Project Report

1. INTRODUCTION:

In the modern retail industry, data has become a critical asset for strategic decision-making. Businesses generate vast amounts of transactional and customer-related data on a daily basis. However, without proper analytical tools and visualization techniques, this data remains underutilized. To remain competitive, retail organizations must analyze sales patterns, pricing strategies, customer behavior, and promotional effectiveness in a structured and systematic manner.

Product placement plays a significant role in influencing customer purchasing decisions. The positioning of products in areas such as endcaps, shelves, and aisles can directly impact visibility, engagement, and sales volume. Similarly, factors such as competitor pricing, seasonal variations, promotional campaigns, and foot traffic also affect overall business performance. Understanding the relationship between these variables is essential for maximizing profitability and operational efficiency.

The **Strategic Product Placement Analysis** project is developed to address these challenges by applying data analytics and visualization techniques to retail sales data. Using Tableau, interactive dashboards and storyboards are created to present insights in a clear and actionable format. The system enables stakeholders to monitor key performance indicators, compare pricing strategies, evaluate promotional impact, and identify high-performing product categories.

Furthermore, the project integrates the analytical dashboards into a Flask-based web application, ensuring accessibility, scalability, and enhanced user interaction. This integration bridges the gap between data analysis and real-world application deployment.

Overall, this project demonstrates how data-driven insights can support intelligent retail decision-making, improve product placement strategies, and enhance overall business profitability.

1.1 Project Overview:

The **Strategic Product Placement Analysis** project is a data-driven retail analytics solution designed to evaluate the impact of product positioning, pricing strategies, promotions, seasonal trends, competitor pricing, and customer demographics on sales performance.

This project leverages advanced data visualization techniques using **Tableau** to transform structured retail datasets into interactive dashboards and analytical storyboards. The system enables stakeholders to monitor key performance indicators (KPIs), identify highperforming product categories, and analyze the effectiveness of product placement strategies such as endcaps, shelves, and aisle positioning.

The analytical framework incorporates calculated fields, filtering mechanisms, and comparative visualizations to uncover correlations between variables such as sales volume, foot traffic, pricing, and promotional impact. These insights support evidence-based decision-making for retail store optimization and revenue enhancement.

Additionally, the solution integrates Tableau dashboards into a **Flask-based web application**, providing a centralized and user-friendly interface for accessing visual analytics. The integration ensures improved accessibility, scalability, and real-time interaction with business data.

Overall, the project demonstrates the practical application of data analytics, visualization, and web integration techniques to enhance retail performance and strategic planning

1.2 Purpose:

The primary purpose of the **Strategic Product Placement Analysis** project is to analyze and evaluate the impact of product positioning and related business factors on overall sales performance in a retail environment.

Retail businesses often face challenges in identifying optimal product placement strategies, pricing structures, and promotional effectiveness. Without structured data analysis, decision-making becomes intuitive rather than evidence-based. This project aims to address these challenges by utilizing data visualization and analytical tools to provide meaningful business insights.

The key purposes of this project are:

- **I.** To analyze the relationship between product placement (endcap, shelf, aisle) and sales volume
- **II.** To evaluate the impact of competitor pricing on product performance
- **III.** To study the influence of promotions and seasonal trends on revenue generation
- **IV.** To assess customer demographics and foot traffic patterns in relation to sales **V.** To support data-driven decision-making for retail optimization

By implementing interactive dashboards and performance metrics, the system enables business stakeholders to monitor key indicators and improve strategic planning. Ultimately, the project aims to enhance operational efficiency, increase revenue, and strengthen competitive advantage through analytical insights.

2. IDEATION PHASE:

2.1 Problem Statement:

In the retail industry, businesses often struggle to identify the most effective product placement and pricing strategies that maximize sales performance. Despite having access to large volumes of transactional data, many organizations lack a structured analytical framework to extract actionable insights from this data.

Retailers face challenges such as:

I. Determining which product categories generate higher revenue
II. Understanding the impact of product positioning (endcap, shelf, aisle) on customer purchase behavior
III. Evaluating the effectiveness of promotional campaigns
IV. Comparing competitor pricing strategies
V. Analyzing seasonal trends and customer demographics

Without proper data visualization and analytical tools, decision-making becomes inefficient and less accurate. Therefore, there is a need for a data-driven system that transforms raw retail data into interactive visual insights to support strategic business decisions.

