RETAIL STORE STOCK INVENTORY ANALYTICS

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Abstract - Inventory Management System is extremely beneficial to business owners, as they allow shops to properly store sales and purchase records. When inventory is mismanaged, it leads to dissatisfied consumers, slower sales, too much cash on hand, and warehouses.One of the most common challenges to sound inventory management is preventing the overselling of products and running out of inventory. Using historical and seasonal data trends can help you accurately predict customer orders.Using data-driven insights to understand the causes of stockouts.The best way to prevent stock-outs and overstocking is to know the demand for the products in advance with accurate forecasting.

Keywords- Retail Inventory analysis, Stock Management, Visualizing Stock Inventory

1.INTRODUCTION

Inventory is the goods and merchandise which is stocked in store for future use, every retail store has a warehouse to stock the merchandise to be used when the existing stock is sold to their customer. The inventory management is a systematic approach of sourcing, storing and selling the products to customers. A stock-out happens when there is no inventory left of a specific item at a specific location. Because of stock-out profit margins will start to decrease, reputation among customers will suffer, competitors will steal sales. Overstock means having too much stock in a warehouse that has not sold which increases storage costs and reduces working capital. The best way to prevent stock-outs and overstocking is to know the demand for the products in advance with accurate forecasting.The inventory is managed by analyzing the previous dataset by using cognos analytics. The dataset is loaded into the cognos, then the raw dataset is pre-processed into a standardized pattern by filling the missing values and removing extraneous data. Then the dataset is explored by using the visualization tools in cognos analytics. By using visualization tools in cognos analytics the interactive dashboard is created for the dataset then the story and report is created for the dataset.

1.1PURPOSE

To avoid these inventory management problems, consult sales reports to understand what are the best-sellers and the dead stocks.By analyzing this dashboard, story and report the retailer understands the previous sales and stock and revenue and improves their method of sales.

2. PROBLEM STATEMENT

Overstocking or understocking both result from poor inventory source control. Having too much inventory on hand might be just as bad as having too little. Overstock has a negative influence on a company's cash flow and can lead to inventory-related issues like storage and loss. Likewise, understock can prevent the company from gaining more sales.

3. PROPOSED SOLUTION

Improve purchasing with accurate demand forecasting,reduction of business losses, individual product profits.This system can be used by any kind of retailer which helps them to increase profit. Activities – stockout and overstocking prediction. Key Resource – previous inventory data.This model will predict the best sellers and slow sellers to optimize buying which avoids overstock and stockout.To predict the stock-outs and overstocking No.of stock to reorder, Cost of goods sold, stock cards etc., used for prediction. IBM Cognos is used for analytics purposes. The overstocking and stockout can be predicted using Linear Regression. Frequent updates on the stock sold, stockout and accurate prediction of the profit/losses gives the status of best sellers and slow sellers too. Proper planning of selling the product based on which they can calculate the profit & losses.

