra, Jatinder Singh

Journal of Management Analytics 7 (3), 424-442, 2020

Presently, retailing has changed its face from unordered stacked traditional stores to beautifully decorated and appropriately managed merchandise stores or shopping malls with excellent ambiance and comfort. Therefore, these stores try to accommodate all needed items for daily use or rarely required items under the same roof. However, the primary challenge for today's retailer is that the modern customer is quality and brands conscious as well as compare for services provided to them by different outlets at the comfort of home with a single click. Therefore, customers prefer to purchase from E-Commerce websites instead of physically visiting a retail store, which leads to the downfall in the sales of retailers which become a serious threat to them. Therefore, retailers are required to work sincerely towards their customer expectations by providing all their needed goods under the same roof. Therefore, the objective of this paper is to assist retail business owners to recognize the purchasing needs of their customers and hence to entice customers to physical retail stores away from competitor E-Commerce websites. This paper employs a systematic research methodology based on association rule mining deployed over Map-Reduce based Apriori association mining and Hadoop based intelligent cloud architecture to determine useful buying patterns from purchase history of previous customers, in order to assist retail business owners. The finding acknowledges that the traditional mining algorithms have not progressed to support big data analysis as required by current retail businesses owners. The job of finding unknown association rules from big data requires a lot of resources such as memory and processing engines. Moreover, traditional mining systems are inadequate to provide support for partial failure support, extensibility, scalability etc. Therefore, this study aims to implement and develop MapReduce based Apriori (MR-Apriori) algorithm in the form of Intelligent Retail Mining Tool i.e. IRM Tool to recognize all these concerns in an efficient manner. The proposed system adequately satisfy all significant requisites anticipated from modern Big Data processing systems such as scalability, fault tolerance, partial failure support

etc. Finally, this study experimentally verifies the effectiveness of the proposed algorithm.

Author: Geert-Jan van Houtum, Jan A Van Mieghem

Manufacturing & Service Operations Management 22 (1), 36-46, 2020

We present a reproducible, objective review of research trends using text mining and citations of papers published in Manufacturing & Service Operations Management during its first 20 years whose abstracts or keywords contain capacity or inventory. The review is followed by our subjective projections on future research opportunities.

Author:Larissa Janssen, Jürgen Sauer, Thorsten Claus, Uwe Nehls

Computers & Industrial Engineering 118, 9-22, 2018

The food waste in grocery retail is a worldwide problem. Many mathematical inventory models for perishable items do not have a closing day’s constraint, although the age of perishable items also increases on closing days in grocery stores. We develop a new age-based inventory model with a closing day’s constraint. This stochastic multi-item inventory model includes total stock capacity constraints, a positive lead time, a periodic inventory control, a target customer service level and mixed FIFO and LIFO issuing policies for perishable items with a fixed lifetime under a non-stationary random demand. We show in a comparative simulation study under a rolling planning that the closing day’s constraint improves order decisions and reduces waste quantities and costs in grocery stores.

Author: Roberta Sirovich, Giuseppe Craparotta, Elena Marocco

Artificial Intelligence for Fashion Industry in the Big Data Era, 173-195, 2018

Retail stock allocation is crucial but challenging. The authors developed an innovative solution, successfully tested in the context of high-end fashion: collaboration between artificial intelligence and human intuition. Each week, stores are assigned a budget based on current stock levels versus potential sales, and offered to “spend” this budget with an initial data-driven recommendation on which SKU/sizes order and release. Each store manager is then given a time window, so she can modify the proposal while respecting budget constraints; and finally, the artificial intelligence optimally allocates available stock to requests based on the expected likelihood of sale minus cost of logistics, subject to management-defined constraints. Our test showed how this system outperformed the control group of stores, relying on a traditional head office-driven allocation without direct human input. The retailer boosted sales, demand cover, and stock rotation performance: an estimated 1M EUR margin/month positive impact. Moreover, the new system improved store managers morale through non-monetary incentive-driven empowerment.

Author:Mansoor Hussain, VijaydeepSiddharth, Sanjay Arya

Indian journal of public health 63 (3), 194, 2019

Background:

An efficient inventory control system would help optimize the use of resources and eventually help improve patient care.

Objectives:

The study aimed to find out the surgical consumables using always, better, and control (ABC) and vital, essential, and desirable (VED) technique as well as calculating the lead time of specific category A and vital surgical consumables.

Methods:

This was a descriptive, record-based study conducted from January to March 2016

in the surgical stores of the All India Institute of Medical Sciences, New Delhi.

Author: Jasmine Kaur, Vernika Arora, ShivaniBali

International journal of system assurance engineering and management 11 (5), 953-961, 2020

A nexus of technological advances and an increasingly competitive environment of the retail industry has taken the phrase, “Customer is the King” to a new tangent altogether. It has been observed how combination of technologies along with analytical concepts of video analytics, social media analytics, wireless analytics and smart vision systems on marketing concepts like market basket model, value-based customer segmentation, campaign planning, etc. can impact the customer satisfaction and reduce the customer churn rate. An effective amalgamative implementation of these concepts will help enhance customer satisfaction and help the retailers gain an edge in the competitive market environment. The aim of this paper is to understand the technological advancements along with the impact of data analytics in the retail sector and to capture and retain maximum customers by conceptualizing effective merchandising and marketing strategies.

IDEATION&PROPOSED SOLUTION:

EMPATHY MAP CANVAS:

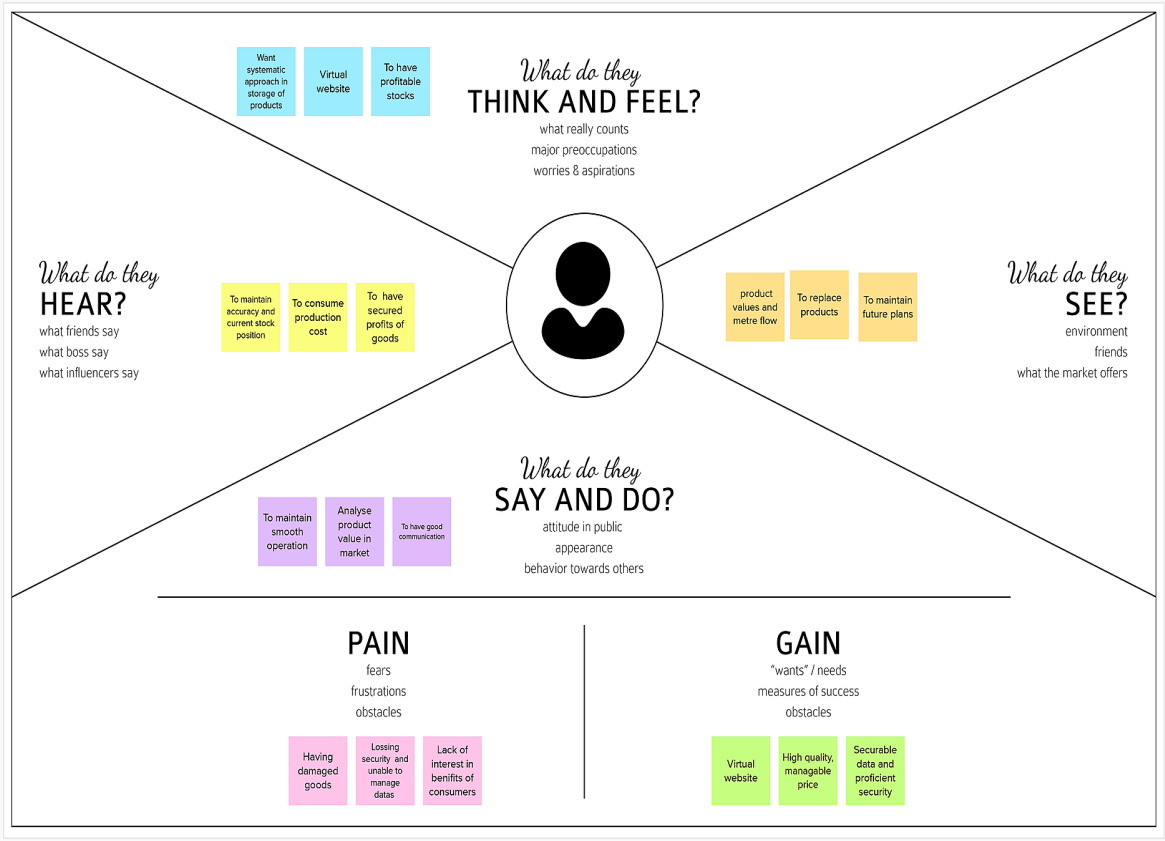
Edit this template
Right-click to unlock

Empathy Map Canvas

Gain insight and understanding on solving customer problems.