The problem addressed in this project is to design and implement an analytical solution that evaluates product placement effectiveness and its impact on sales performance using visualization and web integration technologies.

2.2 Empathy Map Canvas:

The Empathy Map Canvas helps in understanding the needs, thoughts, and challenges of the primary stakeholders, particularly retail business owners and store managers.

User: Retail Business Owner / Store Manager

Thinks:

I. Which products should be placed in high-visibility areas? **II.** Are promotions increasing actual revenue?
III. How can I outperform competitors in pricing?

Feels:

I. Uncertain about current placement strategies
II. Concerned about declining or fluctuating sales **III.** Interested in increasing profitability

Sees:

I. Competitive retail environment
II. Changing customer buying behavior **III.** Seasonal sales fluctuations

Says & Does:

I. Looks for ways to optimize store layout

II. Invests in promotional campaigns
III. Monitors sales performance regularly

Pain Points:

I. Lack of clear data insights
II. Difficulty in identifying high-performing categories **III.** Inconsistent sales trends

Gains:

I. Improved product placement decisions
II. Increased revenue and customer engagement
III. Data-backed strategic planning

2.3 Brainstorming:

During the brainstorming phase, multiple analytical approaches were considered to address the identified problem. The team explored various data visualization and retail analytics techniques to determine the most effective solution.

Key brainstorming ideas included:

I. Comparing average sales volume across product categories
II. Analyzing competitor price vs product price correlation
III. Evaluating promotion impact on sales performance **IV.** Studying seasonal trends and customer demographics
V. Visualizing foot traffic vs sales volume relationship
VI. Creating interactive dashboards with filtering capabilities

After evaluating different approaches, the team finalized the implementation of an interactive Tableau dashboard integrated with a Flask web application. This solution provides real-time insights, user-friendly interaction, and scalable deployment.

The brainstorming process ensured that the final solution is practical, technically feasible, and aligned with business objectives.

3. REQUIREMENT ANALYSIS:

3.1 Customer Journey map:

The Customer Journey Map outlines how retail stakeholders interact with the analytical system from initial access to decision-making.

Stage 1: Problem Identification:

The business owner identifies challenges such as declining sales, ineffective product placement, or unclear promotional impact.

Stage 2: System Access:
The user logs into the web application where the Tableau dashboard is embedded.

Stage 3: Data Exploration:
The user applies filters such as product category, season, promotion status, and product position to analyze specific subsets of data.

Stage 4: Insight Generation:
Interactive visualizations display trends in sales volume, pricing comparison, foot traffic correlation, and seasonal impact.

Stage 5: Decision Making:
Based on insights, the business owner optimizes product placement strategies, adjusts pricing, or modifies promotional campaigns.

Stage 6: Performance Monitoring:
The dashboard is used continuously to monitor key performance indicators (KPIs) and track improvements over time.

This structured journey ensures data-driven strategic planning and continuous business improvement.

3.2 Solution Requirement:

To successfully implement the proposed analytical system, the following requirements were identified:

Functional Requirements:

- **I.** Ability to load and process retail sales dataset
- **II.** Creation of interactive visualizations and dashboards
- **III.** Implementation of filters and calculated fields
- **IV.** Comparative analysis of competitor pricing
- **V.** Web integration of Tableau dashboards using Flask
- **VI.** User-friendly navigation interface

