TEAM ID	**PNT2022TMID23114**
PROJECT TITLE	**Retail Store Stock Inventory Analytics**

TEAM MEMBERS:
- DHURGA S
- DEEPTHI J H
- PRIYANKA N J
- SANGAVI S

Retail Store Stock Inventory Analytics Report

1. INTRODUCTION

1.1 PROJECT OVERVIEW

The retail industry has gone through tremendous technological changes in the past few decades. The retail inventory management software can cut short your in-store inventory process cycles through analytics. The retail inventory management software can automatically count the items in your warehouse with better accuracy. Hence, it can provide you with updated inventory reports. Consumers benefit from retailing as retailers perform marketing functions that make it possible for customers to have access to a broad variety of products and services. A retail inventory management system can integrate sales and inventory data. Applied for all types of retail stores. Retail inventory management solutions automate your administration and documentation, raise accuracy, improve the customer experience, reduce costs and reveal valuable trends.Prioritize purchases based on an item's profitability, popularity and lead time. Then, create a purchase order.

1.2 PURPOSE

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.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

S.NO	PAPER	AUTHOR	METHOD AND ALGORITHM	YEAR OF PUBLICATION
1	Inventory management for retail companies	Cinthya Vanessa Muñoz Macas, Mario Peña	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).	2021
2	Optimizing Inventory Replenishment and Shelf Space Management in Retail Stores	Alyaa Abouali, Nermine Harraz, M. Nashat Fors	The retail stores put up for sale multiple items while the spaces in the backroom and display areas constitute a scarce resource.The NLIP model is implemented in a real world case study in a large retail outlet providing a large variety of products. The proposed model is validated and shows logical results when using the	2014

			experimental data collected from the market.	
3	A joint optimisation model for inventory replenishment, product assortment	Abdulrahman Al-Ahmari,King Saud University Abdel Rahman Hassan Mohamed	The variety of products to be displayed in the retail store, their display locations within the store, their ordering quantities, and the allocated shelf space in each display area are considered as decision variables to be determined by the proposed integrated model. In the model formulation, we include the inventory investment costs, which are proportional to the average inventory, and storage and display costs as components of the inventory costs and make a clear distinction between showroom and backroom inventories.	2007
4	Retail Business Analytics in Store Execution	Timothy.L.urban	The displayed-inventory news-vendor problem is developed and analyzed, utilizing a simple model to illustrate the inter dependencies between the inventory and space-allocation decisions. The model is then extended to the multi-item case, which can be incorporated as part of a comprehensive shelf-management system.	2002

2.2 REFERENCE

- https://www.researchgate.net/publication/352235223_Inventory_management_for_retail_companies_A_literature_review_and_current_trends

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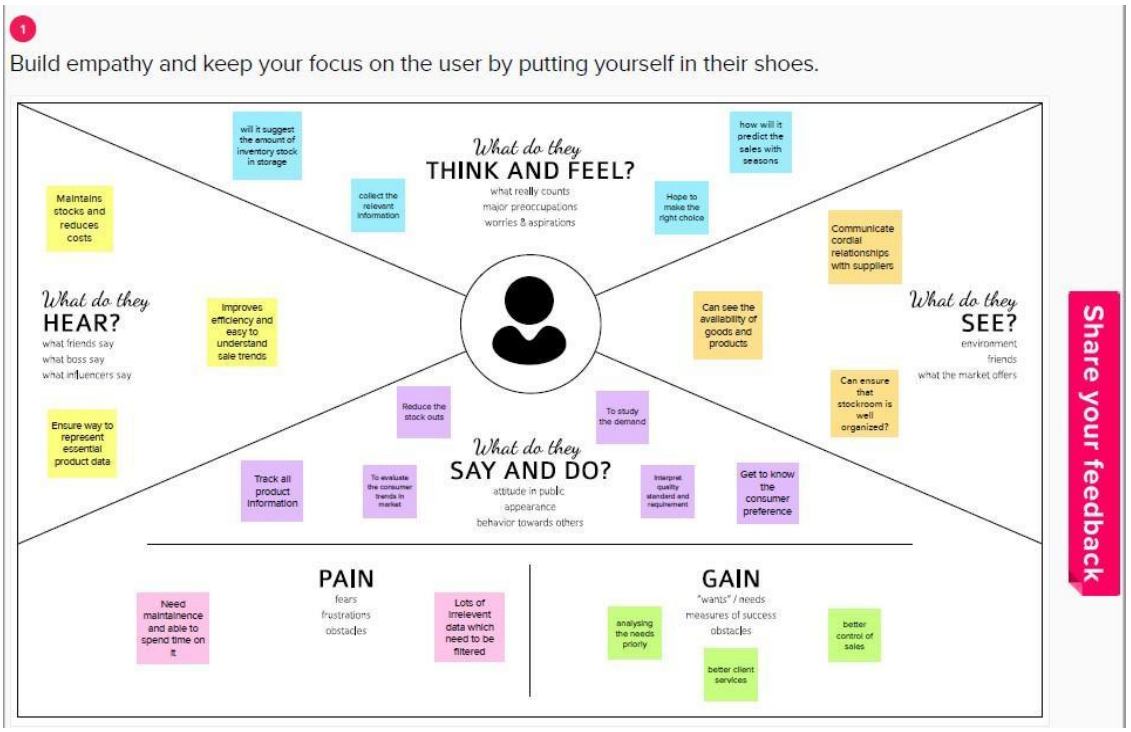
2.3 PROBLEM STATEMENT DEFINITION

Retail inventory management is the process of ensuring you carry products 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. 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 because Too much inventory means working capital costs,

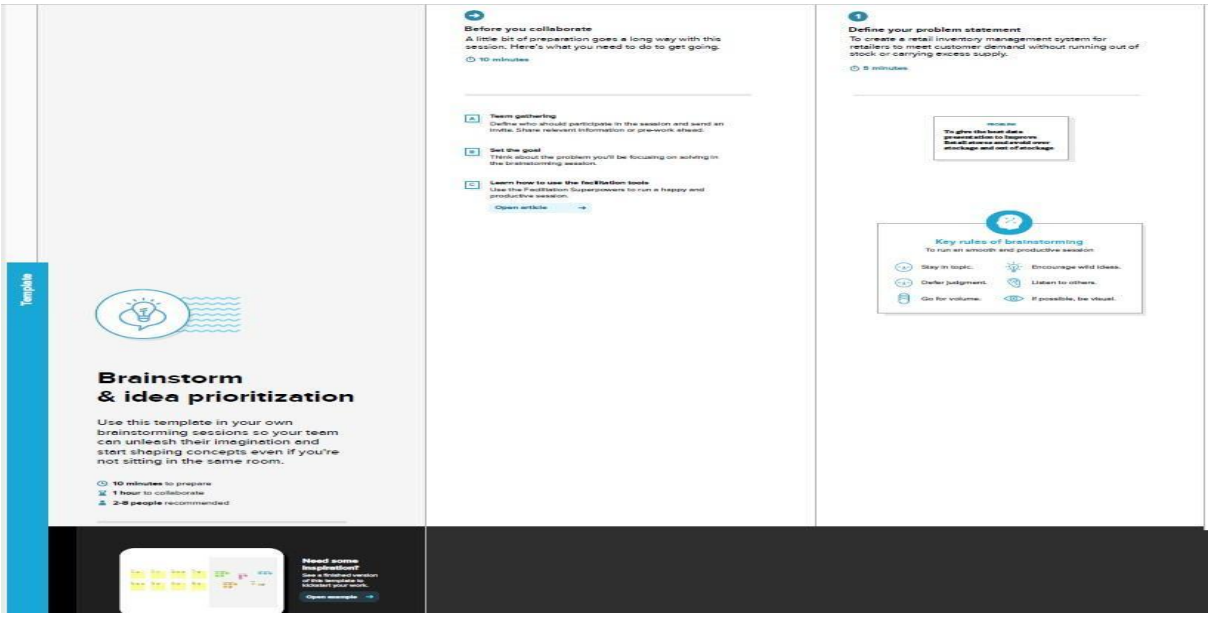
operational costs, and a complex operation. Based on the inventory management analysis we can manage how much inventory is required for selling the product based on which they can calculate the profit & losses.