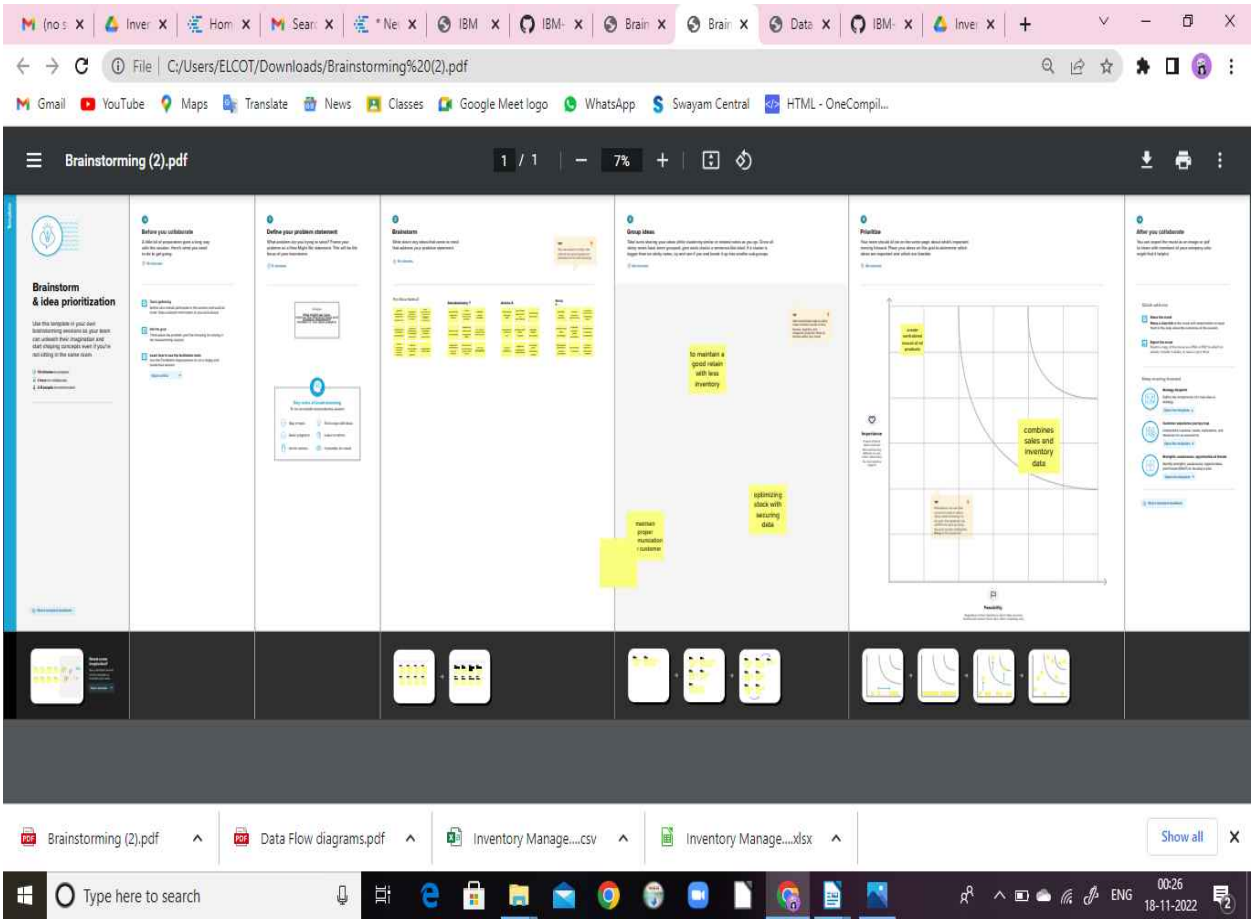
1

Build empathy and keep your focus on the user by putting yourself in their shoes.



Share your feedback

IDEATION&BRAINSTORMING:



PROPOSED SOLUTION

Project Design Phase-I
Proposed Solution Template

Date	19 September 2022
Team ID	**PNT2022TMID33849**
Project Name	Retail store stock inventory analytics
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Increasing Competition: Globalized supply chains are subject to unpredictable economic shifts and market forces that impact the competition for raw materials. Small businesses are sometimes faced with choosing between competing for high-demand materials or holding enough inventory to control cost
2.	Idea / Solution description	Safety Stock: Maintain safety stock to offset supply chain disruptions and help manage increased lead times due to shifting international competition for raw materials. Proper inventory planning helps operations adapt to global supply chains
3.	Novelty / Uniqueness	The retailer's interface with the customer is service-based. Retailers sell small quantities of items on a frequent basis. Retailers provide in terms of location, credit facilities, range of merchandise, after - sales service,
4.	Social Impact / Customer Satisfaction	Regulation and control from various pressure groups such as social activists, social workers, and consumer

		implementing their restrictively and communicating the true picture about the benefits or harms of using a product
5.	Business Model (Revenue Model)	Some retailers assume that a little tinkering with the value proposition is all it takes to adapt to changes in the marketplace. Although it is almost always necessary to keep the value proposition aligned with shifts in the market, the most successful retailers make significant improvements in their operating model as well, because the value proposition and operating model together are responsible for the entire business model success
6.	Scalability of the Solution	An application program would be scalable if it could be moved from a smaller to a larger operating system and take full advantage of the larger operating system in terms of performance (user response time and so forth) and the larger number of users that could be handled.

PROBLEM SOLUTION:

REQUIRED ANALYSIS:
FUNCTIONAL AND NON FUNCTIONAL REQUIREMENT:

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

Date	03 October 2022
Team ID	PNT2022TMID33849
Project Name	Project - Retail Store Stock Inventory Analytics
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