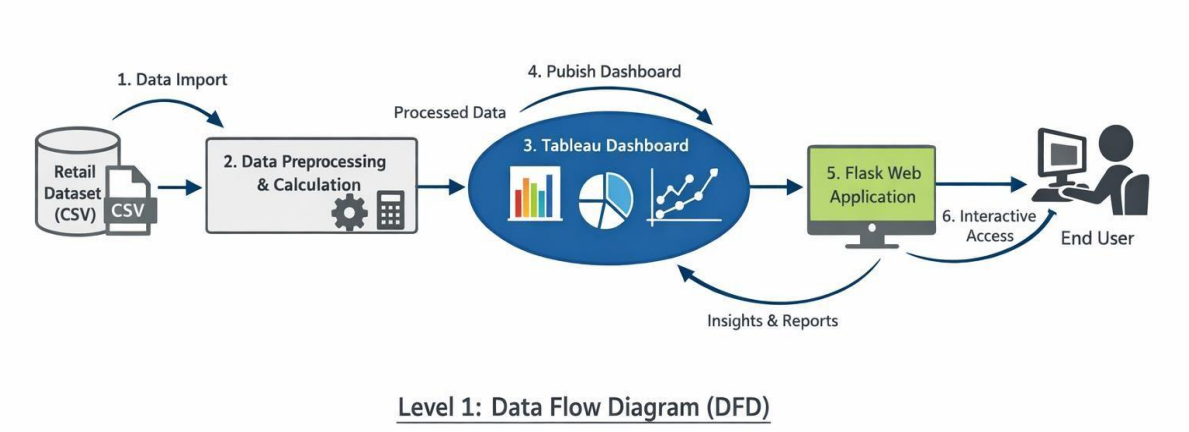
Non-Functional Requirements:

- **I.** High system responsiveness
- **II.** Scalability for larger datasets
- **III.** Secure and reliable web deployment
- **IV.** Cross-browser compatibility
- **V.** Easy accessibility through web interface

These requirements ensure that the system is efficient, scalable, and aligned with business needs.

3.3 Data Flow Diagram:

The Data Flow Diagram represents the flow of data within the system.



Level 1: Data Flow Diagram (DFD)

Level 0 (Context Diagram):

User → Web Application → Tableau Dashboard → Insights → User

Level 1 DFD Explanation:

- **I.** Retail Dataset is imported into Tableau.
- **II.** Data preprocessing and calculated fields are applied.
- **III.** Visualizations and dashboards are generated.
- **IV.** Dashboard is published to Tableau Public.
- **V.** Flask Web Application embeds the dashboard.
- **VI.** End-user interacts with dashboard filters to generate insights.

This structured flow ensures smooth data processing, visualization, and user interaction.

3.4 Technology Stack:

The project utilizes the following technologies:

I. Tableau Public:

Used for data visualization, dashboard creation, and analytical storytelling. Enables interactive filtering and KPI monitoring.

II. Python (Flask Framework):

Used to develop the web application for embedding Tableau dashboards. Provides lightweight backend routing and deployment.

III. HTML & CSS:

Used to design responsive and user-friendly web interface pages.

IV. **Bootstrap (Optional Styling Framework):**
Used to enhance UI responsiveness and visual appearance.

V. **Dataset (CSV Format):**
Structured retail sales dataset used for analysis.

This technology stack ensures seamless integration between analytics and web deployment while maintaining scalability and usability.

4. PROJECT DESIGN:

4.1 Problem Solution Fit:

The retail industry faces significant challenges in identifying optimal product placement strategies, pricing effectiveness, and promotional impact due to the absence of structured analytical systems. Traditional decision-making methods often rely on assumptions rather than data-driven insights.

The proposed solution directly addresses these challenges by integrating data analytics and visualization techniques into a unified analytical framework. By utilizing Tableau dashboards, the system transforms raw retail data into meaningful visual insights. The interactive filtering capabilities allow stakeholders to analyze specific product categories, seasons, promotional activities, and competitor pricing comparisons.

This alignment between business challenges and analytical capabilities ensures a strong problem-solution fit. The solution not only identifies performance gaps but also provides actionable insights to enhance profitability, operational efficiency, and strategic planning.

4.2 Proposed Solution:

The proposed solution is a **Data-Driven Retail Analytics System** that leverages Tableau for visualization and Flask for web deployment.

The system follows a structured workflow:

I. Retail sales data is collected in CSV format.
II. Data preprocessing and calculated fields are implemented in Tableau.
III. Interactive dashboards and storyboards are created to analyze sales performance.
IV. The dashboard is published to Tableau Public.
V. The published dashboard is embedded into a Flask-based web application.

End users interact with the system through a user-friendly web interface.