4. DATA FLOW DIAGRAM

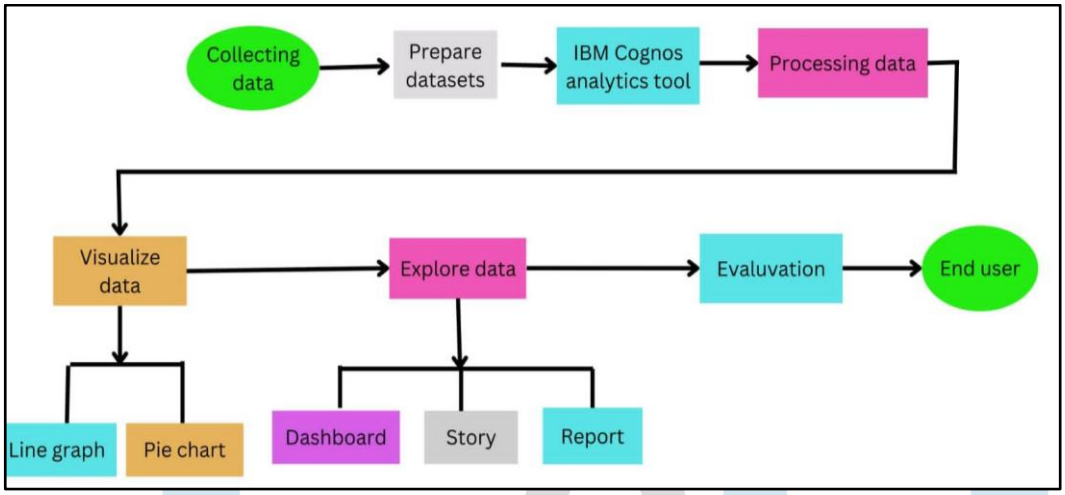

Figure 4.1 Data Flow Diagram

5. SOLUTION ARCHITECTURE

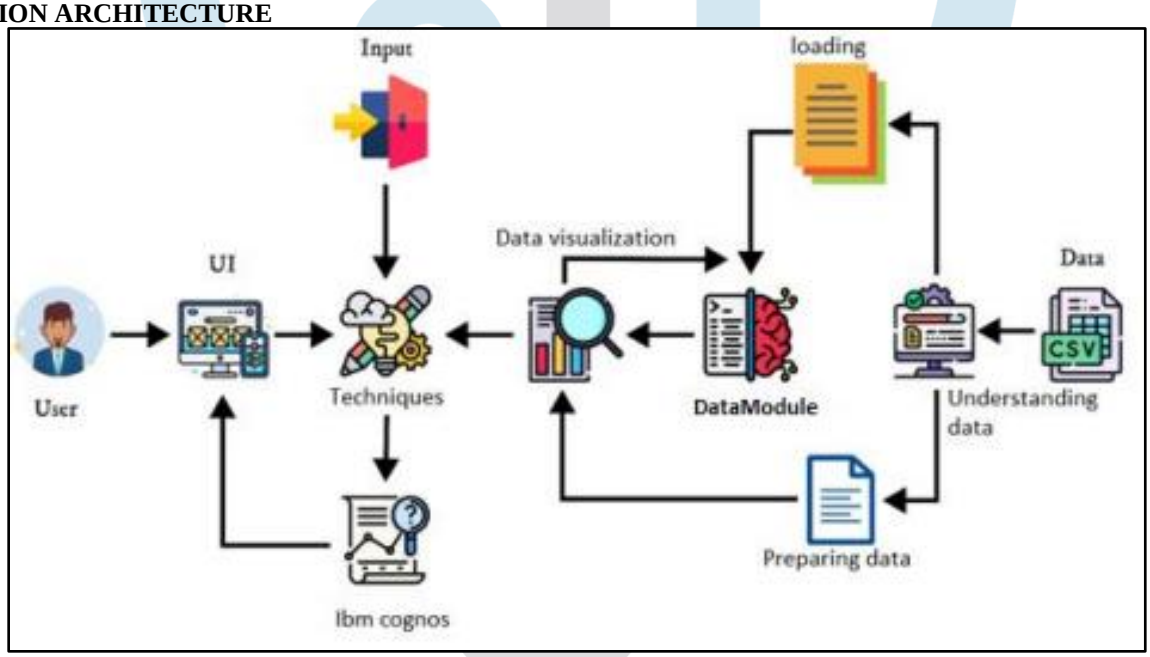

Figure 5.1 Solution Architecture

6. TECHNICAL ARCHITECTURE

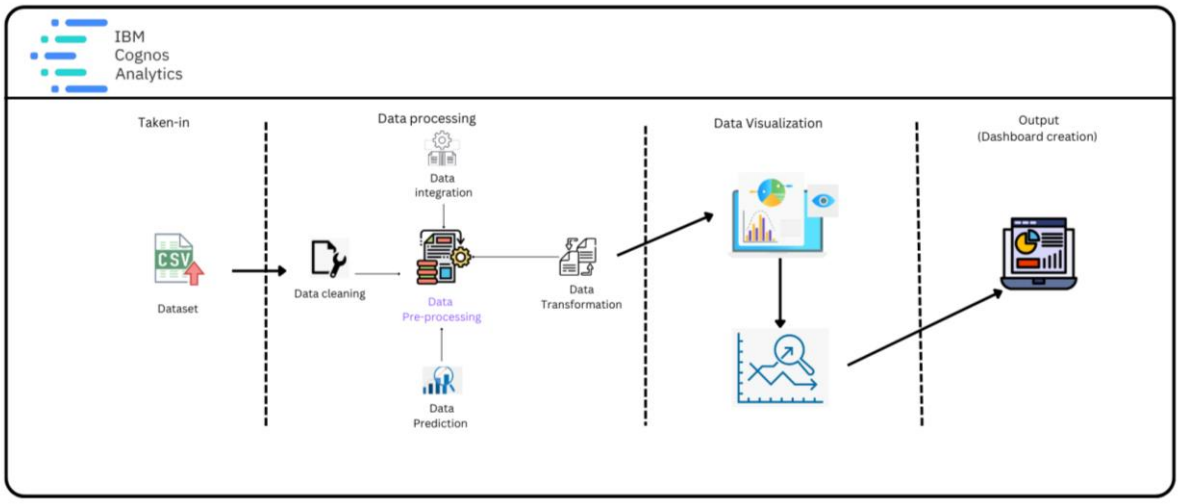

Figure 6.1 Technical Architecture

7. FEATURES

7.1 FEATURE 1 – EXPLORING THE DATASET

In exploratory data analysis the exploration of dataset take place to understand the following,

1. Identification of variables and data types.
2. Analyzing the basic metrics.

Using Visualization tools like Scatterplot, detect the outliers, using IQR, remove the outliers and correlation analysis.

7.2 FEATURE 2 - INTERACTIVE DASHBOARD, REPORT AND STORY.

IBM Cognos is used for analytics purposes,the Dashboard provides users with real time visualization of stock details to avoid the situation of understocking and overstocking with some certain parameters like Past sales performance data, No.of stock to reorder, Cost of goods sold,Stock cards etc., used for prediction, Gives the status of Best sellers and Slow sellers too.

The Story presents the Summary Cards of Total Revenue, Sales, Stock, Price generated by the dataset which have been explored already. By the open timeline the final story is generated and displayed.The Report presents the visualization of data modules which have been performed in the particular dataset which was used previously.

Figure 7.2.2 Home Page

8. ALGORITHM USED

8.1 LINEAR REGRESSION