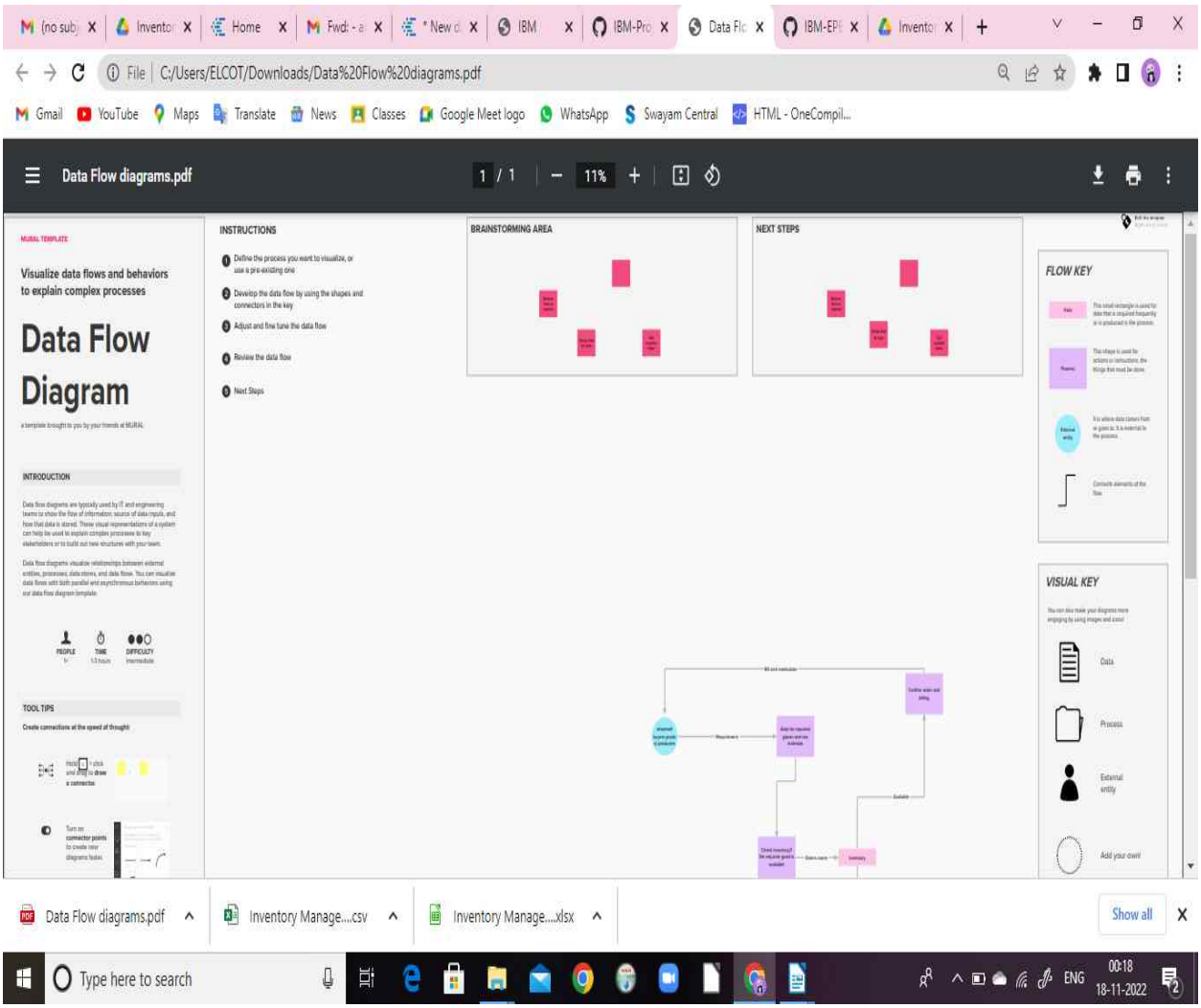
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Ordering	Ordering through Website Ordering Through directly
FR-4	User Payment	Payment via Online Payment via offline

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The customer decides where he shops and whether he uses the online store via the computer,the smartphone or a tablet. Good usability for every end device is essential for the shopping experience and in some cases makes the difference of whether a purchase takes place or not.
NFR-2	**Security**	The process of ensuring safety and optimum management control of stored goods.
NFR-3	**Reliability**	The understanding of customers well can drastically reduce churn and increase up-selling opportunities,thus increasing revenues for the company.
NFR-4	**Performance**	Inventory performance is a measure of how effectively and efficiently inventory is used and replenished.
NFR-5	**Availability**	It represents the extent to which a company has enough inventory to fulfill customer orders

PROJECT DESIGN:
DATA FLOW DIAGRAM:



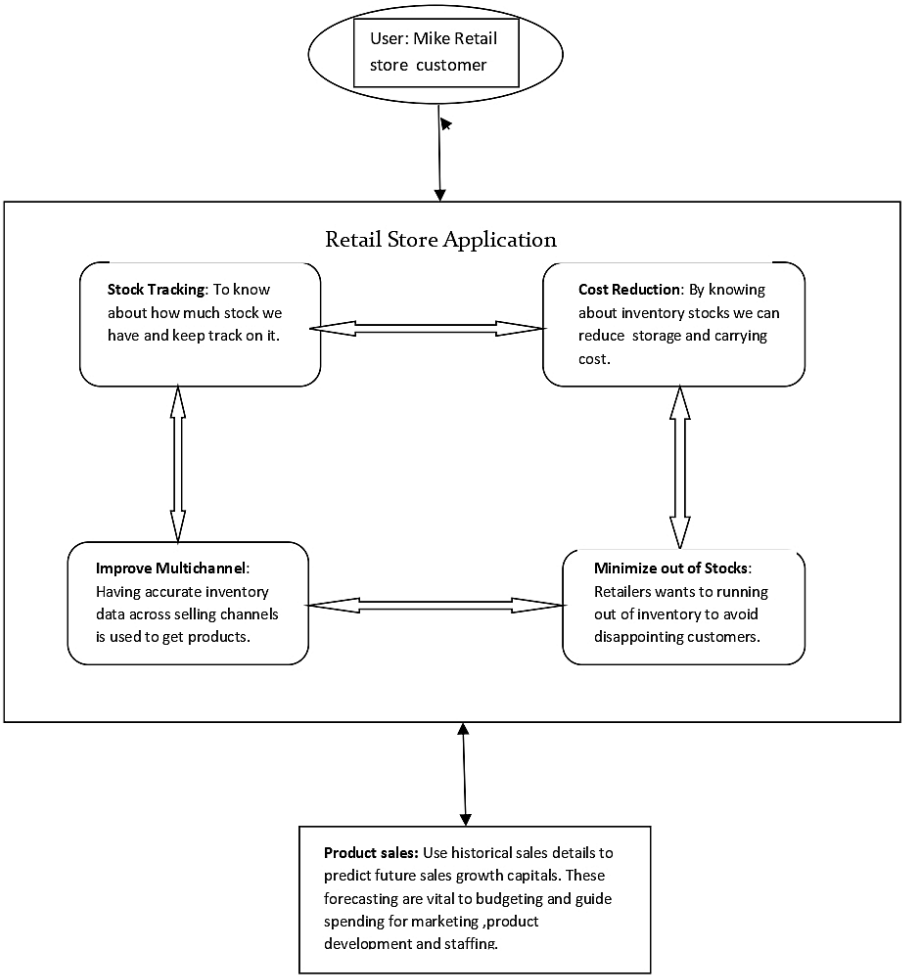
SOLUTION & TECHNICAL ARCHITECTURE:

As for solution and Technical architecture the templates are separated and posted below for references.