3.IDEATION & PROPOSED SOLUTION

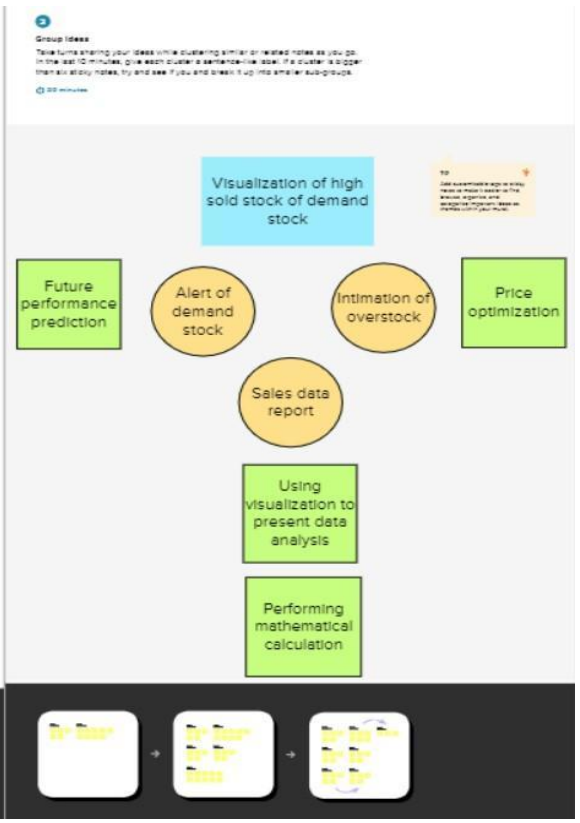
3.1 EMPATHY MAP CANVAS

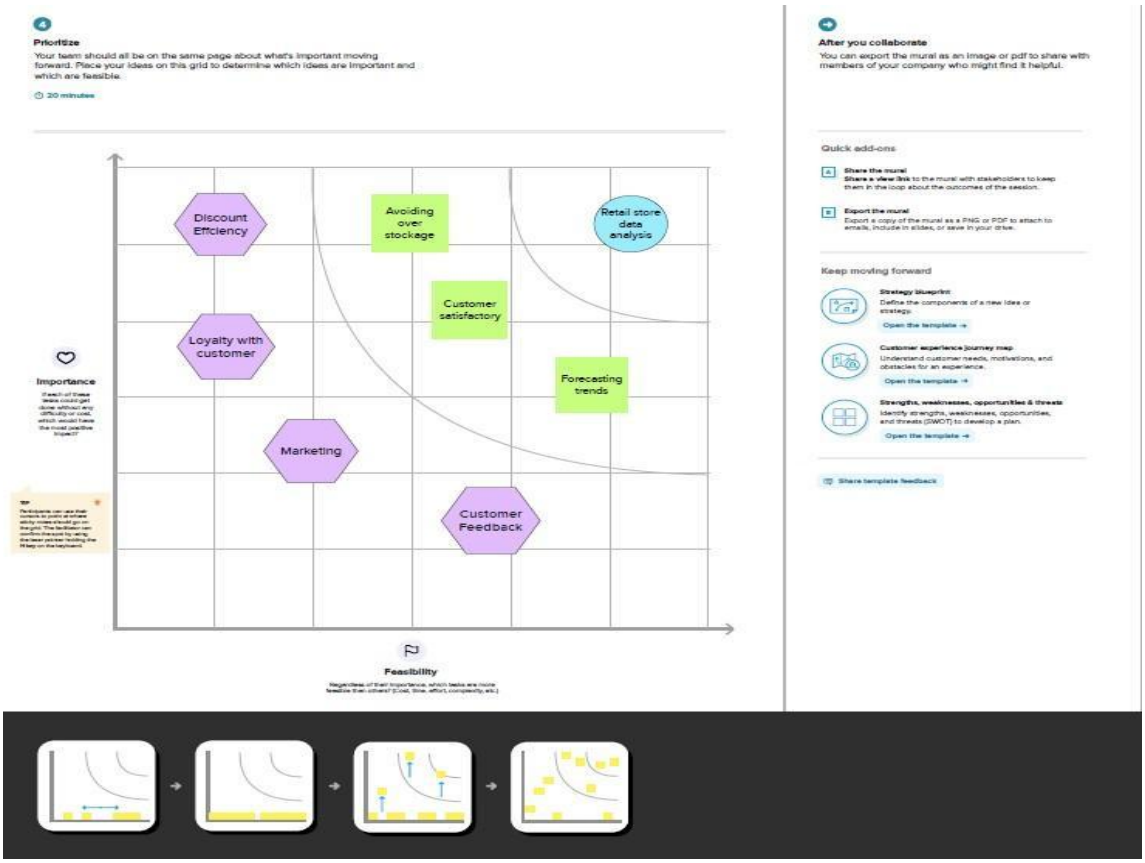


3.2 IDEATION & BRAINSTORMING




Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
DHURGA
PREVENTS OVER STOCK
ALERT DEMAND STOCK
FREQUENT ANALYSIS OF DATA
INFORMATION OF STOCKS SOLD
HELPS TO SET OFFERS ON SOON EXPIRED STOCK
DEEPTHI
PRODUCT EXPIRATION
EFFECTS OF OVER STOCK
UNSOLD STOCK
LOSS IN BUSSINESS
PRIYANKA
PREPARATION
GENERATE IDEAS
SELECT SOLUTION
CHECK
IMPACT ANALYSIS
SANGAVI
STRATEGIC AREA FOR RETAILERS
DEMAND PREDICTION
IDENTIFYING CUSTOMERS


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
Visualization of high sold stock of demand stock
Future performance prediction
Alert of demand stock
Intimation of overstock
Price optimization
Sales data report
Using visualization to present data analysis
Performing mathematical calculation


4
Prioritize
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.
20 minutes
Discount Efficiency
Avoiding over stockage
Retail store data analysis
Customer satisfactory
Loyalty with customer
Forecasting trends
Marketing
Customer Feedback
Importance
Feasibility
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

3.3 PROPOSED SOLUTION

S.NO	Parameter	Description
1	Problem Statement (Problem to be solved)	To create a retail store stock inventory management system for retailers to meet customer demand without running out of stock or carrying excess supply
2	Idea / Solution description	Retail store stock inventory analytics is implemented to analyze the historical sales data of a retailer. By deeply understanding the dataset, identifying pattern, relationships and connection using python libraries like pandas and using IBM Cognos analytics to build visualizations of stock inventory and to create meaningful dashboards. The final dynamic dashboard helps retailers by providing detailed product listing, easy categorization, inventory reports satisfying customer needs and meet variation in product demand.
3	Novelty / Uniqueness	This solution involves analyzing the sales ratio and determining the stock availability. It indicates the retailer of out of stock commodities and also determine the popular products among customers. Also it involves usage of IBM Cognos analytics tool for visualization rather than using python libraries like matplotlib.
4	Social Impact / Customer Satisfaction	Customers will get more varieties, high availability of the products.
5	Business Model (Revenue Model)	1. Improve the decision-making process oriented at reducing costs and increasing revenues. 2. Retailers are able to understand the deepest customer needs and adjust their offering to meet shoppers' demands.
6	Scalability of the Solution	This solution is applicable for small retail stores as well as large departmental stores. It can also analyse wide range of datasets and different types of visualisations can be done.

3.4 PROBLEM SOLUTION FIT

Project Title: Retail Store Stock Inventory Analytics

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID23114

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?

Shopkeeper's who are in need for buying products to refill their stocks

6. CUSTOMER CONSTRAINTS

What constraints prevent your customers from taking action or limit their choices of solutions?

1. Inadequate Capital
2. Lack of awareness of technologies
3. Unavailability of devices

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customer when they face the problem orneed to get the job done? what have theytried in the past?

- Sudden change in demand which is directly proportional to the price surge can be identified previously and stocked accordingly.
- Customers assign a managing assistant to overview the stock.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

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

Which jobs-to-be-done (or problems) do you address for your customers?