Key analytical components of the solution include:

I. Sales Volume Analysis by Product Category
II. Competitor Price vs Product Price Comparison
III. Promotion Impact Assessment

IV. Seasonal Trend Evaluation

V. Foot Traffic Correlation Analysis

This solution enables business stakeholders to make informed decisions based on real - time visual analytics rather than intuition

4.3 Solution Architecture:

The system architecture follows a layered design approach consisting of the following components:

I. Data Layer:

a. Retail dataset in CSV format
b. Structured data containing sales, pricing, promotion, season, and demographic attributes

II. Processing & Visualization Layer:

a. Tableau Public for data preprocessing
b. Implementation of calculated fields and filters
c. Dashboard and story creation
d. KPI visualization and comparative analysis

III. Integration Layer:

a. Dashboard published to Tableau Public
b. Embedded using iframe code

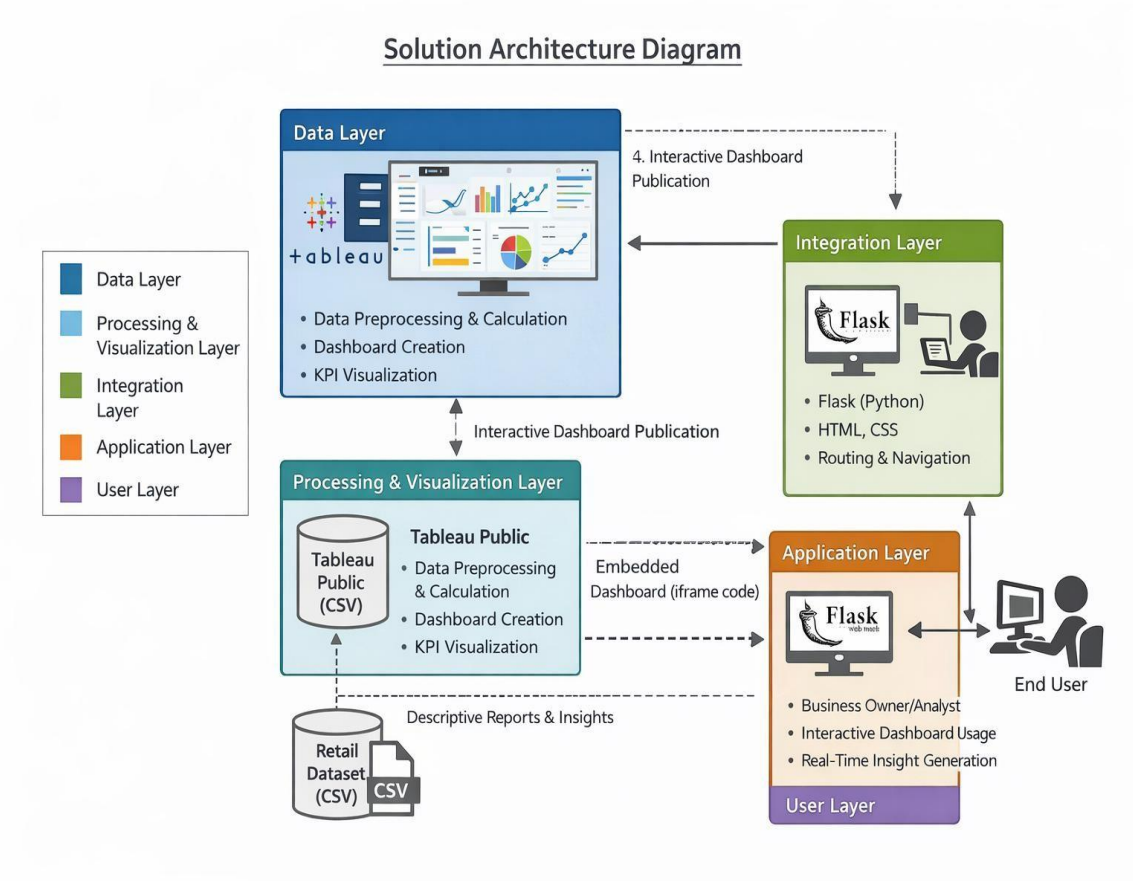
IV. Application Layer:

a. Flask web framework
b. HTML, CSS for frontend design
c. Routing and navigation control

V. User Layer:

a. End users (Business Owners / Analysts)
b. Interactive access to dashboards
c. Real-time insight generation

The architecture ensures scalability, modularity, and ease of deployment. It provides seamless interaction between data visualization tools and web application technologies, creating a comprehensive retail analytics platform.



