Food Inventory Tracking System

Anjali P Waghmare[1], Dr. Liladhar Rewatkar[2],

[1]PG Student, Department of Computer Science, Dr. S C Gulhane Prerna College of Commerce, Science and Arts, Nagpur, MS (India)

[2]Project Guide & Head, Department of Computer Science, Dr. S C Gulhane Prerna College of Commerce, Science and Arts, Nagpur, MS (India)

[2] leela_rewatkar@rediffmail.com

Abstract :

Efficient inventory management is vital in the food industry to minimize waste, ensure food safety, and optimize operational processes. Traditional methods of managing food inventory can be time-consuming and error-prone. Power BI, a powerful data visualization and business intelligence tool by Microsoft, offers advanced capabilities to streamline and automate food inventory tracking. This study explores the relationship between inventory management and control and performance and Food and Beverages companies [4]. By leveraging Power BI, businesses can design interactive dashboards that provide real-time monitoring of inventory levels, track expiration dates, forecast demand, and identify patterns that help reduce waste and optimize procurement processes. The system integrates data from various sources such as sales, procurement, and storage systems, providing a comprehensive view of inventory status. It also enables the generation of automated reports and insights, facilitating better decision-making and forecasting. Additionally, Power BI can be configured to provide timely alerts and notifications for low stock levels and expiring items, ensuring efficient inventory control and compliance with food safety standards. Overall, implementing a Food Inventory Tracking System using Power BI enhances data-driven decision-making, reduces operational costs, and promotes sustainability in the food industry. Nutrient profiles data are available used to collect and anaylze intake data [8].

Keyword : Time Consuming, Storage System, Forecasting, Data Drive.

1. INTRODUCTION :

Inventory management is a critical component of the food industry, where ensuring the availability of fresh and safe food products is essential for business success and customer satisfaction. Inefficient inventory practices can lead to food waste, financial losses, and non-compliance with food safety regulations. It is not only buying the item but also concerns the quantity of buying each item. That is why manual management of grocery is very hard and we need some system to manage it. The following are the things which we have to do for better grocery management [1]. Traditional methods, such as manual tracking and spreadsheet-based systems, are prone to human error and inefficiencies. These challenges highlight the need for a more advanced, automated solution that ensures accuracy, efficiency, and sustainability in managing food inventory. The procedure facilitates decision-making for the management of the mill regarding how many and what intermediates to store. Extensions of the models presented might be helpful to solve related problems such as determining the number of intermediate storage tanks required. [2].

Power BI, a leading business intelligence and data visualization tool by Microsoft, offers a powerful solution for food inventory tracking. By integrating various data sources and presenting them through interactive dashboards, Power BI enables businesses to monitor inventory levels in real-time, track expiration dates, and forecast future demand. The collected data can be analyzed in real time to understand the daily or weekly consumption and also predict usage/consumption patterns. There is also provision to check the real time status, history of consumption through application [3]. It also supports the generation of automated reports, providing insights that assist in strategic decision-making. Moreover, Power BI's capability to set alerts and notifications for low stock and expiring items helps businesses take timely action, reducing waste and optimizing procurement processes. Implementing a Food Inventory Tracking System in Power BI not only enhances operational efficiency but also contributes to sustainable practices in the food industry. Inventory Control System is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum of investment [4].The most cases of face serious problems relating to the long-term analysis data [9].

2. REVIEW OF LITERATURE :

According to surveys, it is used by restaurants and analysis of food data [12], several studies have emphasized the importance of automated inventory systems in reducing waste, optimizing resource utilization, and ensuring food safety. According to Smith et al. (2018), automated inventory tracking systems significantly reduce human errors associated with manual inventory processes, leading to improved accuracy and efficiency. Similarly, research by Johnson and Lee (2020) highlighted that real-time tracking systems help businesses better manage stock levels, reduce excess inventory, and minimize losses due to spoilage or expiration.

Power BI has been recognized as an effective tool for data visualization and business intelligence across various industries, including food inventory management. A study by Kumar and Sharma (2021) emphasized that integrating Power BI into inventory management systems enables real-time data analysis and interactive dashboards, which enhance decision-making and forecasting capabilities. Additionally, Gupta and Patel (2019) demonstrated that businesses utilizing Power BI for inventory tracking reported improved operational efficiency, reduced costs, and better compliance with safety regulations. The ability to generate automated reports and set up alerts for critical inventory levels further supports timely decision-making and reduces waste.