- Periodic changes according to season.
- Locating the Warehouse
- Sudden surges in prices
- Daily transportation costs

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists? What is the back story behind the need to do this job?

Most of the shopkeepers lose their customers because of insufficient stock and proper stock management. So they face loss in their business. In order to help them with their profit we are helping them with technology to make it easy.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?

The process of gathering data on the actions of buyers in a retail environment and then using that data to identify their buying preferences.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act?

- Immense wastage of products due to less sales.
- Reading about innovative ideas

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?

- Frustration
- Helplessness
- Demotivated
- Sense of thrill
- Sense of Freedom

10. YOUR SOLUTION SL

We are working on a new business proposition, where the shopkeeper can view the products availability in form of dashboard and buy product based on their need which saves time for them. Expiry date is displayed which helps shopkeeper to provide quantity and quality product to customer.

8.CHANNELS of BEHAVIOUR CH

8.1 ONLINE

Advertise with financial influencers to spread awareness and promote it.

8.2 **OFFLINE**

What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

The person who belongs to the work he should have or create some social contacts in his/her surrounding that's will create a certain trustworthy things in his business.

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

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
FR-3	User Login	• Login with form and Gmail
FR-4	Stock Extension	• User should be able to add/update sales data • User can generate the barcode to their corresponding stocks
FR-5	Stock Management	• Stock prediction using data science • Sales inventory report will be periodically generated • Notification of the products which is going to be expired
FR-6	Billing System	• Utilizing barcodes on products for rapid billing • The billing invoice accurately calculates taxes • Automated invoice generation in printable format

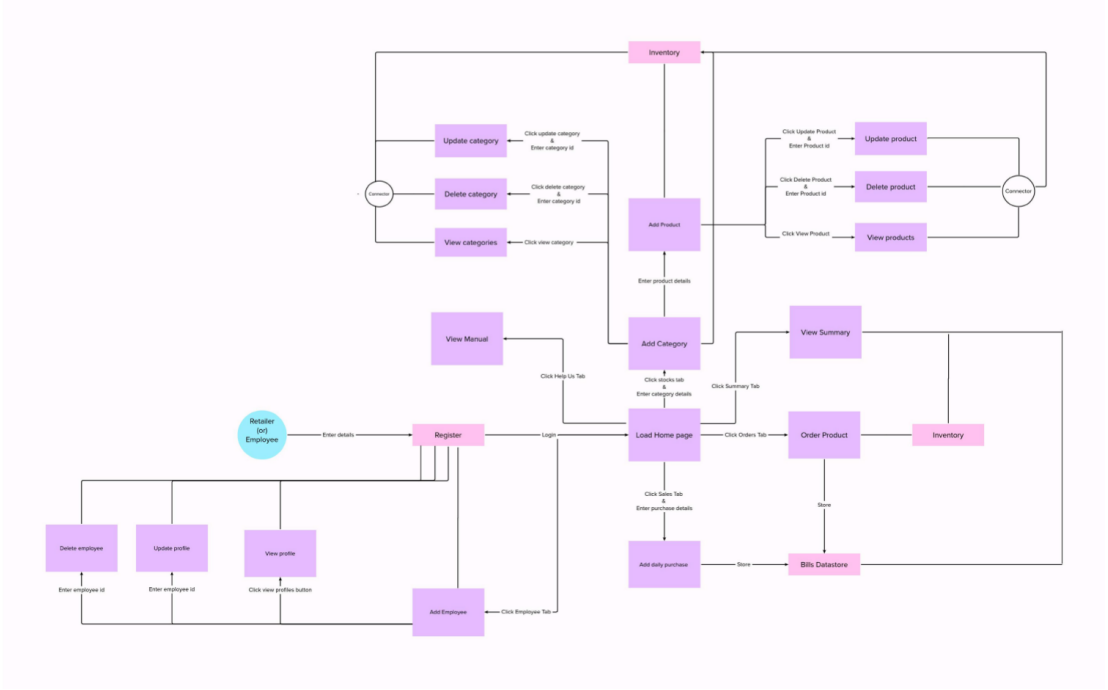
4.2 NON - FUNCTIONAL REQUIREMENT

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	• They are more likely to have the right amount of inventory to take advantage of every potential sale while avoiding overstocking and cutting costs. Both desktop and mobile browsers can handle this architecture
NFR-2	Security	• Sha-256 data protection will be provided • It is impossible to go around authentication
NFR-3	Reliability	• It will provide accurate stock prediction • It will prevent overselling of stocks • Reduce risks of major loss for the retailer by

		predicating accurately • Reliable notification system
NFR-4	Performance	• The Retailer will get the rapid invoice with the help of barcode. The invoice will contain each customer details such as Name, Address, Phone no, Purchasing products etc., • It will give accurate efficiency with the given sales stock • Data quality improvement will be performed before stock predication • Works good with moderate network stability and bandwidth
NFR-5	Availability	• Accessible on all devices • Run efficiently at the bare minimum specifications
NFR-6	Scalability	• Many users can access simultaneously without any glitch • Data can be imported and exported as json files

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS



5.2 SOLUTION & TECHNICAL ARCHITECTURE

Table-1 : Components & Technologies:

S.No	**Components**	**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	IBM Cloud Hosting

		users	
5	Performance	The user can know how to maintain the inventory to increase profits.	ML algorithms

5.3 USER STORIES

User Type	Functional Requirement(Epic)	User Story Number	User Story/Task	Acceptance criteria	Priority	Release
Retailer (Web user)	Login	USN-1	As a Retailer,I can log into the application by entering email & password(provided by developer)	I can access my account/ dashboard	High	Sprint-1
	Add product	USN-2	As a Retailer,I will be able to add the products by entering their details.	I can view the added product by clicking view product button	High	Sprint-2
	Update product	USN-3	As a Retailer,I can able to update the products details by entering the product ID(Product ID known by clicking view product button, Generated by the system while adding)	I can update the products details	Low	Sprint-2
	Delete product	USN-4	As a Retailer,I can able to the product as it is no longer needed by entering the product ID (Product ID known by clicking view product button, Generated by the system while adding)	I can delete the products from the system.	Low	Sprint-2
	View products	USN-5	As a Retailer,I am able to view the list of products by clicking the view product button in the stock tab.	I can view the list of products.	High	Sprint-2
	Add category	USN-6	As a Retailer,I am able to add category by entering category details(category name).	I can create a new category.	High	Sprint-1
	Update category	USN-7	As a Retailer,I am able to Update category by selecting the category name.	I can update the category details.	Low	Sprint-1

	Delete category	USN-8	As a Retailer,I am able to delete the category details by selecting the category name as it is no longer needed.	I can delete the category if it is no longer needed.	Low	Sprint-1
	Order product	USN-9	As a Retailer,I am able to order the products by entering customer details, product id and quantity	I can forecast the stocks needed by pre-ordering	High	Sprint-2
	View summary	USN-10	As a Retailer,I can view the summary of the inventory such as total orders,stock details and sales details.	I can view the total inventory details	High	Sprint-2
	View bills	USN-11	As a Retailer,I can view bills based on the amount,date and customer	I can view the bills	Medium	Sprint-2
	Add Employee	USN-12	As a Retailer,I can add employees by entering their details.	I can generate employee login credentials	High	Sprint-3
	Update Employee	USN-13	As a Retailer,I can Update Employee details by entering their ID.	I can access the employee details	Low	Sprint-3
	Delete Employee	USN-14	As a Retailer,I can Delete employee as it is no longer needed.	I can delete the employee details	Low	Sprint-3
	View profile	USN-15	As a Retailer,I can view list of Employees and their details by clicking the view profile button	I can view the employee profile	Medium	Sprint-3
	Notify on critical stock	USN-16	As a Retailer,I can view the notification via mobile phone and dashboard	I am aware of understock and overstock	High	Sprint-3
	Add daily purchase	USN-17	As a Retailer,I can add the daily purchase by entering the product ID and quantity.	I can keep track of stocks	High	Sprint-3
Employee (website)	Login	USN-18	As a Retailer,I can log into the application by entering email & password	I can access the system	High	Sprint-1
	Order product	USN-19	As an employee I am able to order the products by entering customer details, product ID and quantity.	I can enter the pre-order details	High	Sprint-4