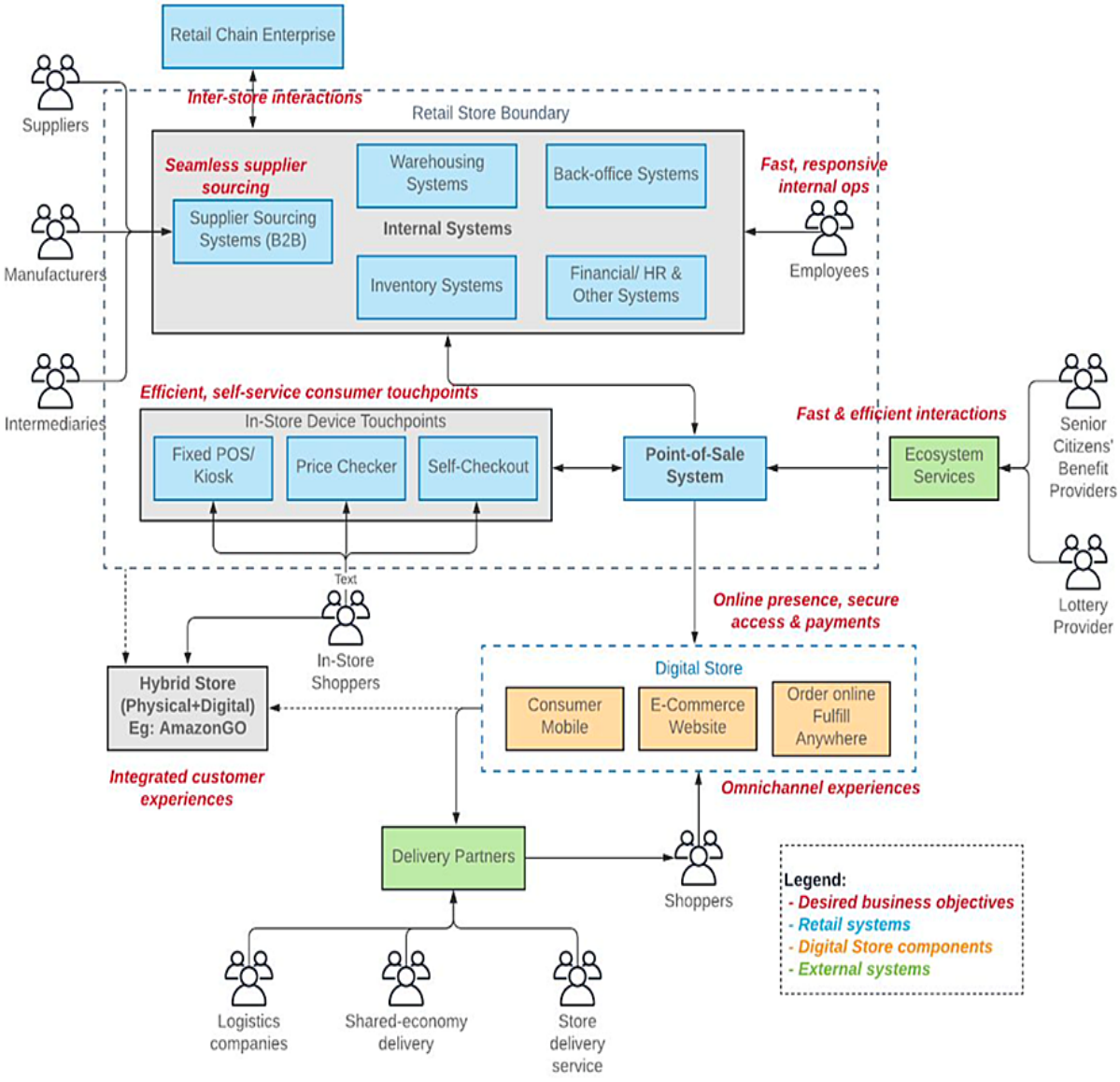
PROJECT DESIGN PHASE – I

SOLUTION ARCHITECTURE

Date	13 October 2022
Team id	PTN2022TMID33849
Project Name	Retail Store Stock Inventory Analytics
Maximum marks	4 marks



TECHNICAL ARCHITECTURE:



PROJECT PLANING & SCHEDULING:

The planning phase has been divided into four sprints and the code developments and their estimation has established as follows.

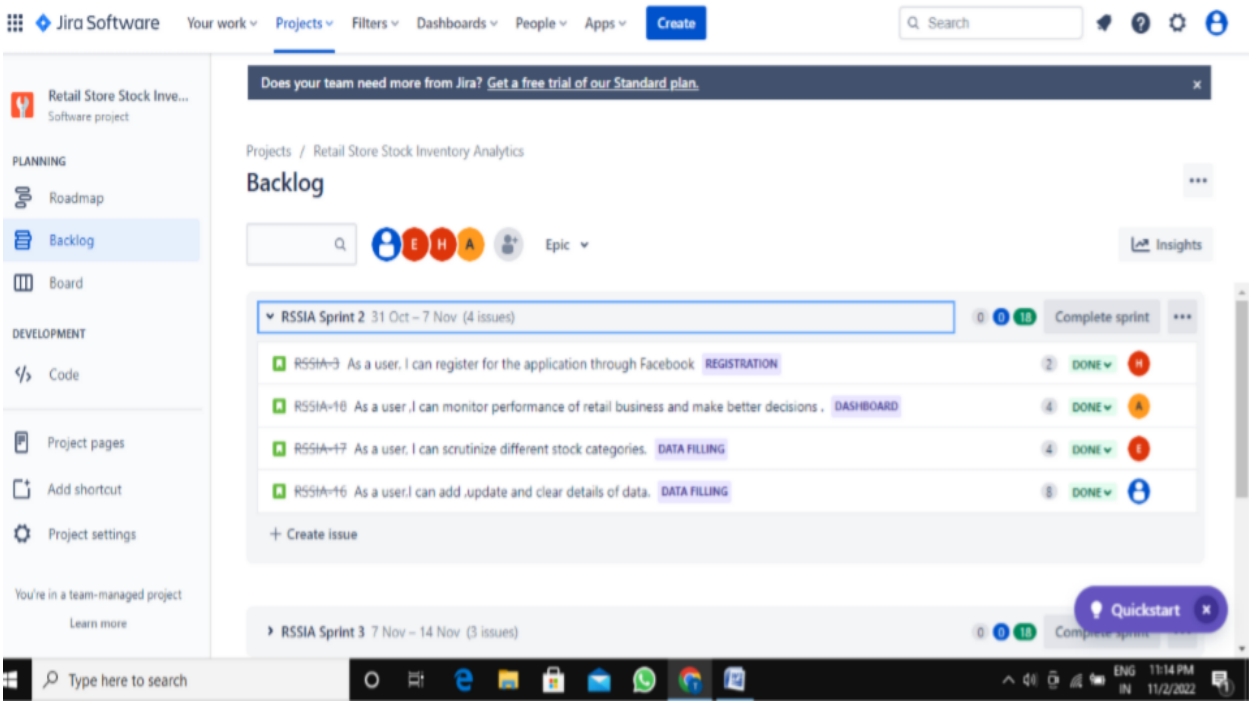
SPRINT PLANING & ESTIMATION:

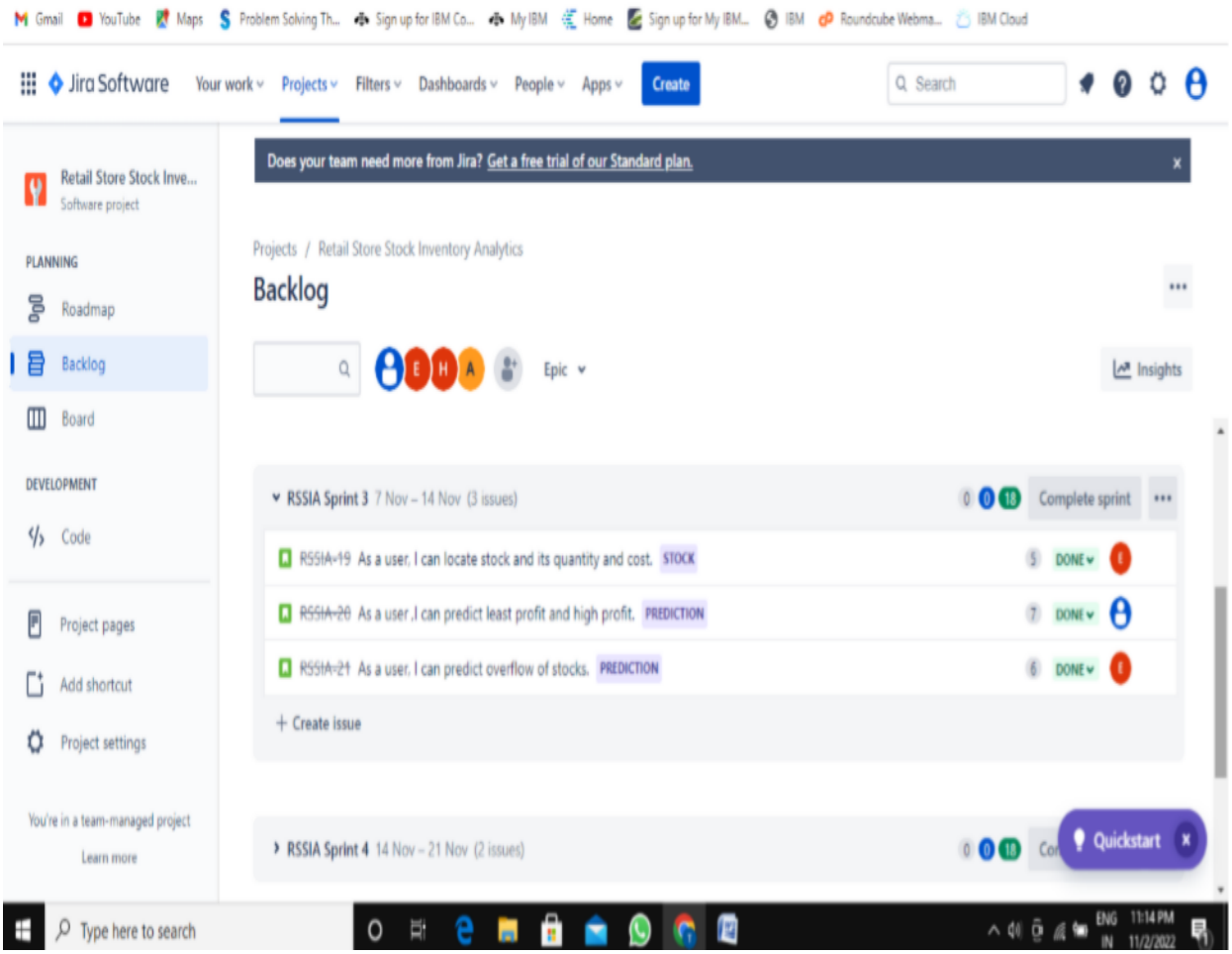
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Kamalieshwary T
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	S.Anisha
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	E.Haritha
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	M.Elakiya
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	E.Haritha
Sprint-2	Data Filling	USN-6	As a user,I can add ,update and clear details of data.	8	High	Kamalieshwary T
Sprint-2		USN-7	As a user,I can scrutinize different stock categories.	4	High	M.Elakiya
Sprint-2	Dashboard	USN-9	As a user,I can monitor performance of retail business and make better decisions	4	Medium	S.Anisha
Sprint-3	Stock	USN-10	As a user, I can locate stock and its quantity and cost.	5	High	M.Elakiya
Sprint-3	Prediction	USN-11	As a user,I can predict least profit and high profit.	7	High	Kamalieshwary T
Sprint-3		USN-12	As a user, I can predict overflow of stocks.	6	High	M.Elakiya
Sprint-4	Software Billing	USN-13	As a user,I can have paperless documents on inventory,invoice and purchase order procedures.	9	Medium	E. Haritha
Sprint-4	Analyze	USN-14	As a user,I can analyze stocks and make decisions.	9	High	S.Anisha

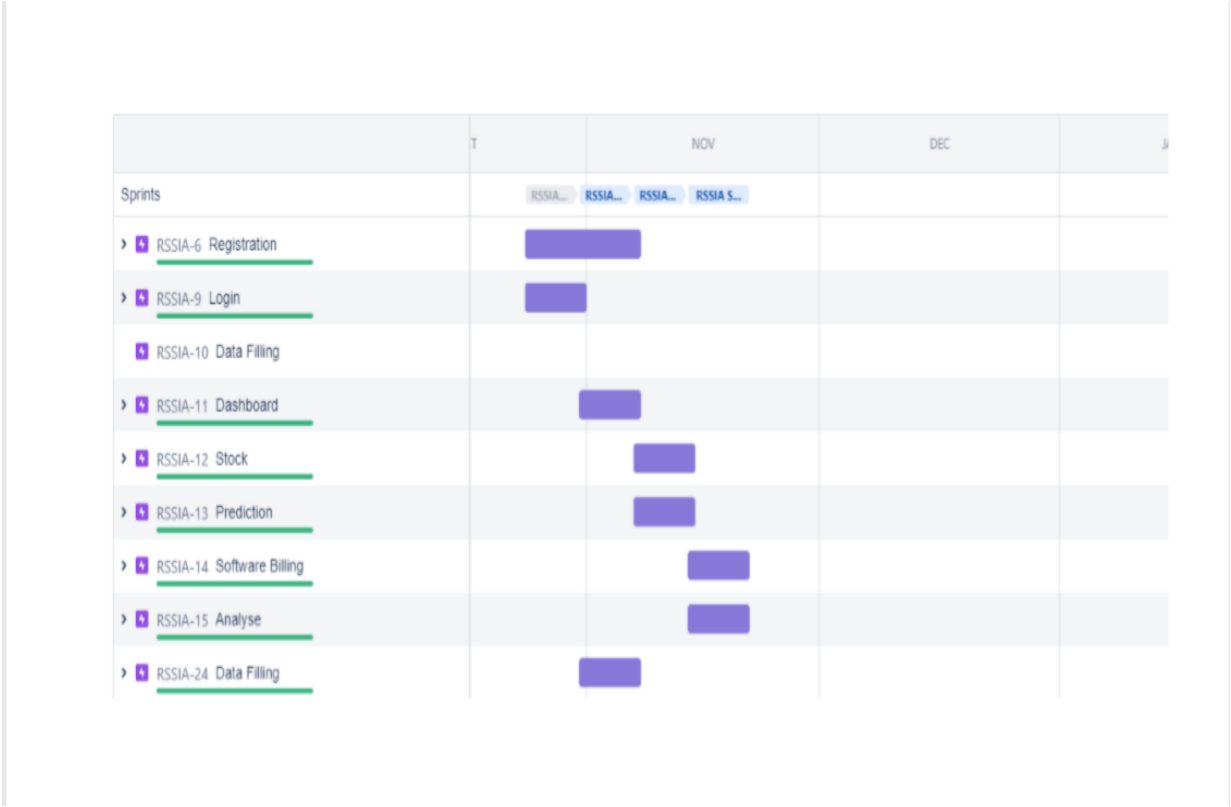
SPRINT DELIVERY SCHEDULE:

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	20	6 Days	24 Oct 2022	29 Oct 2022	6	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	18	02 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	18	02 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	18	02 Nov 2022

REPOTS FROM JIRA:




Gmail
YouTube
Maps
Problem Solving Th...
Sign up for IBM Co...
My IBM
Home
Sign up for My IBM...
IBM
Roundcube Webma...
IBM Cloud
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Retail Store Stock Inve...
Software project
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Does your team need more from Jira? Get a free trial of our Standard plan.
Projects / Retail Store Stock Inventory Analytics
Backlog
Epic
Insights
RSSIA Sprint 3 7 Nov – 14 Nov (3 issues)
Complete sprint
RSSIA-19 As a user, I can locate stock and its quantity and cost. STOCK
RSSIA-20 As a user ,I can predict least profit and high profit. PREDICTION
RSSIA-21 As a user, I can predict overflow of stocks. PREDICTION
DONE
Create issue
RSSIA Sprint 4 14 Nov – 21 Nov (2 issues)
Quickstart
Type here to search
ENG
IN
11:14 PM
11/2/2022



CODING&SOLUTION:

Feature 1:

```
<!DOCTYPE html>
<html lang="en">

<!--HTML HEADER-->
 <section class="vh-100" style="background-color:
#508bfc;">
  <div class="container py-5 h-100">
    <div class="row d-flex justify-content-center
align-items-center h-100">
      <div class="col-12 col-md-8 col-lg-6 col-xl-
5">
```

```
9         <div class="card shadow-2-strong"
  style="border-radius: 1rem;">
10          <div class="card-body p-5 text-center">
11
12            <h3 class="mb-5">Sign in</h3>
13
14            <div class="form-outline mb-4">
15              <input type="email" id="typeEmailX-2"
  class="form-control form-control-lg" />
16              <label class="form-label"
  for="typeEmailX-2">Email</label>
17            </div>
18
19            <div class="form-outline mb-4">
20              <input type="password"
  id="typePasswordX-2" class="form-control form-
  control-lg" />
21              <label class="form-label"
  for="typePasswordX-2">Password</label>
22            </div>
23
24            <!-- Checkbox -->
25            <div class="form-check d-flex justify-
  content-start mb-4">
26              <input class="form-check-input"
  type="checkbox" value="" id="form1Example3" />
27              <label class="form-check-label"
  for="form1Example3"> Remember password </label>
```

```
            </div>

          </div>
        </div>
      </div>
    </div>
  </div>
</section>
<a
  href="file:///C:/Users/JESUS/Documents/index.html">
  log in </a>
<!-- Header -->
<header class="w3-display-container w3-content w3-
  center" style="max-width:1500px">

  <!-- Navbar (placed at the bottom of the header
  image) -->
  <div class="w3-bar w3-light-grey w3-round w3-
  display-bottommiddle w3-hide-small" style="bottom:-
  16px">
    <a href="#" class="w3-bar-item w3-
  button">Home</a>
    <a href="#Services" class="w3-bar-item w3-
  button">Services</a>
    <a href="#contact" class="w3-bar-item w3-
  button">Contact</a>
  </div>
```

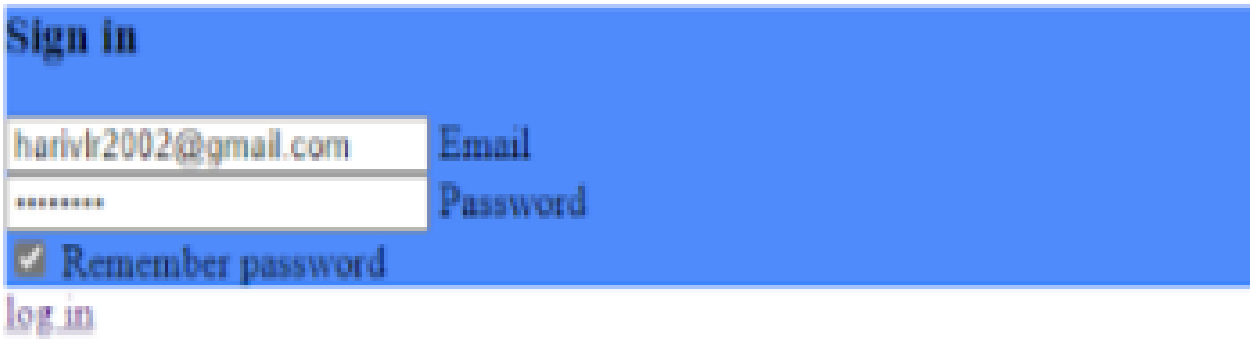
```
47</header>
48
49<!-- Page content -->
50
51<!--HTML IMAGES -->
52
53<img src="IMAGES/image2.jpg"/>
54
55<div class="w3-content w3-padding-large w3-margin-
  top" id="Services">
56
57<h1> STOCK DETAILS </h1>
58
59<iframe
  src="https://us1.ca.analytics.ibm.com/bi/?perspecti
  ve=dashboard&amp;pathRef=.my_folders%2FNew%2Bdashbo
  ard&amp;closeWindowOnLastView=true&amp;ui_appbar=fa
  lse&amp;ui_navbar=false&amp;shareMode=embedded&amp;
  action=view&amp;mode=dashboard&amp;subView=model000
  001848134fc52_00000000" width="1500" height="1000"
  frameborder="0" gesture="media" allow="encrypted-
  media" allowfullscreen=""></iframe>
60
61<h2> stock report</h2>
62
63<iframe
  src="https://us3.ca.analytics.ibm.com/bi/?pathRef=.
  my_folders%2FReport&amp;closeWindowOnLastView=true&
```

```
  amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMo
  de=embedded&amp;action=run&amp;prompt=false"
  width="1200" height="1000" frameborder="0"
  gesture="media" allow="encrypted-media"
  allowfullscreen=""></iframe>
64
65<h3> stock story </h3>
66
67<iframe
  src="https://us1.ca.analytics.ibm.com/bi/?perspecti
  ve=story&amp;pathRef=.my_folders%2FNew%2Bstory&amp;
  closeWindowOnLastView=true&amp;ui_appbar=false&amp;
  ui_navbar=false&amp;shareMode=embedded&amp;action=v
  iew&amp;sceneId=model00000184819b0e45_00000000&amp;
  sceneTime=10000" width="1500" height="1000"
  frameborder="0" gesture="media" allow="encrypted-
  media" allowfullscreen=""></iframe>
68
69
70  <!-- Contact -->
71  <div class="w3-light-grey w3-padding-large w3-
  padding-32 w3-margin-top" id="contact">
72    <h3 class="w3-center">Contact</h3>
73    <hr>
74    <p>contact us:students at GCE.
75    <form action="/action_page.php"
  target="_blank">
76      <div class="w3-section">
```

```
77         <label>Name</label>
78         <input class="w3-input w3-border"
  type="text" required name="Name">
79       </div>
80       <div class="w3-section">
81         <label>Email</label>
82         <input class="w3-input w3-border"
  type="text" required name="Email">
83       </div>
84       <div class="w3-section">
85         <label>Message</label>
86         <input class="w3-input w3-border" required
  name="Message">
87       </div>
88       <button type="submit" class="w3-button w3-
  block w3-dark-grey">Send</button>
89     </form><br>
90     <p>Powered by <a
  href="https://www.w3schools.com/w3css/default.asp"
  target="_blank" class="w3-hover-text-
  green">w3.css</a></p>
91
92   </div>
93
94<!-- End page content -->
95</div>
96
97</body>
```

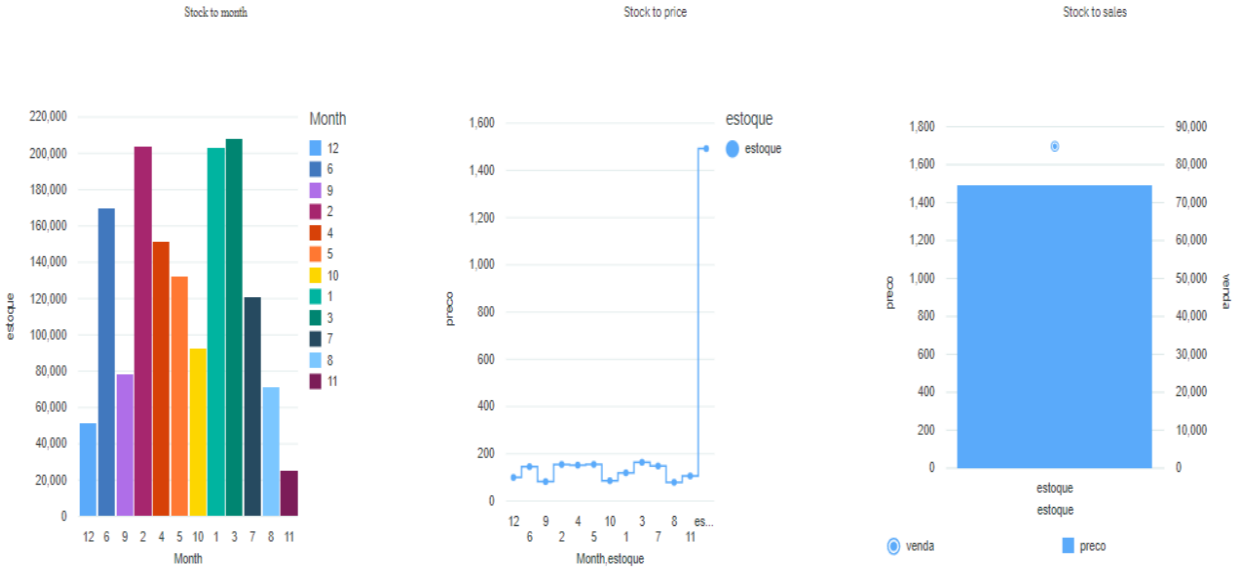
```
98</html>
99
```

Feature 2:
solutions for the above code.