Linear regression is a data analysis technique that predicts the value of unknown data by using another related and known data value. It mathematically models the unknown or dependent variable and the known or independent variable as a linear equation. For instance, suppose that you have data about your expenses and income for last year. Linear regression techniques analyze this data and determine that your expenses are half your income. They then calculate an unknown future expense by halving a future known income.

```
In [24]: #Calculate scores for model evaluation
         scores = f'''
         {'Metric'.ljust(10)}{'Train'.center(20)}{'Test'.center(20)}
         {'r2_score'.ljust(10)}{r2_score(Y_train, lm.predict(X_train))}\t{r2_score(Y_test, lm.predict(X_test))}
         {'MSE'.ljust(10)}{mse(Y_train, lm.predict(X_train))}\t{mse(Y_test, lm.predict(X_test))}
         '''
         print(scores)

         Metric          Train               Test
         r2_score  0.09019445790013358   -0.0013349861300886445
         MSE       6330.789959550737     5451.3327505108045
```

Figure 8.1 Training and Testing

9. CONCLUSION

Inventory management in retail is easy when done right. In this project we provided an interactive dashboards,story and reports which allows you to understand your sales, when to order more inventory, how to manage the cost of your inventory, as well as how much of your inventory is making it into the hands of consumers, as opposed to being stolen or broken.

In our application, the user can analyze this dashboard, story and report. The retailer understands the previous sales and stock and revenue and improves their method of sales.