	View summary	USN-20	As an employee I can view the summary of inventory such as total orders, stock details and sales details.	I can view the total inventory details	High	Sprint-4
	View bills	USN-21	As an employee I can view bills based on the amount,date and customer	I can view the bills	Medium	Sprint-4
	Add daily purchase	USN-22	As an employee I can add the daily purchase by entering product ID and quantity.	I am aware of stock availability	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed**	**Sprint Release Date**
Sprint-1	6	6 Days	24 Oct 2022	29 Oct 2022	6	29 Oct 2022
Sprint-2	16	6 Days	31 Oct 2022	05 Nov 2022	16	05 Nov 2022
Sprint-3	10	6 Days	07 Nov 2022	12 Nov 2022	10	12 Nov 2022
Sprint-4	14	6 Days	14 Nov 2022	19 Nov 2022	14	19 Nov 2022

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement	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	2	High	Deepthi J H Dhurga S

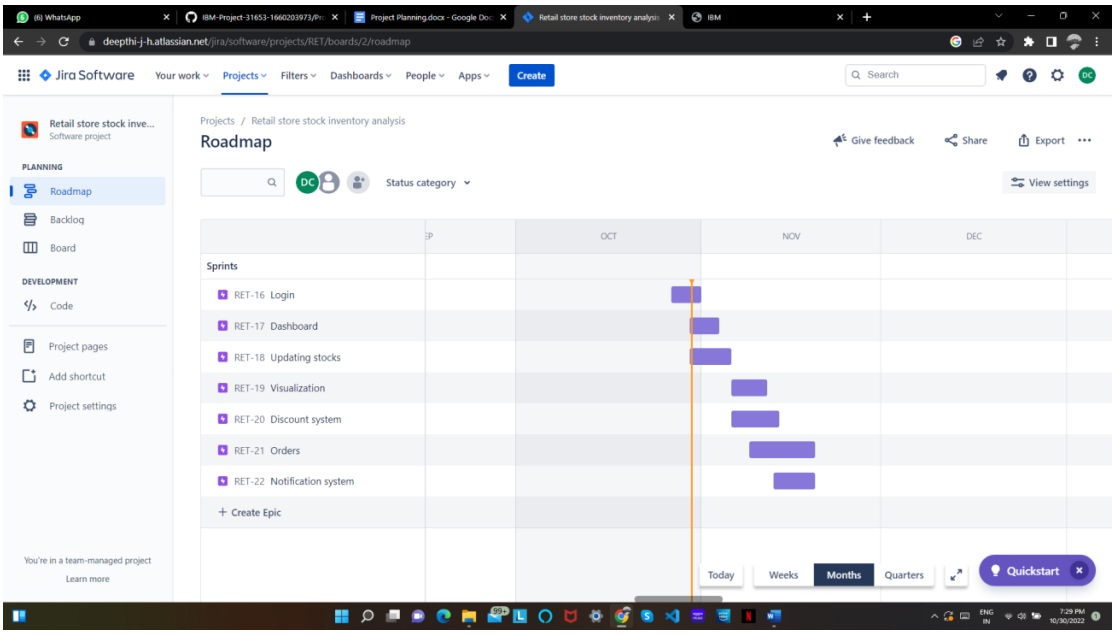
			by entering my email, password, and confirming my password.			
Sprint-1	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Priyanka N J Sangavi S
Sprint-1	Registration through Facebook	USN-3	As a user, I can register for the application through Facebook	2	Low	Deepthi J H Dhurga S
Sprint-1	Registration through Gmail	USN-4	As a user, I can register for the application through Gmail	2	Medium	Priyanka N J Sangavi S
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Deepthi J H Dhurga S
Sprint-2	Dashboard	USN-6	As a user, I can view my dashboard and can perform stock prediction and analysis	3	High	Deepthi J Priyanka N J Sangavi S
Sprint-2	View list of stocks	USN-7	As a user I can view the list of categorized	4	High	Deepthi J H Dhurga S

			products and their details			
Sprint-2	Search products	USN-8	As a user I can search through the product using barcode	2	Medium	Priyanka N J Sangavi S
Sprint-3	Report generation	USN-9	As a user I can generate reports based on product sales	5	High	Deepthi J H Dhurga S
Sprint-3	Stock Prediction	USN-10	As a user I can predict out of stock and less stock for a product	5	High	Priyanka N J Sangavi S
Sprint-4	Notification system	USN-11	As a user I can view notification for expired and out of stock products	4	High	Deepthi J H Dhurga S
Sprint-4	Re-Ordering stock	USN-12	As a user I can reorder stocks based on predictions and notification	3	High	Priyanka N J Sangavi S
Sprint-2	Updating stock	USN-13	As a user I can add/delete products	5	High	Deepthi J H Dhurga S Priyanka N J Sangavi S
Sprint-4	Invoice generation	USN-14	As a user I can generate invoice calculating taxes, discount and calculate credits	4	High	Deepthi J H Dhurga S
Sprint-4	Discount	USN-15	As a user I	3	Medium	Priyanka N J

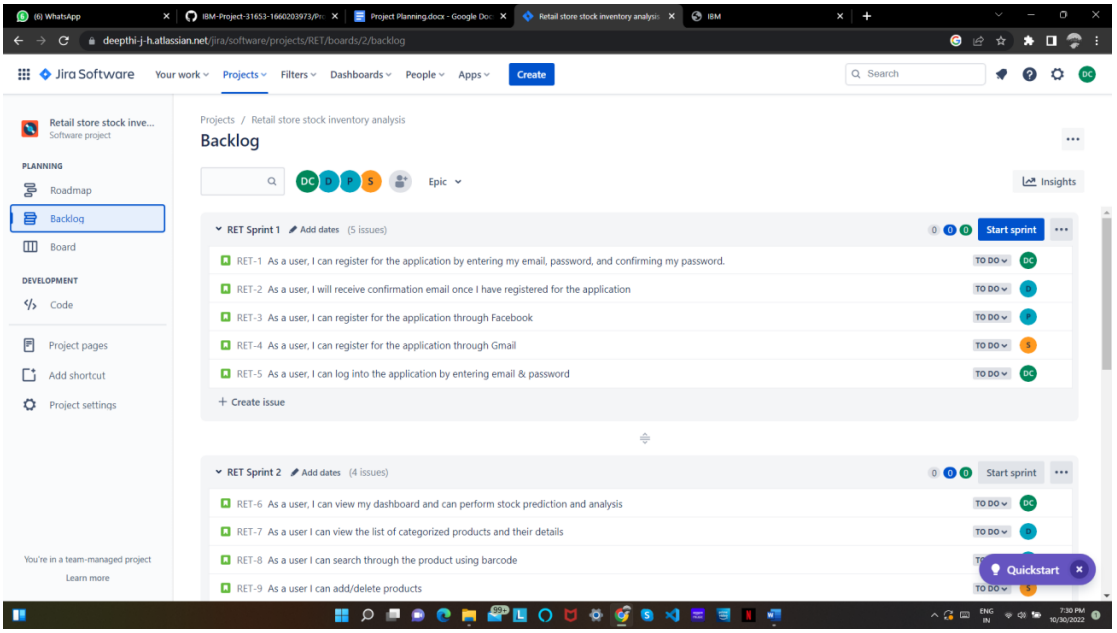
	system		can provide discount based on credit points			Sangavi S