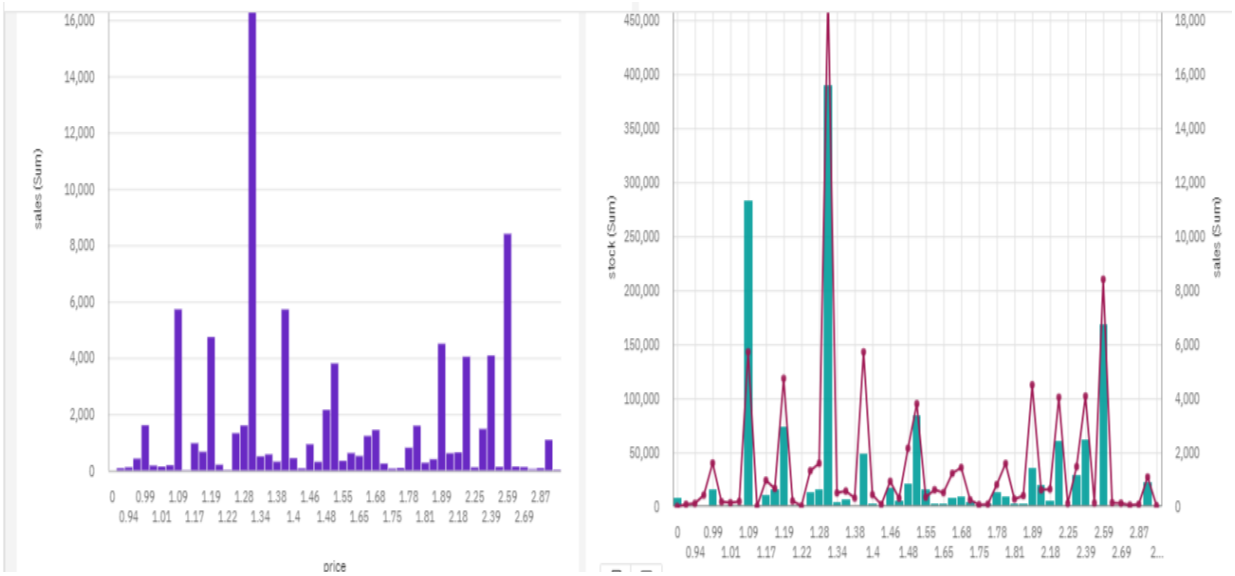


Stock Details

Stock Report

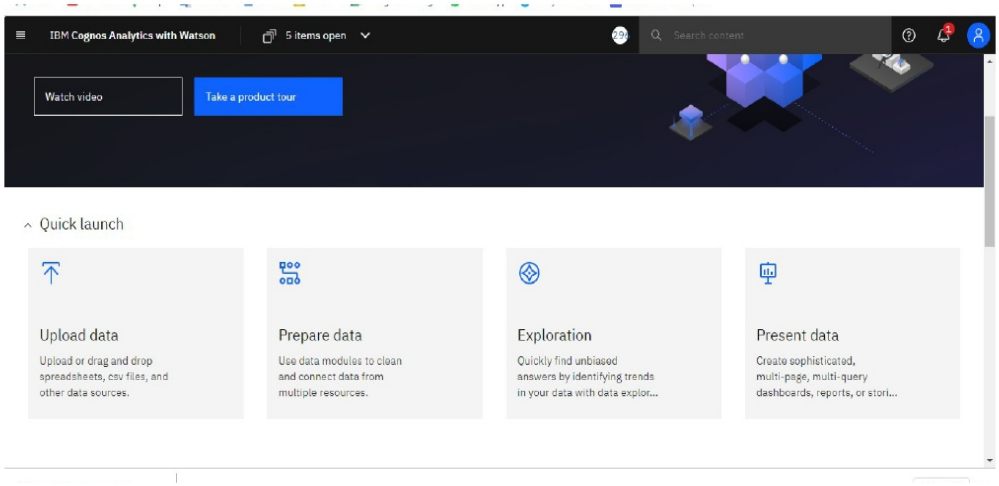


Stock Story

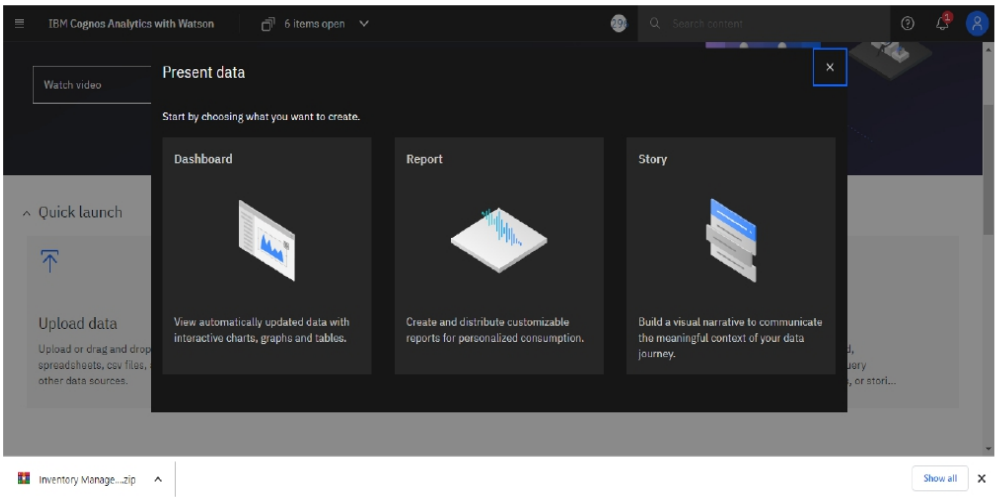


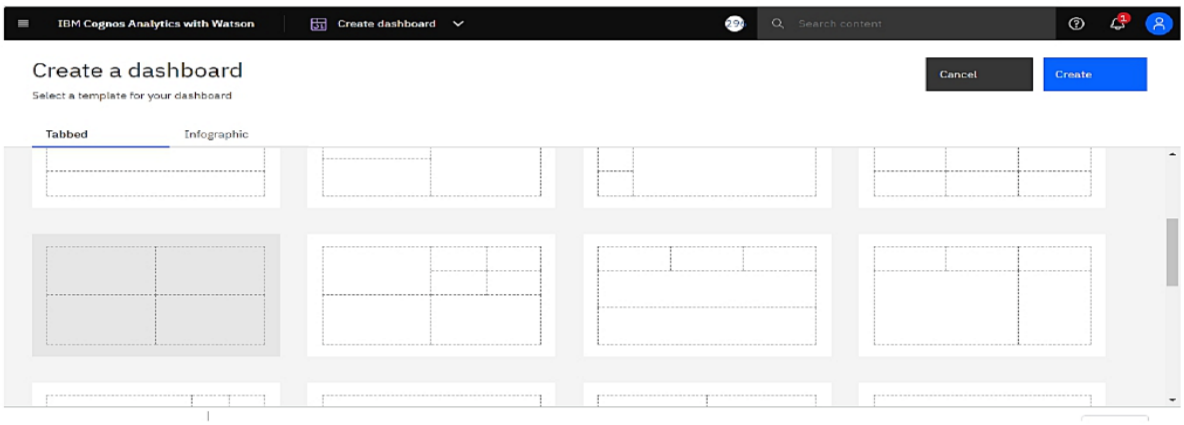
Testing the data:

1. Go to the present data

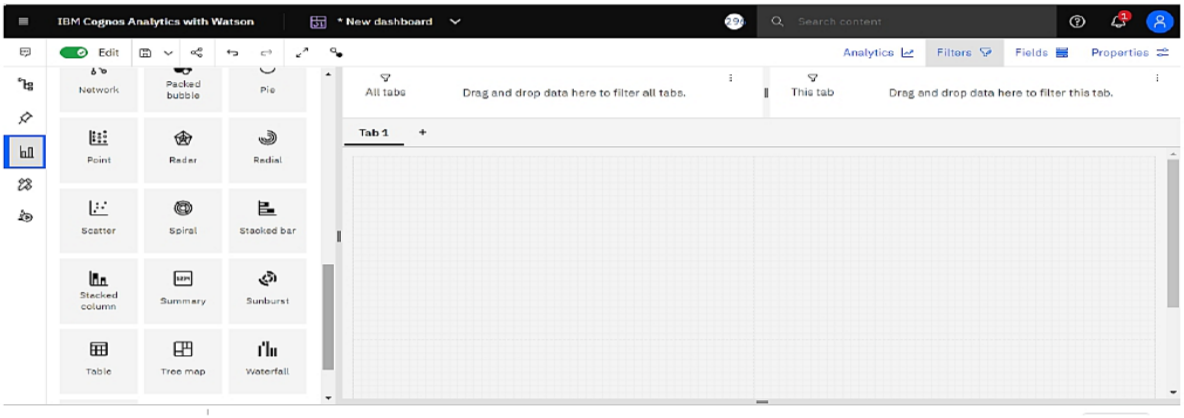


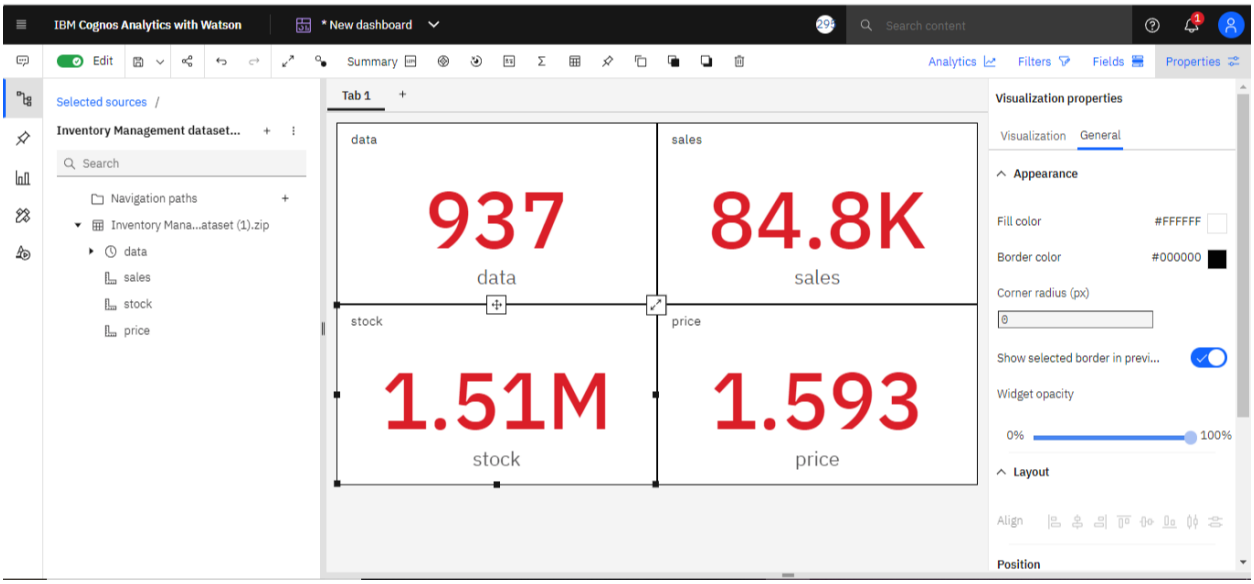
2.Click the dashboard





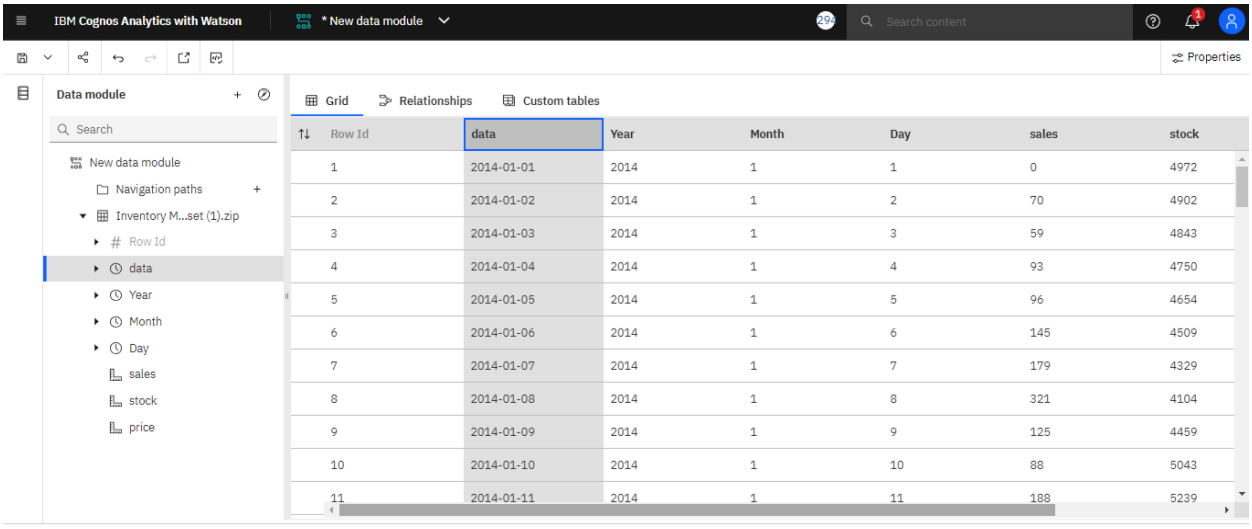
4. Select any one from the type of listed graphs





Data Filtering:

Filtering of data can be done in IBM Cognos Analytics by presenting the data.The process is easy to implement when we have the concept behind it.While spliting a dataset the format will have many layers to fullfill it .It also have mathematical calculation to find some crucial data calculations.



RESULT:

The result of this analytics is based on how we predict the data and to provide an analytic view to the customer about stock values and to improve the further development of retailers.

ADVANTAGES:

- Customer Behavior Insights
- Improving Marketing ROI
- Optimizing In -Store Operation
- Managing The Basics
- Enhancing Loyalty

DISADVANTAGES:

- Loss Of Items
- Scanning Error
- Improper Inventory Tracking
- Hacking
- Theft

APPLICATIONS:

- Flex Your Ordering Muscles
- Be Proactive With Your Supply Chain
- Crunch Your Numbers
- Maximize Efficiency
- Prioritize Accuracy
- Use An Inventory Management System

FUTURE SCOPE:

- 'Physical Stores Are Here To Stay. Retail Analytics Paves The Way'.
- 'The In-Store Experience Is The Leverage. In Store Analytics Can Make A Difference'.
- 'Analytics Is Key To Optimizing Inventory And Supply Chain Logistics'

APPENDIX:

Github

Project demo link .

https://drive.google.com/file/d/137jKkb5F7Lre_9-Wet8-6GMuj2aH21cp/view?usp=sharing