5. PROJECT PLANNING & SCHEDULING:

5.1 Project Planning:

The project planning phase was structured to ensure systematic execution, timely completion, and efficient team coordination. The development process was divided into multiple stages, each focusing on specific objectives and deliverables.

Phase 1: Requirement Analysis:

I. Identification of retail business challenges
II. Definition of project objectives
III. Collection and understanding of dataset attributes
IV. Selection of appropriate analytical tools

Phase 2: Data Preparation:

I. Importing retail dataset (CSV format)
II. Data cleaning and preprocessing
III. Creation of calculated fields
IV. Validation of data consistency

Phase 3: Dashboard Development:

- **I.** Designing interactive visualizations in Tableau
- **II.** Implementing filters and KPI metrics
- **III.** Creating dashboard and analytical story
- **IV.** Performance testing of dashboard responsiveness

Phase 4: Web Integration:

- **I.** Publishing dashboard to Tableau Public
- **II.** Developing Flask-based web application
- **III.** Embedding dashboard using iframe integration
- **IV.** Implementing navigation and UI enhancements

Phase 5: Testing & Validation:

- **I.** Functional testing of dashboard components
- **II.** Performance testing under different filters
- **III.** Verification of web deployment **IV.** Final review and optimization

Phase 6: Documentation & Presentation

- **I.** Preparation of project report
- **II.** Designing architecture and DFD diagrams
- **III.** Compilation of results and screenshots **IV.** Final presentation preparation

The project planning ensured proper task allocation among team members, efficient time management, and systematic workflow execution. This structured approach minimized risks, improved collaboration, and ensured successful completion of the project within the scheduled timeline.

6. FUNCTIONAL AND PERFORMANCE TESTING:

6.1 Performance Testing:

Performance Testing was conducted to evaluate the responsiveness, stability, and efficiency of the proposed retail analytics system under various operational conditions. The objective was to ensure that the Tableau dashboard and Flask web application function smoothly without performance degradation.

6.1.1 Dashboard Responsiveness Testing:

The interactive Tableau dashboard was tested by applying multiple filters such as product category, season, promotion status, and product position. The system successfully updated visualizations in real-time with minimal latency, ensuring smooth user interaction.

6.1.2 Load Testing:

The web application was accessed multiple times and tested under repeated interactions to evaluate its stability. The embedded dashboard maintained consistent performance without crashing or freezing.

6.1.3 Integration Testing:

The integration between Tableau Public and the Flask web application was tested to verify proper embedding using iframe code. The dashboard loaded successfully across different pages without rendering issues.

6.1.4 Cross-Browser Compatibility Testing:

The application was tested on major web browsers such as Google Chrome and Microsoft Edge to ensure consistent display and functionality.

6.1.5 Data Accuracy Validation:

All visualizations were verified against the original dataset to ensure correctness of calculated fields, KPIs, and aggregated metrics.

6.2 Performance Outcome:

I. The system demonstrated high responsiveness and stable performance.

II. Dashboard loading time remained within acceptable limits.

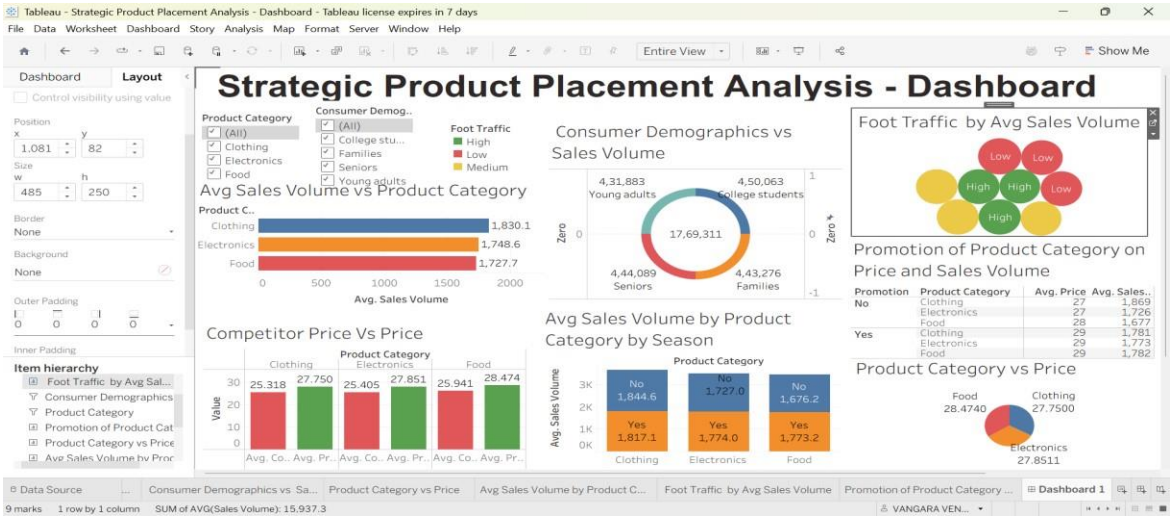
III. No major functional or integration errors were observed. **IV.** The application handled interactive filtering efficiently.