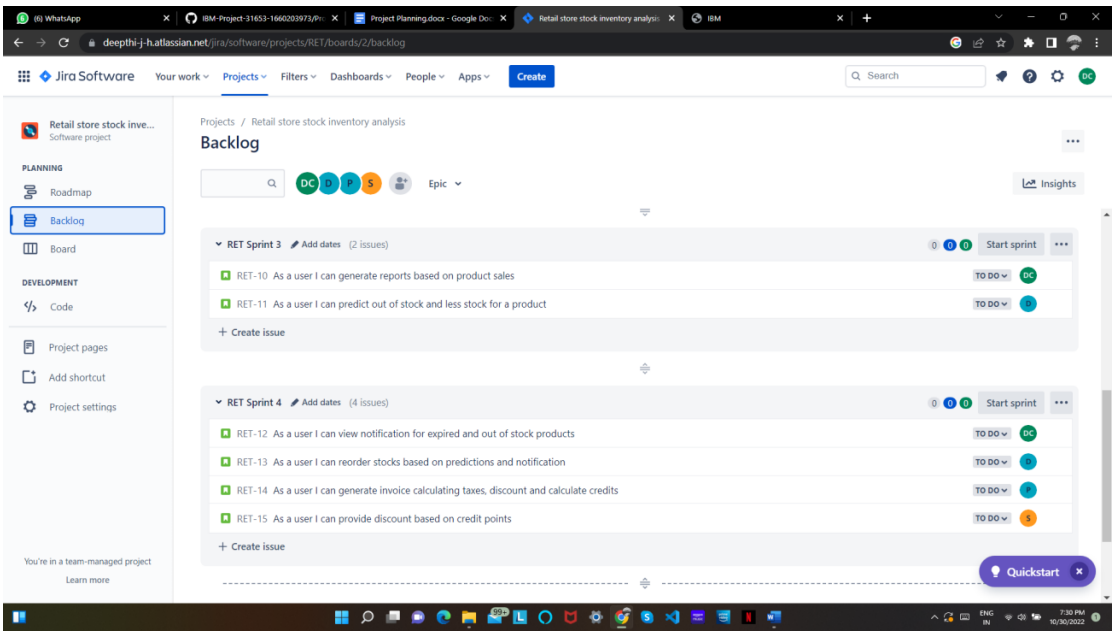
6.3 REPORTS FROM JIRA

ROADMAP



SPRINT PLANNING

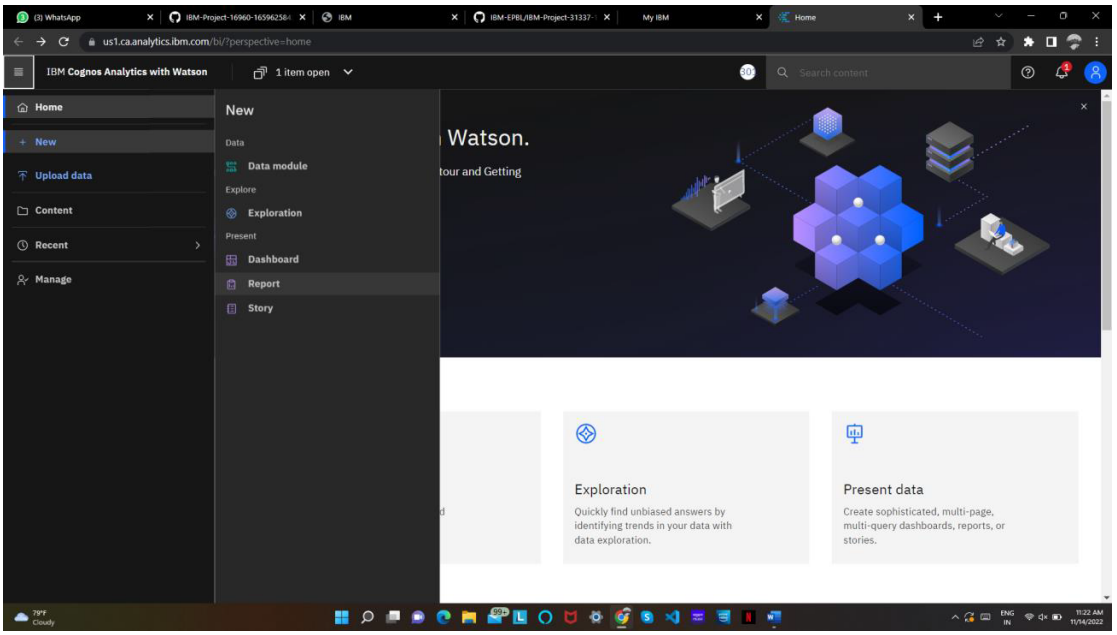




7. SOLUTIONING

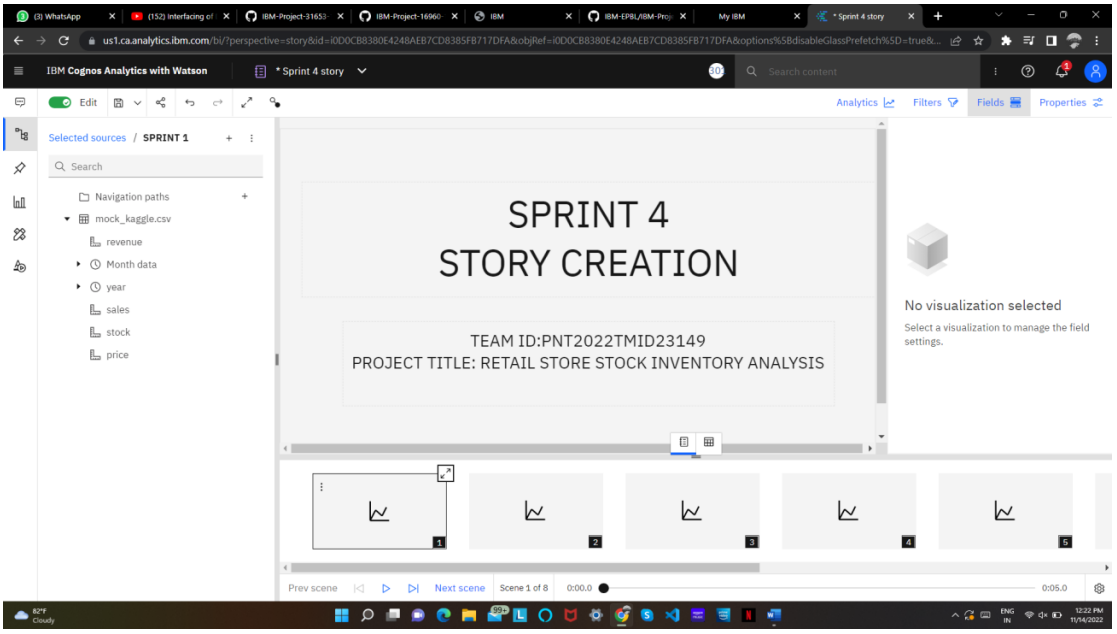
7.1 FEATURE 1

DASHBOARD AND REPORT



7.2 FEATURE 2

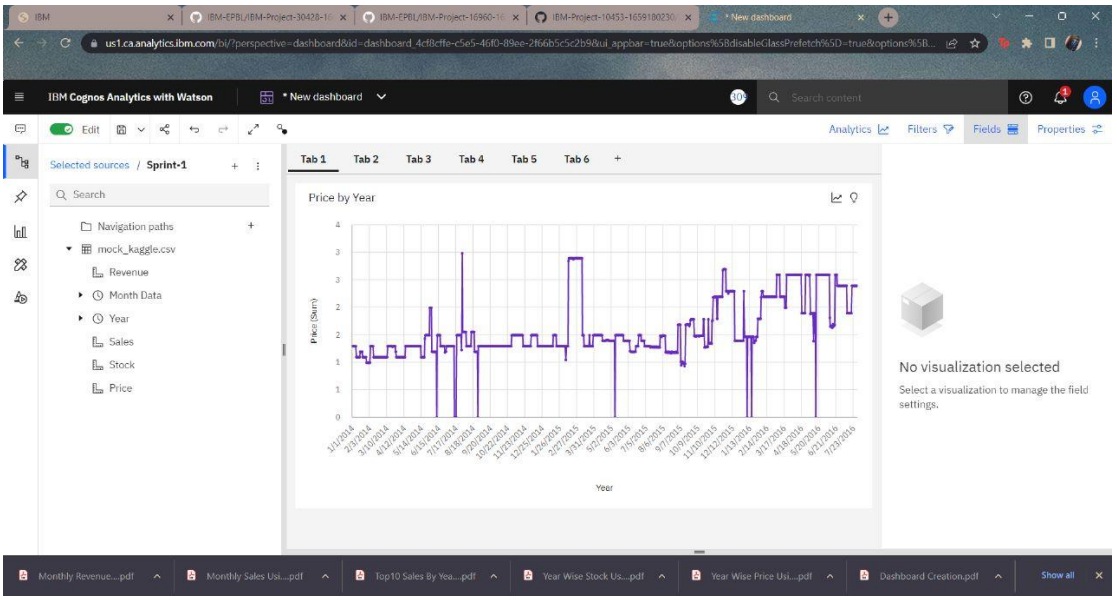