Moreover, literature suggests that integrating inventory systems with other business processes, such as procurement and sales, enhances overall efficiency. Patel and Singh (2022) noted that systems like Power BI provide a centralized platform for analyzing data from multiple sources, leading to more cohesive and informed strategies for inventory management. Thus, existing research underscores the potential of Power BI as a transformative tool for enhancing food inventory tracking and management.

I chose this project to address the inefficiencies of traditional food inventory management by leveraging Power BI's advanced data visualization and real- time tracking capabilities. This system aims to minimize food waste, optimize stock management, and enhance decision-making. Additionally, it offers an opportunity to deepen my skills in Power BI and data analytics while promoting sustainable practices in the food industry.

3. OBJECTIVES :

- **To develop an interactive dashboard** using Power BI for real-time monitoring of food inventory levels.
- **To track expiration dates and stock movements** to reduce food waste and ensure timely replenishment.
- **To generate automated reports and insights** for better decision-making and demand forecasting.
- **To integrate data from multiple sources** such as procurement, sales, and storage systems for comprehensive analysis.
- **To set up alerts and notifications** for low stock levels and approaching expiration dates to ensure efficient inventory control.

4. SYSTEM FLOWCHART :

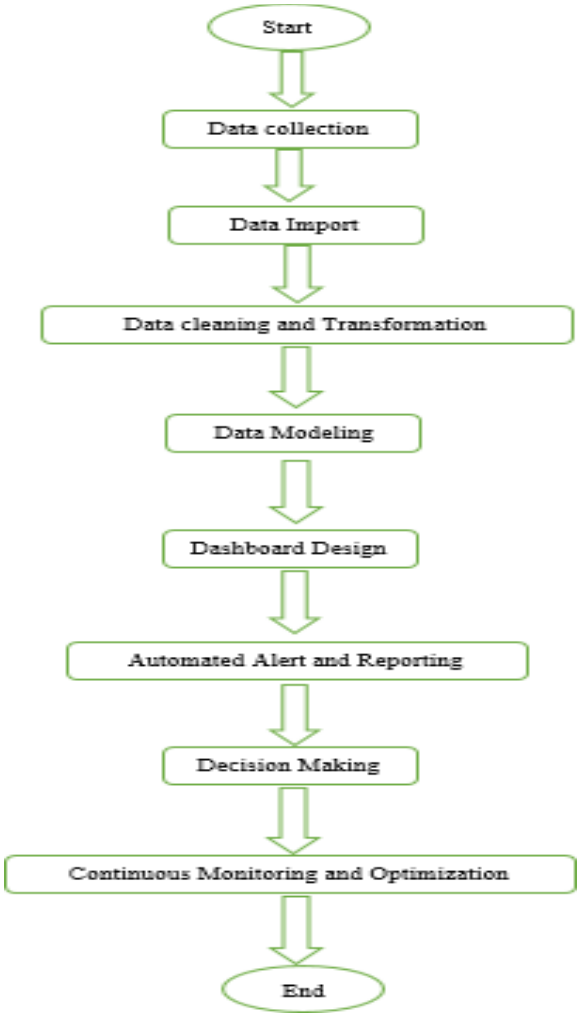

Fig 1. Flowchart of Food Inventory Tracking System.

5. ANALYSIS OF FOOD INVENTORY TRACKING SYSTEM POWER BI :

A. Inventory Overview Dashboard:

- Bar Chart: Display total sales (quantity_sold) per product, allowing for quick identification of top-selling items.
- Card Visualization: Summarize key metrics such as total quantity sold, total wastage, and current stock levels, providing an at-a-glance view of inventory health.

B. Wastage Analysis:

- Line Chart: Track the wastage_analysis percentage over time to identify trends and patterns.
- Conditional Formatting: Highlight products with wastage percentages exceeding a predefined threshold, enabling targeted interventions.

C. Stock and Sales Trends:

- Clustered Bar Chart: Compare quantity_start_of_day against quantity_sold to assess daily sales performance.
- Date Filter: Utilize transaction_date for filtering data, allowing users to view trends over specific time periods.