Overall, the system meets the required performance standards and provides a reliable platform for data-driven retail decision-making.

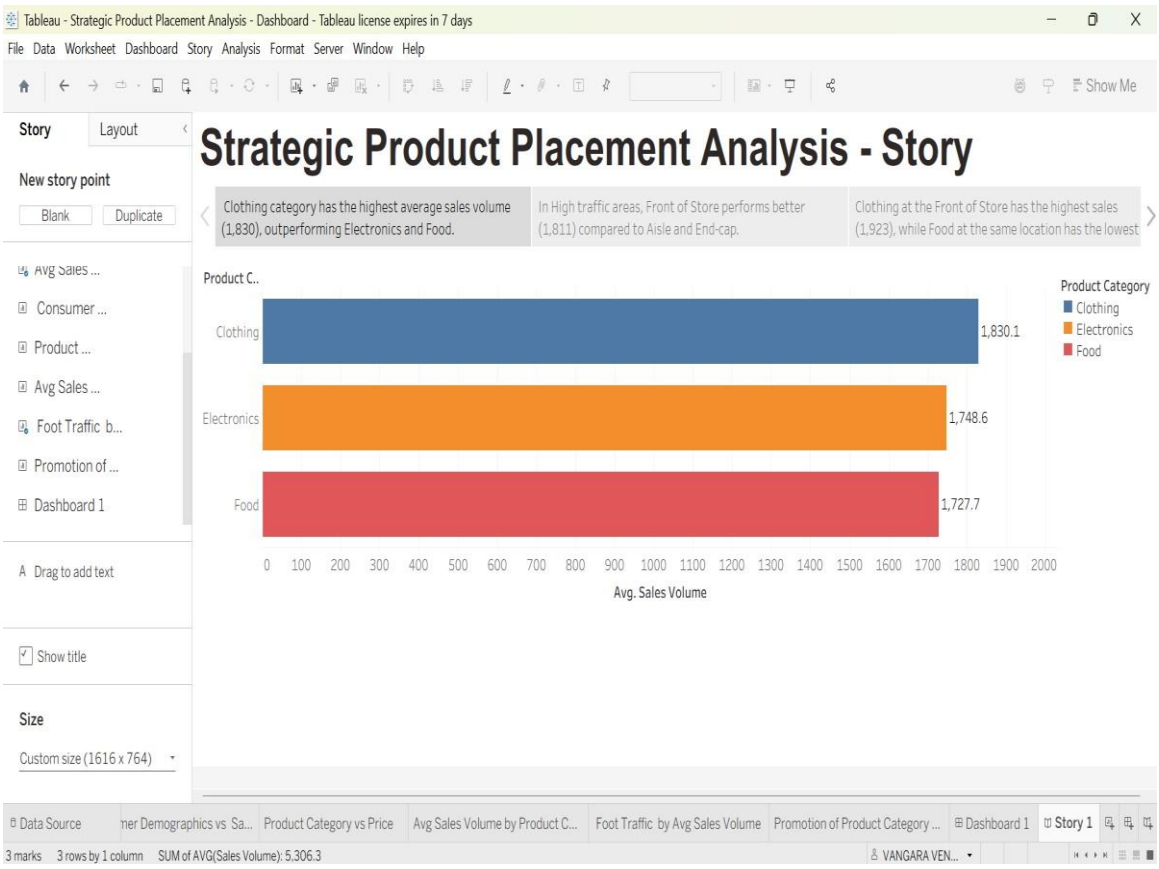
7. RESULTS:

7.1 Output Screenshots:

Dashboard:



Story – 1:



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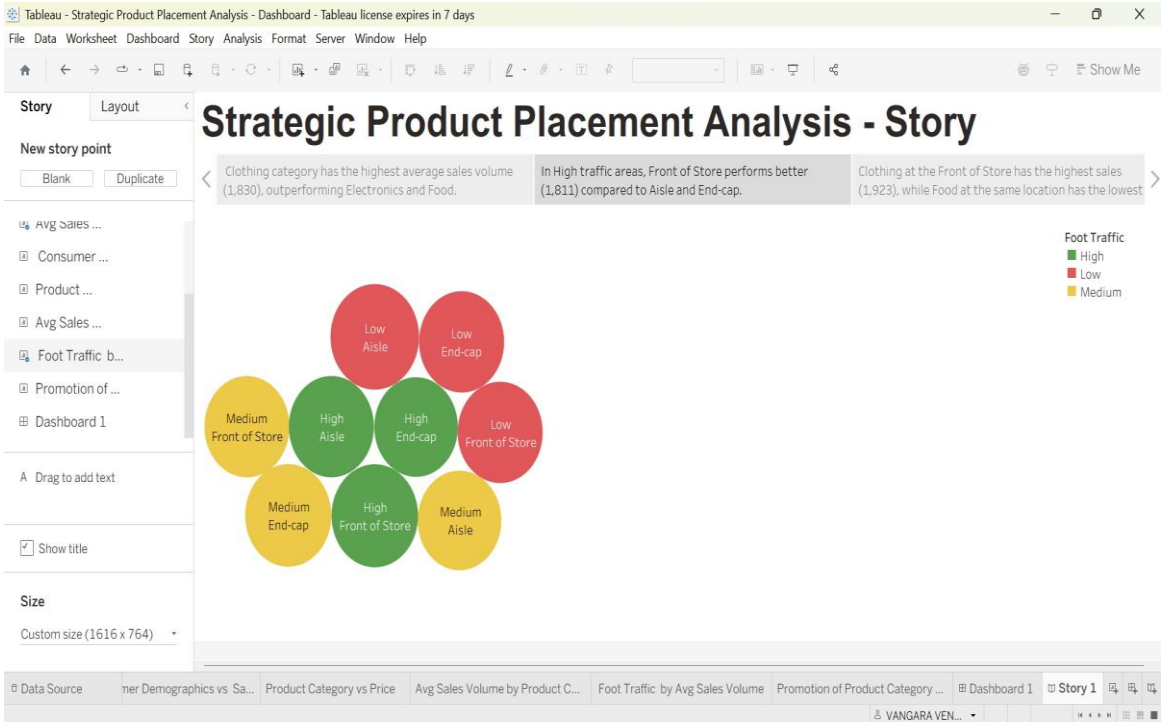
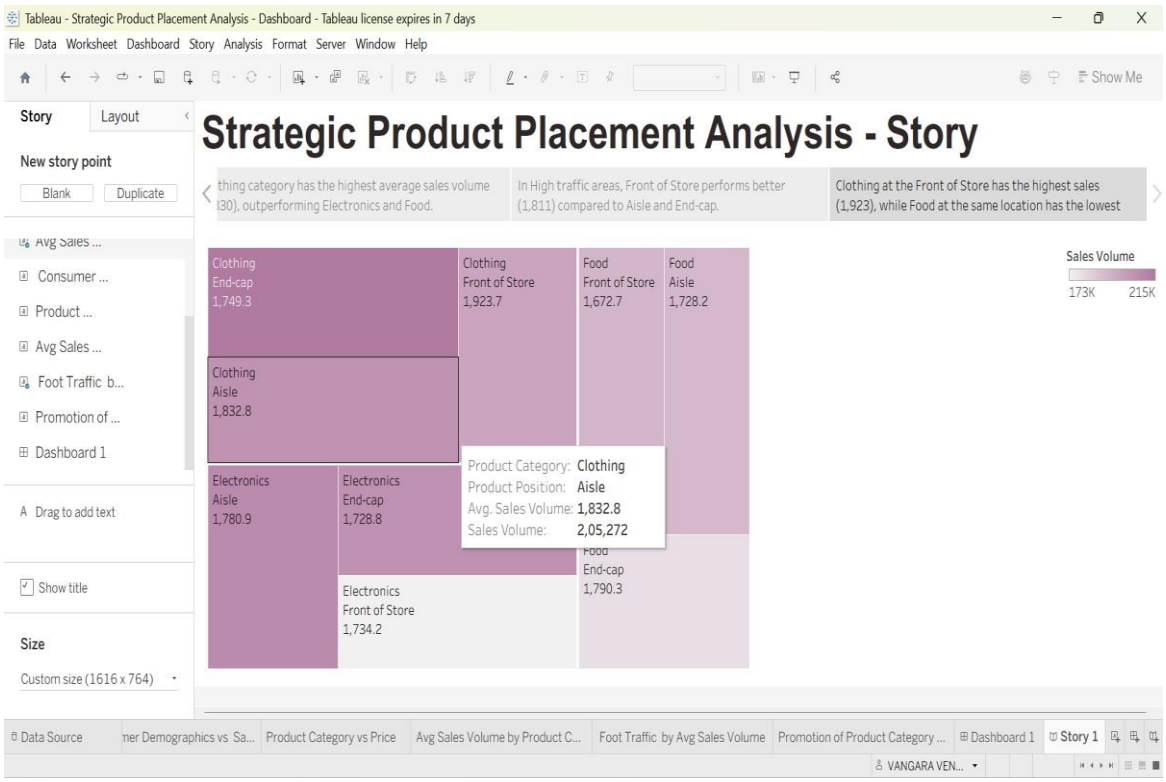