STORY OF THE DATASET



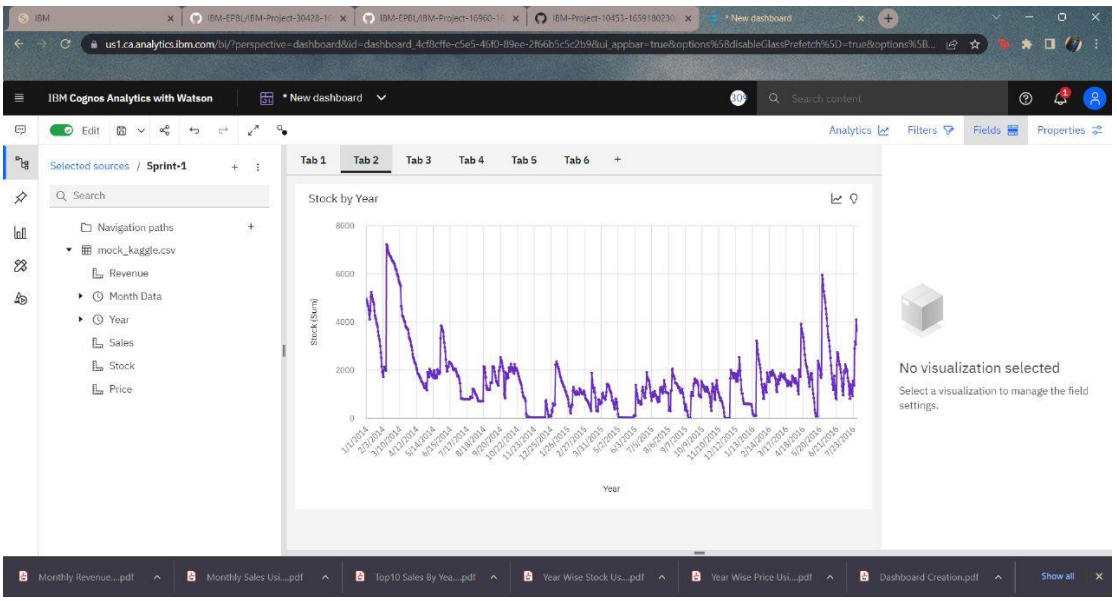
8. TESTING

8.1 TEST CASES

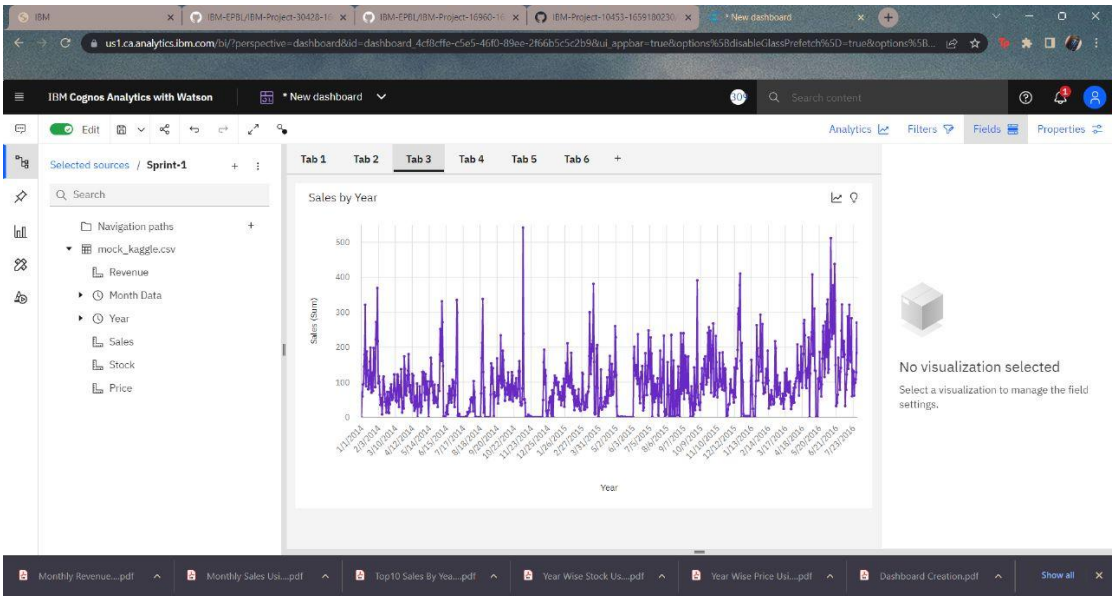
1.Year Wise Price Using Line Graph



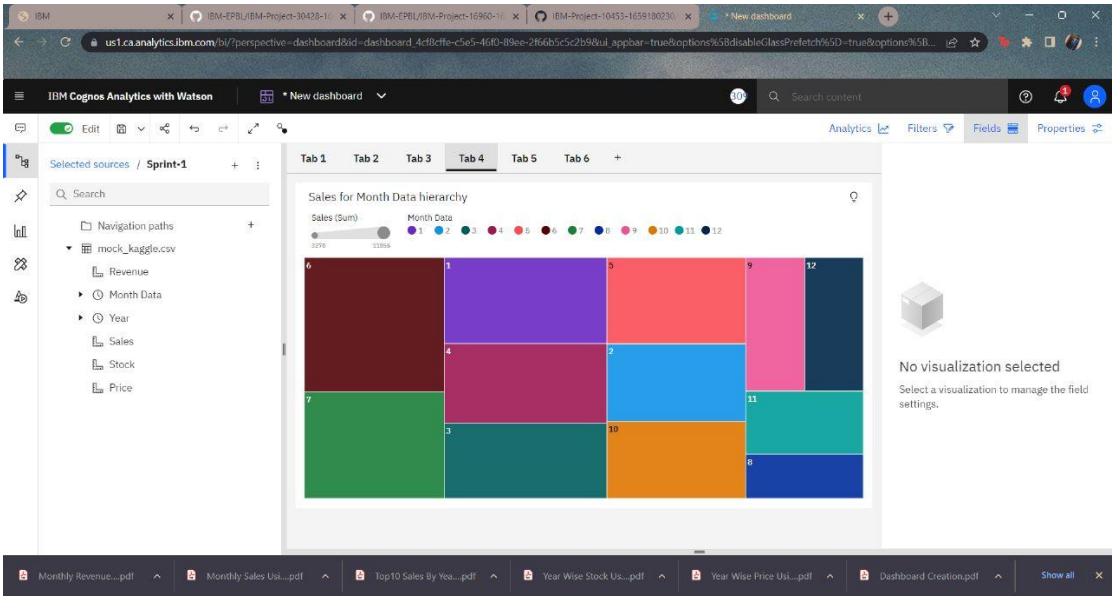
2.Year Wise Stock Using Line Graph