D. Expiry Monitoring:

- Table Visualization: List products nearing their expiry_date within the next 7 or 14 days, facilitating proactive management.
- Alert System: Configure alerts in Power BI for products approaching expiration, ensuring timely action.

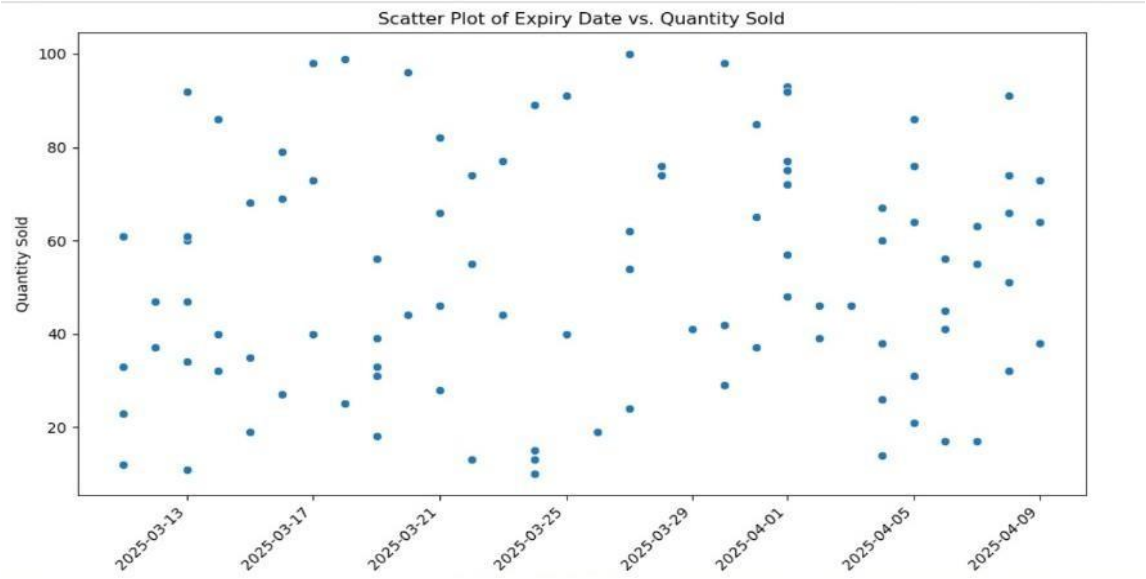

Fig 2. Scatter Plot of Expiry Date vs. Quantity Sold

E. Store-wise Performance:

- Pie Chart: Visualize the distribution of sales by Store_id, highlighting which stores are performing best.
- Heat Map: Identify stores with higher wastage rates, enabling targeted strategies for improvement.

F. Forecasting and Decision-Making:

- Forecasting Tool: Leverage Power BI's forecasting capabilities to predict future sales trends based on historical data.
- What-If Scenarios: Create scenarios to analyze the potential impact of different sales strategies on reducing wastage.

G. Inventory Tracking Dashboard:

- Total Sales: Sum of quantity_sold.
- Stock Levels: Comparison of quantity_start_of_day versus quantity_sold.
- Wastage Analysis: Average or total wastage_analysis over time.

H. Key Analysis to Perform:

i. **Inventory Levels:**

- Create visuals to show starting and ending inventory levels.

ii. Sales Analysis:

- Total Quantity Sold.
- Sales trends over time.
- Identification of top-selling products.

iii. Wastage Analysis:

- Total wastage quantity.
- Identification of products contributing most to wastage.

iv. Expiry Monitoring:

- Track products nearing expiration.