10. FUTURE ENHANCEMENT

In the future, we will track the stock's location based on price range and also to predict by age group wise. Notifications will be sent to the user for continuous updating about the stock's status. The stock details will be displayed. If the user gives the stock name and price range, the available stocks with the location will be displayed. Although weather conditions are the major reasons for stock delays, other unprecedented events such as major calamities , natural or man-made, can cause major delays in delivery of stocks.

11. SAMPLE OUTPUT

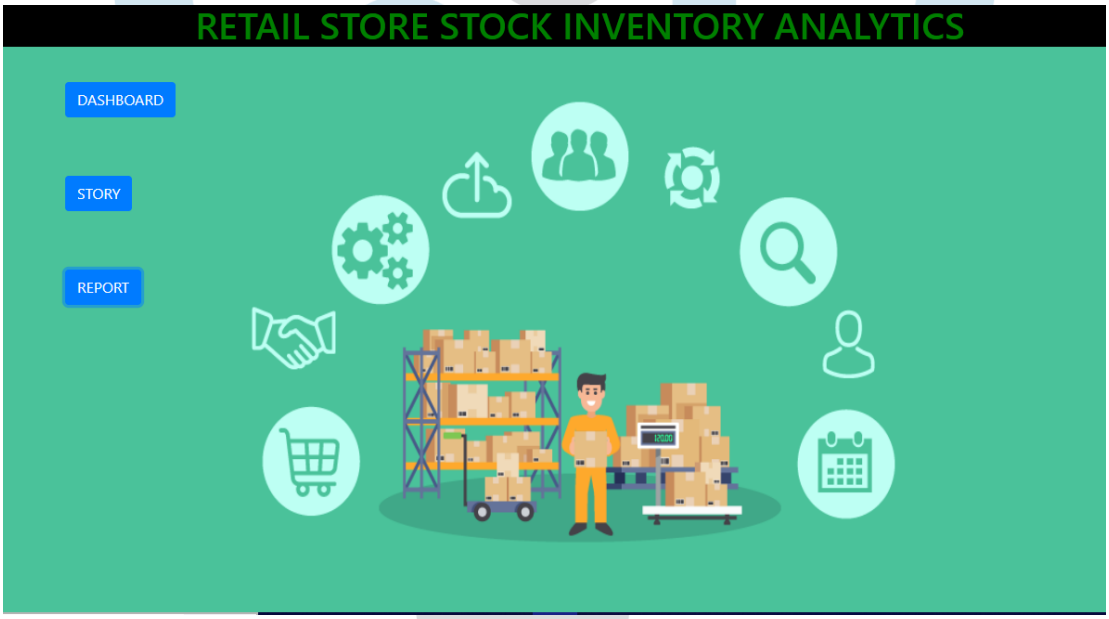

Fig 11.1 Home Page

Fig 11.2 Dashboard tab 1

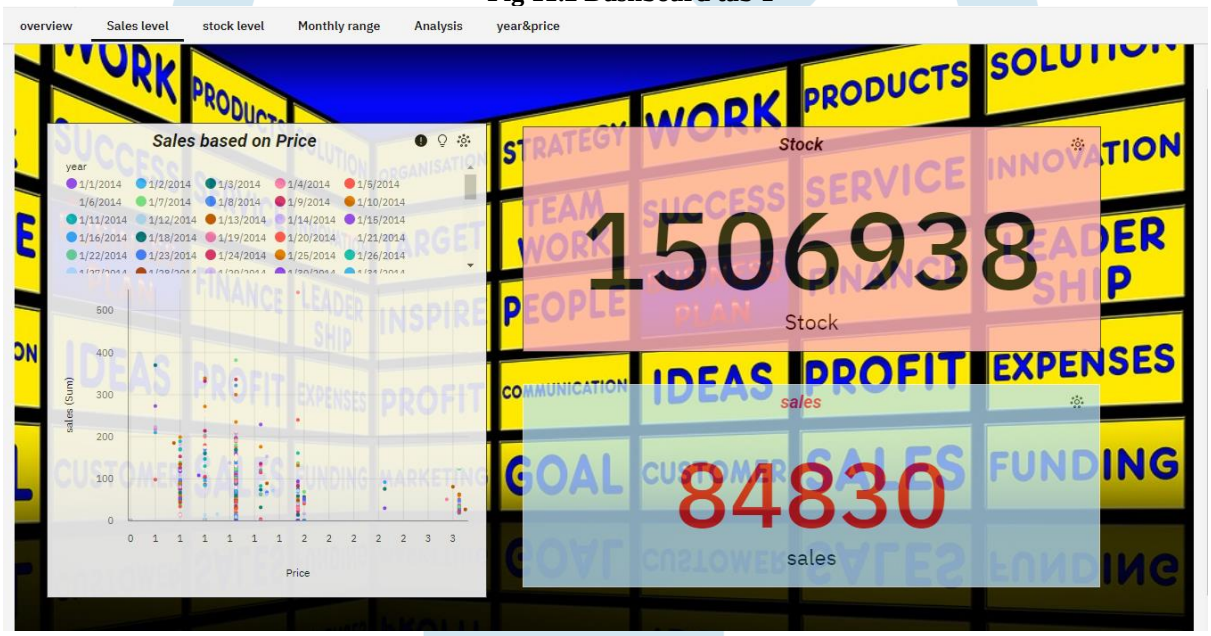

Fig 11.3 Dashboard tab 2

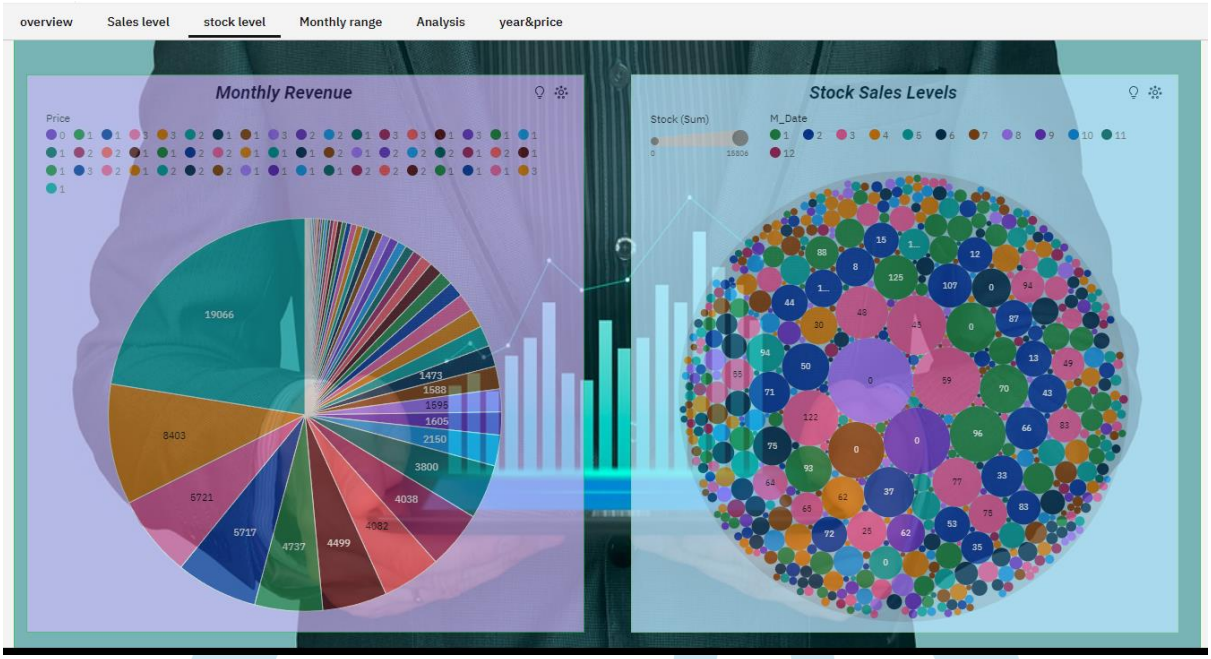

Fig 11.4 Dashboard tab 3

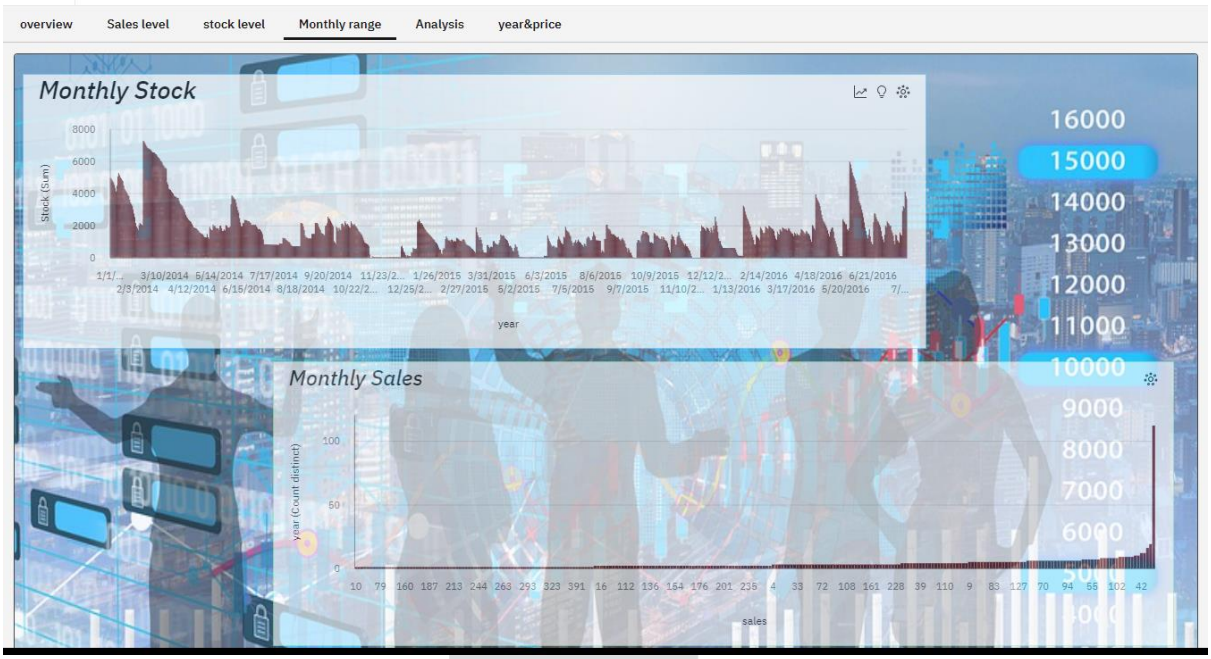