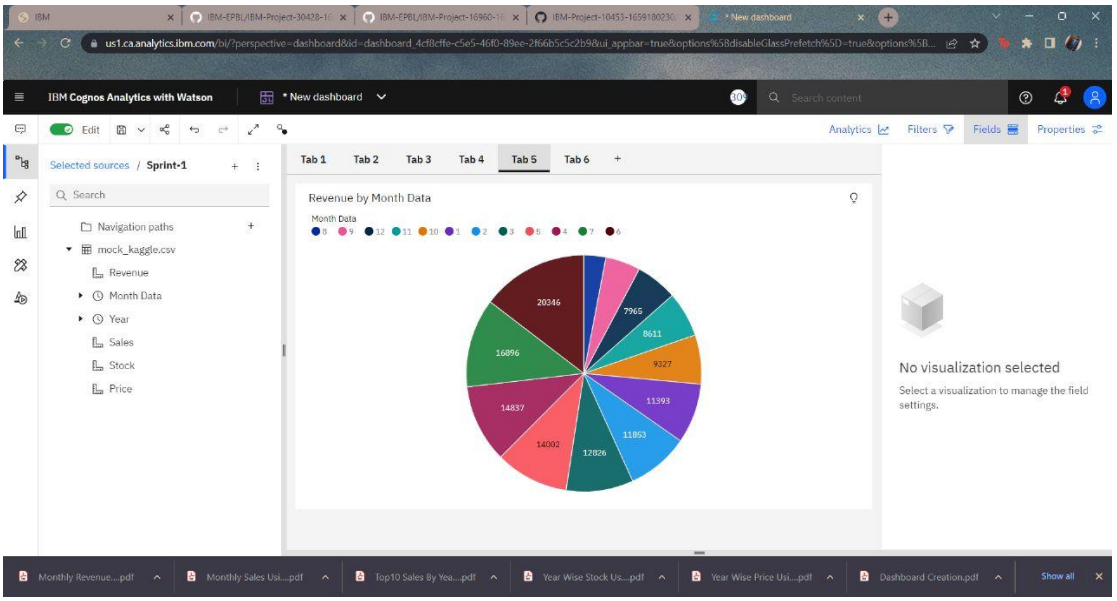
3.Top 10 Sales By Year Using Line Graph



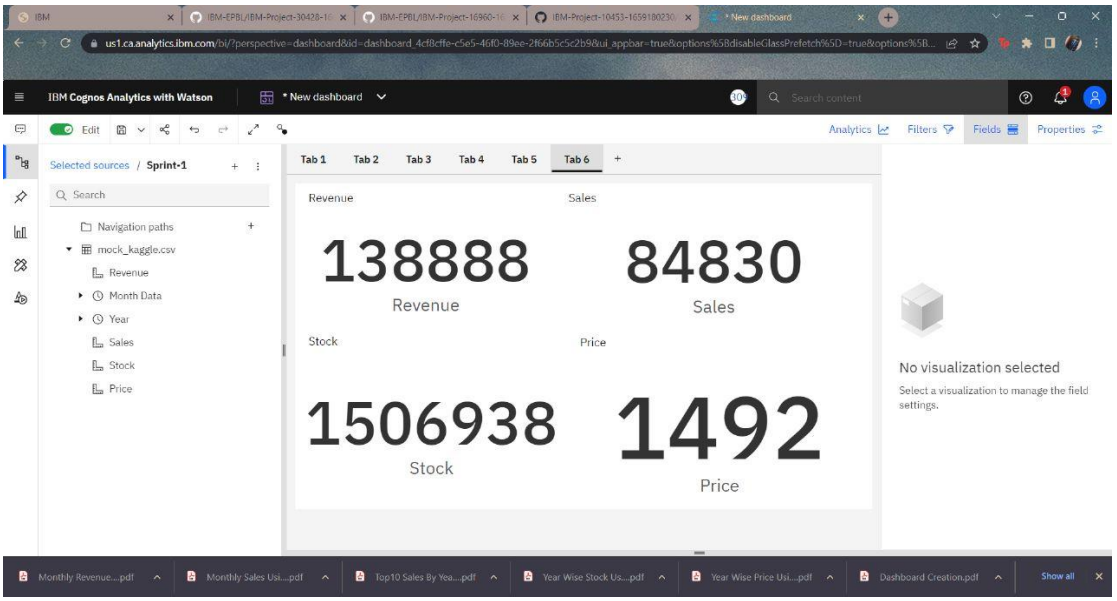
4.Monthly Sales Using Tree Map



5.Monthly Revenue by Pie Chart



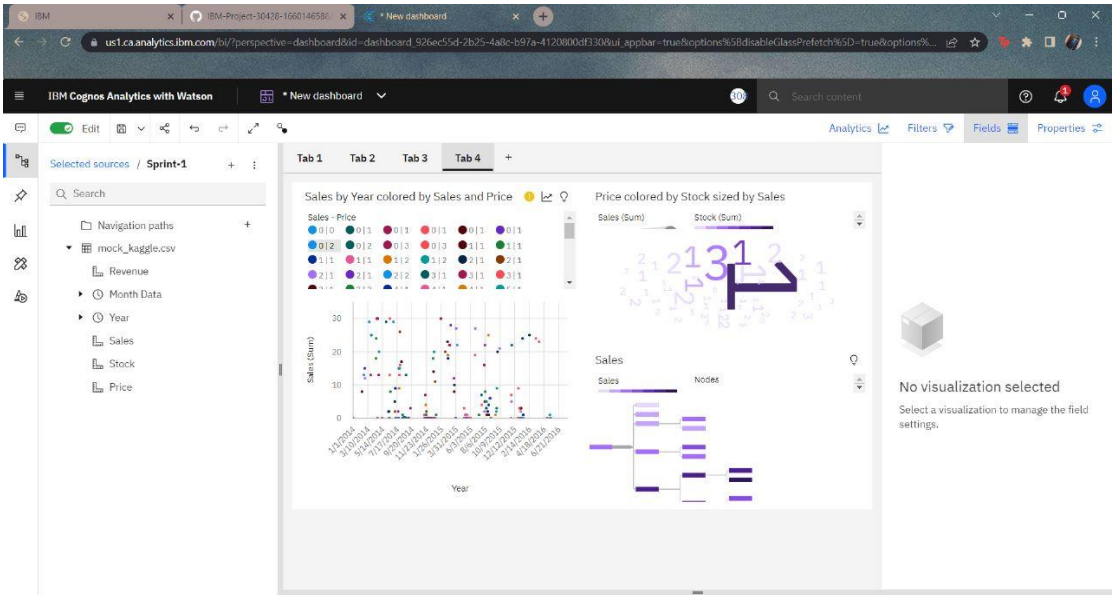
6.Summary Cards of Total Revenue,Sales,Stock,Price