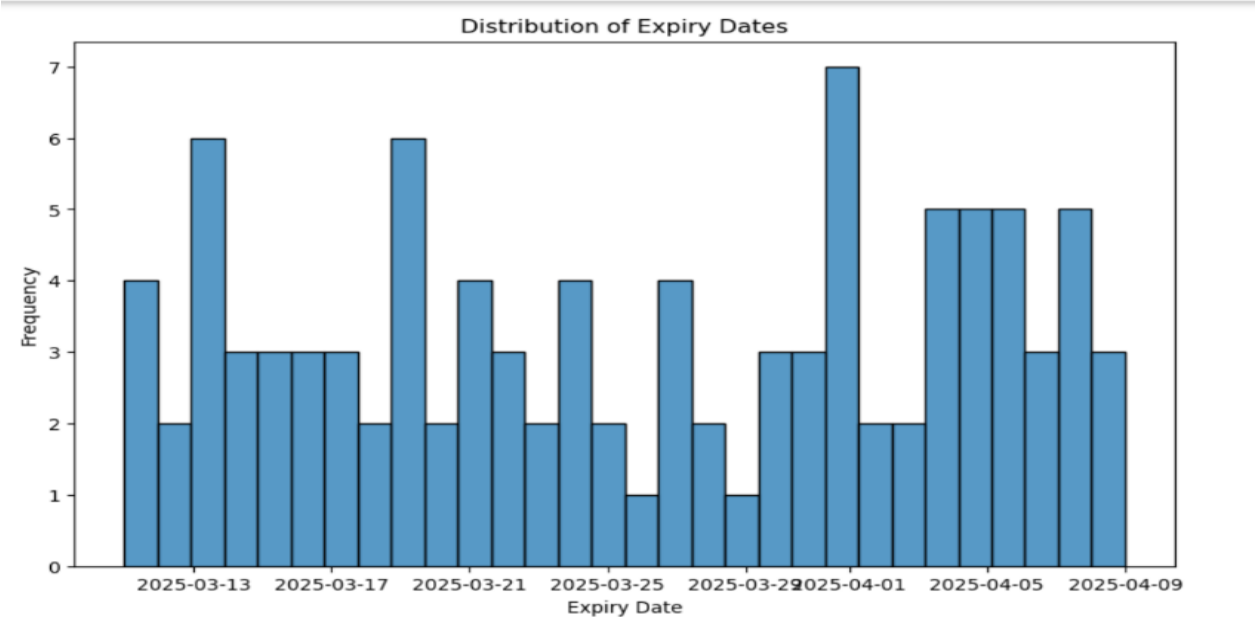

Fig 3. Distribution of Expiry Dates

I. Deep Dive into Key Metrics:

i. To enhance insights, detailed measures should be created:

- Daily Sales: Calculate total sales on a daily basis.
- Stock Remaining: Determine the remaining stock after sales.
- Wastage Percentage: Calculate the percentage of wastage for each product.
- Expiry within 7 Days: Identify products that will expire within the next week.

ii. To further enhance the dashboard:

- Conditional Formatting: Highlight products with high wastage or those approaching expiry.
- Drill-Down Capability: Allow users to drill down from Store → Product Category → Individual Products for detailed insights.
- Dynamic Date Filters: Implement slicers for time periods (e.g., last 7 days, last 30 days) to facilitate flexible analysis.

iii. Optimizing Data Model:

- Remove redundant columns to streamline the dataset.
- Create calculated columns for cleaner visuals.
- Ensure proper relationships are established between Product and Sales tables

6. RESULT :

The analysis of the food inventory tracking system in Power BI provides valuable insights that enhance inventory management, optimize sales, and reduce wastage. By leveraging interactive dashboards and visualizations, the system effectively tracks product sales, identifies top-selling and underperforming items, and highlights trends over time. It monitors inventory levels, showing starting stock, daily sales, and remaining stock, while also generating low-stock alerts for timely reordering. In the light of recent legislation and a number of food safety incidents, traceability of food products back from the consumer to the very beginning of the supply chain has never been so important [5]. Wastage analysis identifies products contributing

most to waste, enabling businesses to implement strategies to minimize losses. The system also tracks expiry dates, highlighting products nearing expiry so that proactive measures, such as discounts or promotions, can be applied to avoid financial loss. Additionally, store-wise performance comparisons help identify high-performing locations and those needing operational improvements. Efficiency metrics, such as inventory turnover ratios and stock coverage days, offer deeper insights into inventory movement and sustainability. Overall, the Power BI system enhances decision-making by providing

The food inventory tracking system in Power BI also improves operational efficiency by automating data collection and visualization, reducing manual tracking errors. It enables businesses real-time, data-driven insights that lead to improved profitability, better stock management, and reduced operational inefficiencies. At present, the health promotion appears on phase of several large-scale [7].