Fig 11.5 Dashboard tab 4

Fig 11.6 Dashboard tab 5

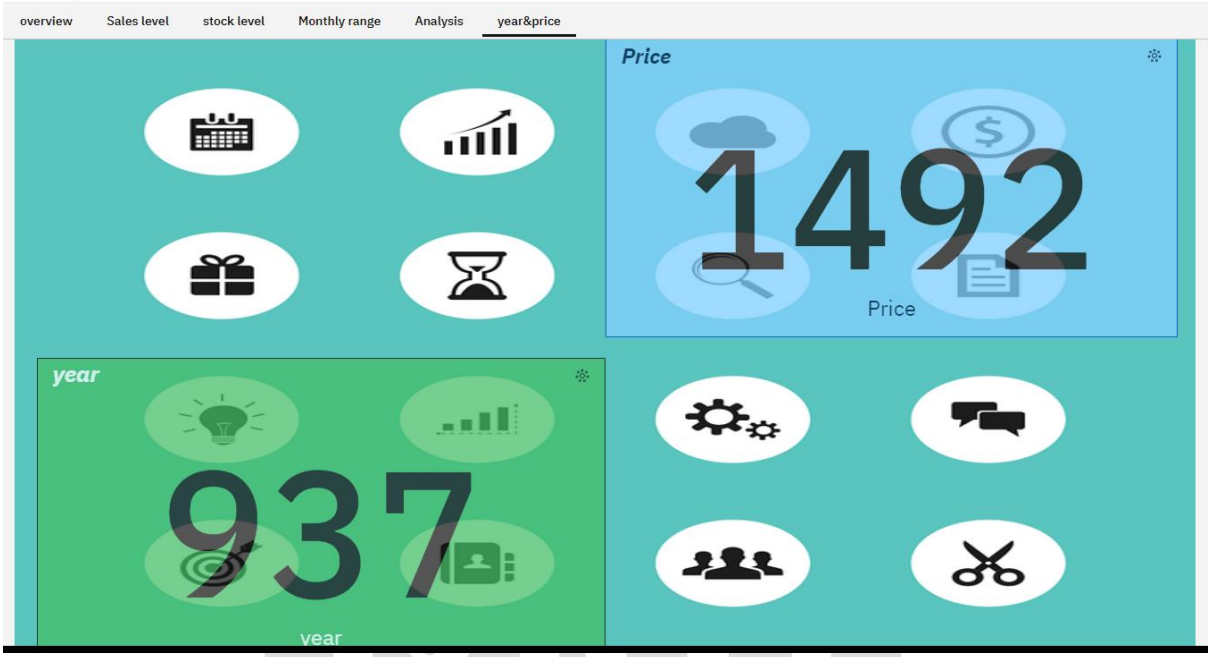

Fig 11.7 Dashboard tab 6

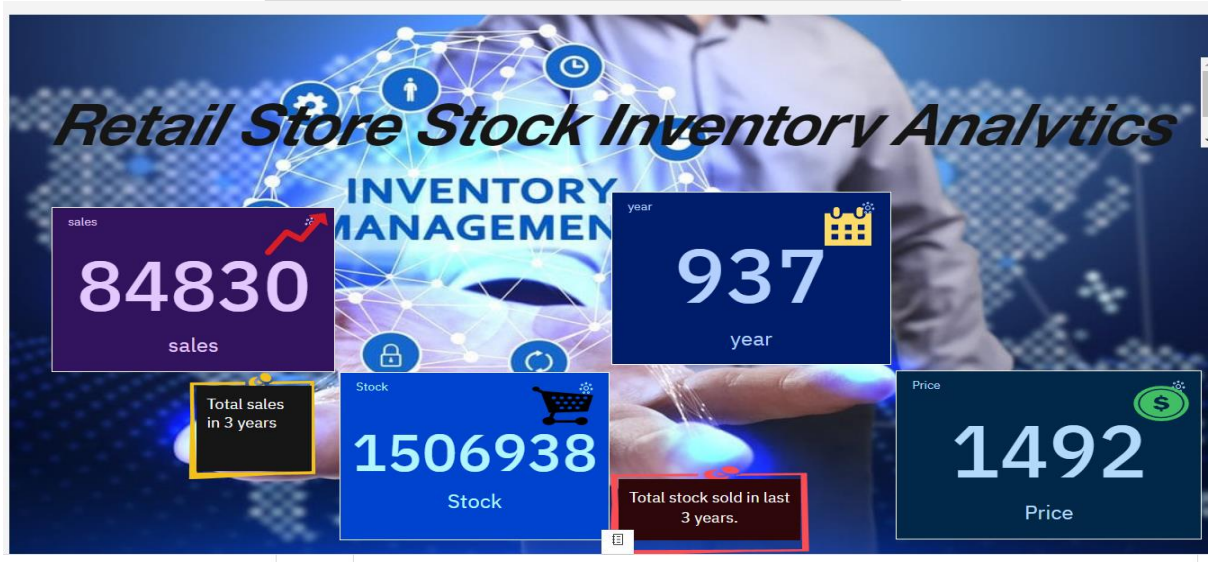

Fig 11.8 STORY 1

Fig 11.9 STORY 2

Fig 11.10 REPORT

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