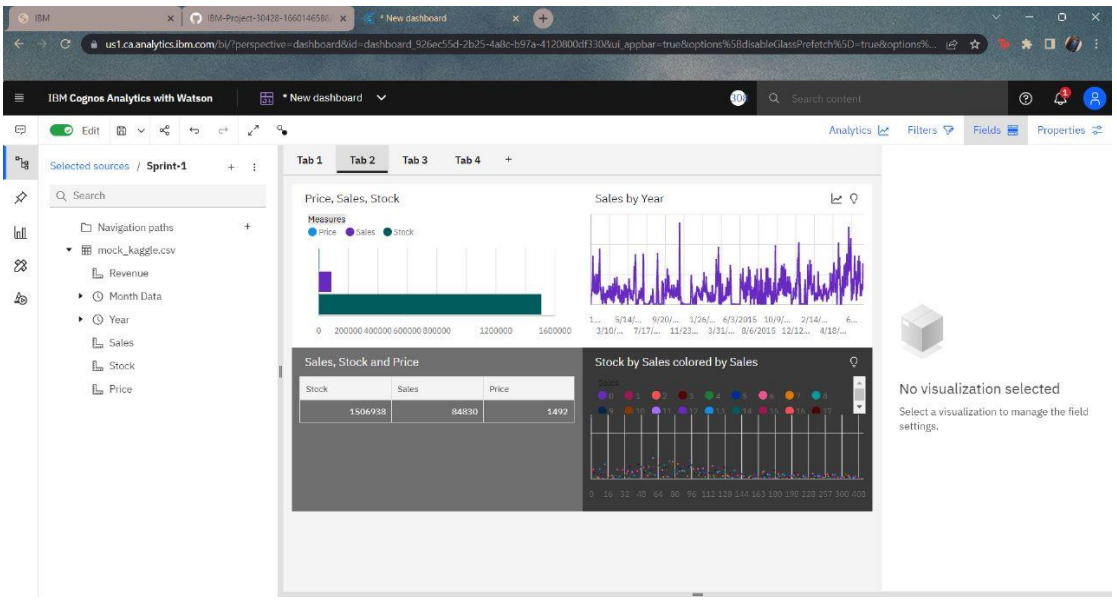


9. RESULTS

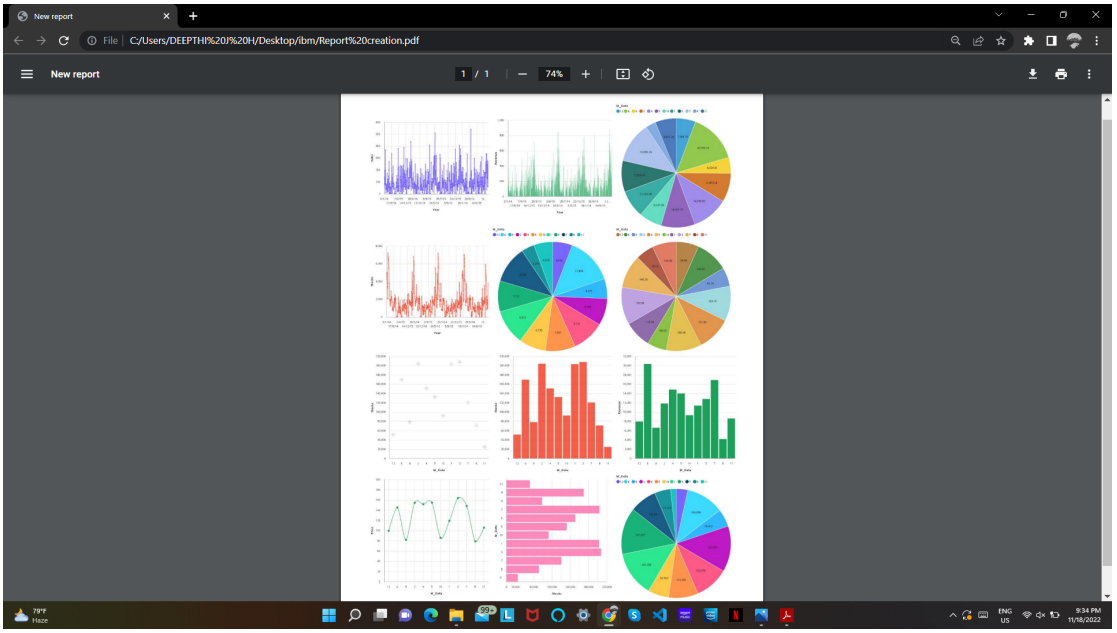
9.1 Performance Metrics

DASHBOARD




IBM Cognos Analytics with Watson
* New dashboard
Search content
Edit
Analytics
Filters
Fields
Properties
Selected sources / Sprint-1
Search
Navigation paths
mock_kaggle.csv
Revenue
Month Data
Year
Sales
Stock
Price
Tab 1
Tab 2
Tab 3
Tab 4
Price, Sales, Stock
Measures
Price
Sales
Stock
Sales by Year
Sales, Stock and Price
Stock
Sales
Price
1506938
84830
1492
Stock by Sales colored by Sales
No visualization selected
Select a visualization to manage the field settings.

REPORT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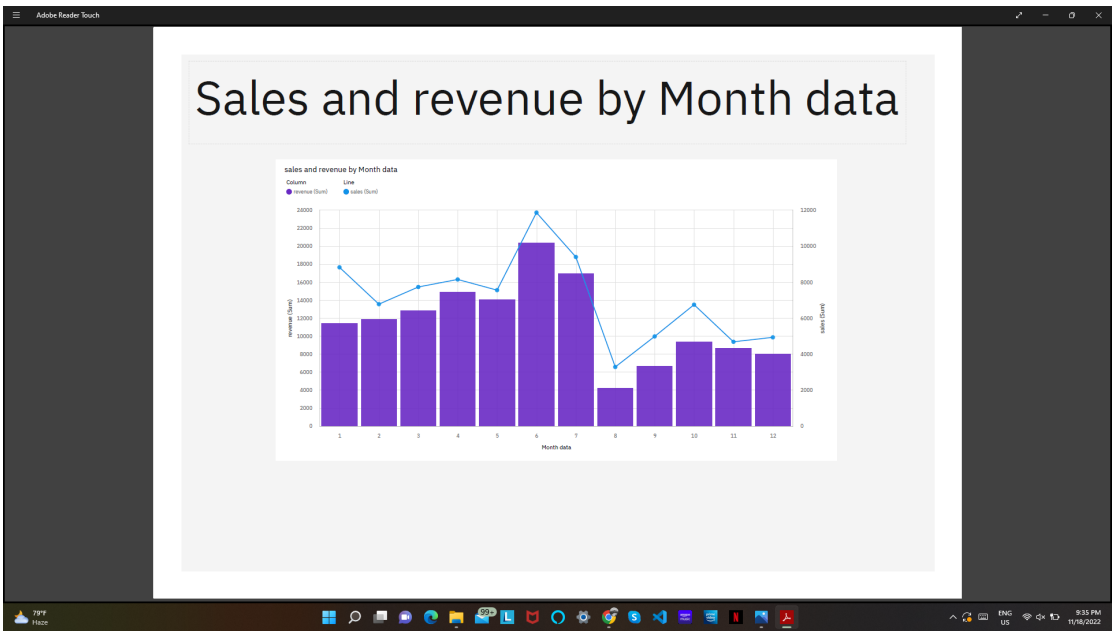
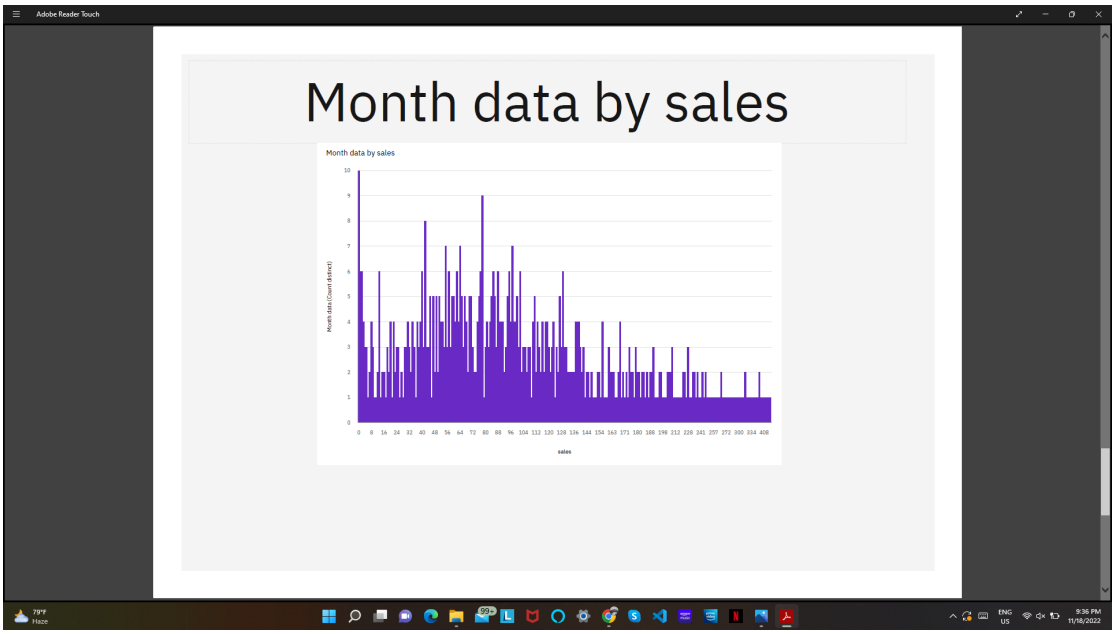
New report
1 / 1
74%

STORY


Adobe Reader Touch
Sales and revenue by Month data
sales and revenue by Month data
Column
Line
revenue (Sum)
sales (Sum)
Month data


Adobe Reader Touch
Month data by sales
Month data by sales
Month data (Count distinct)
sales

10. ADVANTAGES

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.

DISADVANTAGES

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

11.CONCLUSION

This retail store stock inventory analytics dashboard shows the particular test cases for the retail store from which we can identify the stocks and also the retailer can analyze the items using this dashboard.

12.FUTURE SCOPE

This dashboard does not include any prediction model. It can be built by using machine learning techniques, so that the retailer can predict the items which will be sold more in future. By knowing that stock, the retailer can gain more profit.

13. APPENDIX

GitHub Repository Link :

https://github.com/IBM-EPBL/IBM-Project-31337-1660199462.git