Story – 3:



8. ADVANTAGES & DISADVANTAGES:

8.1 Advantages:

- **i.** Provides data-driven insights for strategic decision-making
- **ii.** Interactive dashboards improve analytical clarity
- **iii.** Enhances product placement optimization
- **iv.** Supports competitor price comparison analysis
- **v.** Improves promotional effectiveness evaluation
- **vi.** Scalable and accessible through web integration
- **vii.** User-friendly interface with real-time filtering

8.2 Disadvantages:

- **i.** Depends on data accuracy and completeness
- **ii.** Limited to structured dataset format
- **iii.** Performance may vary with extremely large datasets
- **iv.** Requires basic knowledge of data interpretation

9. CONCLUSION:

The **Strategic Product Placement Analysis** project successfully demonstrates the practical application of data analytics and visualization in the retail domain. By leveraging Tableau for interactive dashboard creation and Flask for web deployment, the system provides a comprehensive analytical platform for evaluating sales performance.

The project highlights the importance of product positioning, pricing strategies, promotional activities, and seasonal trends in influencing retail profitability. Through structured data visualization and real-time interaction, stakeholders can make informed and evidence-based decisions.

This implementation proves that integrating analytical tools with web technologies enhances accessibility, usability, and scalability of business intelligence solutions. The project effectively meets its objectives and provides a strong foundation for future retail analytics enhancements.

10.FUTURE SCOPE:

The current implementation of the Strategic Product Placement Analysis system provides a strong foundation for retail data analytics. However, the project can be further enhanced with advanced features and scalability improvements.

Future enhancements may include:

I. Integration of real-time database connectivity instead of static CSV datasets
II. Implementation of machine learning models for sales prediction and demand forecasting
III. Advanced customer segmentation using clustering techniques
IV. Integration with cloud platforms for scalable deployment V. Role-based authentication and secure login system
VI. Mobile-responsive dashboard optimization
VII. Automated report generation and export functionality (PDF/Excel) VIII. Deployment on cloud services such as AWS or Azure

By incorporating predictive analytics and automation, the system can evolve into a comprehensive retail decision-support system capable of handling enterprise-level data.

11.APPENDIX:

Source Code: Upoload in github

Dataset Link : https://www.kaggle.com/datasets/amitvkulkarni/impact-of-productpositioning-on-sales

GitHub Link : https://github.com/Kusuma-h9/Strategic-Product-Placement-Analysis.git

Project Demo Link: https://github.com/Kusuma-h9/Strategic-Product-Placement-Analysis/tree/main/DemovideoLink