7. DISCUSSION :

to set up real-time alerts for low stock, high wastage, and upcoming expirations, ensuring proactive decision- making. The system's interactive filters and drill-down capabilities allow users to analyze inventory trends across different time periods and store locations. Additionally, predictive analytics can be incorporated to forecast future demand, helping businesses maintain optimal stock levels. This new information RFID-based system helps to achieve better inventory control, improve events management such as cold-storage room replenishment, or reduce products close to expiration date. The importance of this project is in the fact that, according to a previous review, there is no an initiative similar to develop this RFID application anywhere else [6]. By integrating sales and inventory data, the system identifies patterns that support better pricing and procurement strategies. It also helps in minimizing financial losses by identifying slow-moving products and recommending timely promotions. The ability to generate customizable reports ensures that stakeholders have access to relevant insights for strategic planning. Overall, Power BI enhances inventory management by providing a data-driven, user-friendly approach that improves accuracy, efficiency, and profitability, there is the link between ownership and management [10].

REFERENCE :

[1] K. Sakthisudhan, S. Mohanraj, T.V.P. Sundararajan: ―A Smart Kitchen Automation and Grocery Management System using IoT‖, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8, Issue-1, May 2019.

[2] Akkerman, R., van der Meer, D., van Donk, D.P., 2010, "Make to stock and mix to order: choosing intermediate products in the food-processing industry," International Journal of Production Research, Vol. 48, No. 12, pp. 3475-3492 Kolkwitz, B.: Einfluss der thermischen Last auf das Arbeitsergebnis und die Energieeffizienz beim Schleifen. Dr.-Ing. Diss. University of Bremen, Shaker (2020)

[3] Omkar Mulay, Manas Bhalerao, SayaliBhamare, Vinod Gaikwad, Dr. Kamini Nalavade : ―IoT Based Food Inventory Tracking System for Domestic and Commercial Kitchens.‖ ISSN: 2455-2631 October 2019 IJSDR | Volume 4, Issue 10

[4] Tarn, J.M., Razi, M.A., Wen, H.J., Perez Jr, A.A. (2003) "E-fulfillment: the strategy and operational requirements". Bradford: .Vol.16, Iss. 5; pg. 350, 13 pgs Van Hoek, R.I. (1999), "Postponement and the reconfiguration challenge for food supply chains", Supply Chain Management, Vol. 4 No.1, pp.18-34. Rief, M., Karpuschewski, B., Kalhöfer, E.: Evaluation and modelling of the energy demand during machining. CIRP J. Manuf. Sci. Technol. 19, 62–71 (2017)

[5] Smith, I., Furness, A., 2006, Improving traceability in food processing and distribution. Woodhead Publishing in Food Science, Technology and Nutrition No. 119.

[6] Bravo, B.B., Fernandez, J.C., Barrera, M.M., Sanchez, J.R.: Implementation of RFID tags in food containers in catering business. ITC-Fachbereich 224 - RFID Systech (2010).

[7] Koepsell TD, Wagner EH, Cheadle AC, et al. Selected methodological issues in evaluating community-based health promotion and disease prevention programs. Annu Rev Public Health. 1992;13:31-57.

[8] Schakel SF, Sievert YA, Buzzard IM: Sources of data for developing and maintaining a nutrient database. J Am Diet Assoc 1988, 88(10):1268-1271.

[9] Panigrahi C.M.A., 2013. Relationship between inventory management and profitability: An empirical analysis of Indian cement companies. Asia Pacific Journal of Marketing & Management Review, 2(7), 23-37.

[10] Elsayed K., Wahba H., 2013. Reinvestigating the relationship between ownership structure and inventory management: A corporate governance perspective. International Journal of Production Economics, 143(1), 207-218.

[11] Z. Liu, N. Zhou, and X. Xiao, "Application of smart packaging in fruit and vegetable preservation: A review," Foods, vol. 14, no. 3, p. 447, 2025, doi: 10.3390/foods14030447.

[12] S. Piramuthu and W. Zhou, RFID and Sensor Network Automation in the Food Industry: Ensuring Quality and Safety through Supply Chain Visibility. John Wiley & Sons, 2016, pp. 17–149, doi: 10.1002/9781118967423.ch2.