

LEVERAGING INVENTORY MANAGEMENT FOR WALMART

Google Drive Link: [Project](#)

Github repo link: [Repo Link](#)

Problem Statement:

Walmart, a prominent retail organization, possesses an extensive repository of data and knowledge, yet it lacks a structured approach to effectively utilize this information to solve its inventory management issues. I am tasked with addressing the challenge of efficient inventory management leveraging available data/knowledge. I aim to harness Walmart's historical sales dataset to provide viable solutions. The goal is to optimize inventory management strategies, minimize stockouts, and maximize revenue. Leveraging Python and machine learning techniques, my goal in this project is to extract actionable insights from the dataset to enhance Walmart's inventory management practices.

Scope:

Utilized Python and machine learning techniques to extract insights from Walmart's historical sales dataset. This involves data cleaning, exploratory data analysis (EDA), visualization, and answering key questions to improve inventory management strategies.

Dataset Overview:

The dataset comprises columns like Store, Date, Weekly_Sales, Temperature, Fuel_Price, product_category, product_sub_category, dept, and more. Each column offers critical information regarding sales, products, regions, and economic factors.

(Link to the Data Codebook: [Codebook](#))

Workflow:

Python is the primary tool for data analysis, using libraries like Pandas, NumPy, Matplotlib/Seaborn for data manipulation, analysis, and visualization. Machine learning models are employed for forecasting sales demand and optimizing inventory levels.

Step 1: Data Collection and Preprocessing

- Acquired Walmart's sales dataset, focusing on historical sales and relevant attributes.
- Cleaned and preprocessed the dataset to handle inconsistencies, missing values, and ensure data quality.

Step 2: Feature Selection

- Able to determine which columns are crucial for the analysis based on their relevance to inventory management, etc.
- Identified and leveraged features for insights into product demand, inventory optimization, and pricing strategies.

Step 3: Exploratory Data Analysis (EDA) and Visualizations

- Analyzed sales trends over time, identifying seasonal patterns and location-specific sales trends and correlations between features using visualizations.
- Uncovered correlations between sales and attributes like product category, location, and season.
- Utilized interactive visualizations to better understand intricate relationships within the data.

Step 4: Knowledge Management and Inventory Optimization Solution Development

- Generated recommendations for inventory stocking, promotional strategies, and pricing optimization.
- Extracted actionable insights from the EDA and sales forecasting to identify high-selling product categories, locations, and seasons.
- Developed data-driven recommendations to optimize inventory levels and disseminate findings to Walmart's inventory management team.

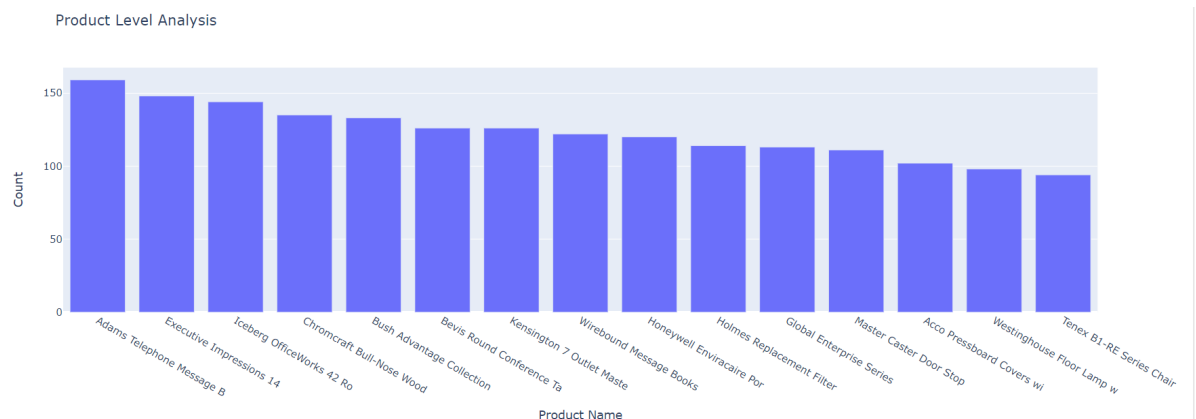
Step 7: Implementation and Monitoring

- Implementation: Implement the recommended strategies and monitor their effectiveness over time.
- Iterate and Improve: Continuously refine the models and strategies based on new data and observations for ongoing enhancement.

Analysis

Here are the summarized key findings that could help Walmart in improving inventory management strategies.

1) What are the Top-selling 15 Products by Count in Walmart's Sales Data?



Insights for Inventory Management:

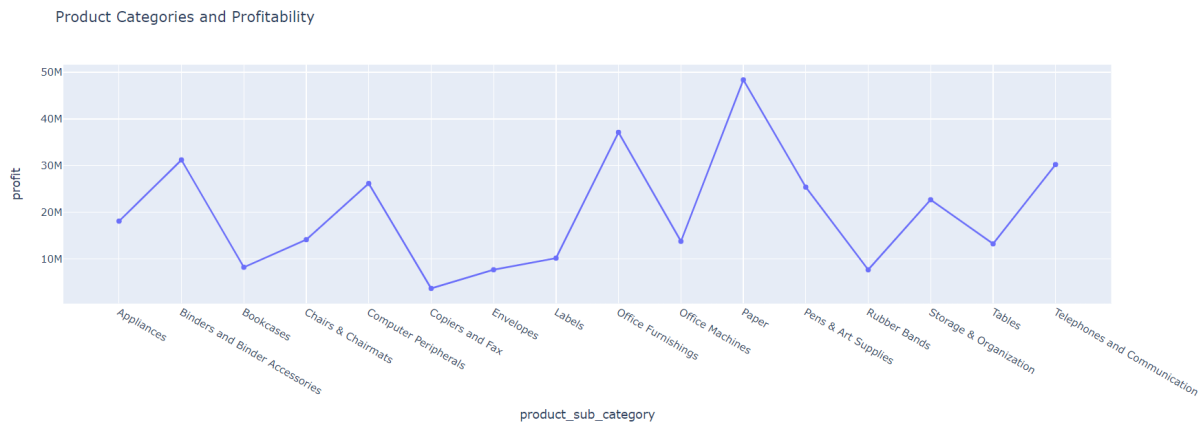
- Walmart can strategize inventory stocking by ensuring these top-selling products are consistently available.
- Prioritizing the stocking of these products can help prevent stockouts and cater to high customer demand.

- Implement a focused stocking strategy for these top 15 products to ensure their availability across stores.
- Consider optimizing shelf space and promotions for these products to capitalize on their popularity.
- Analyze the sales patterns and correlate them with other features (e.g., seasonality, location) to further refine inventory strategies.

Additional Suggestions:

- **Seasonality:** Investigate if certain products have seasonal peaks in sales and adjust inventory levels accordingly.
- **Location-Based Sales:** Explore how product popularity varies across different store locations and optimize stocking based on regional preferences.
- **Promotional Data (Markdowns):** Analyze how promotions impact the sales count of products and tailor promotional strategies accordingly.

2) How Do Profits Vary Across Different Product Subcategories at Walmart?



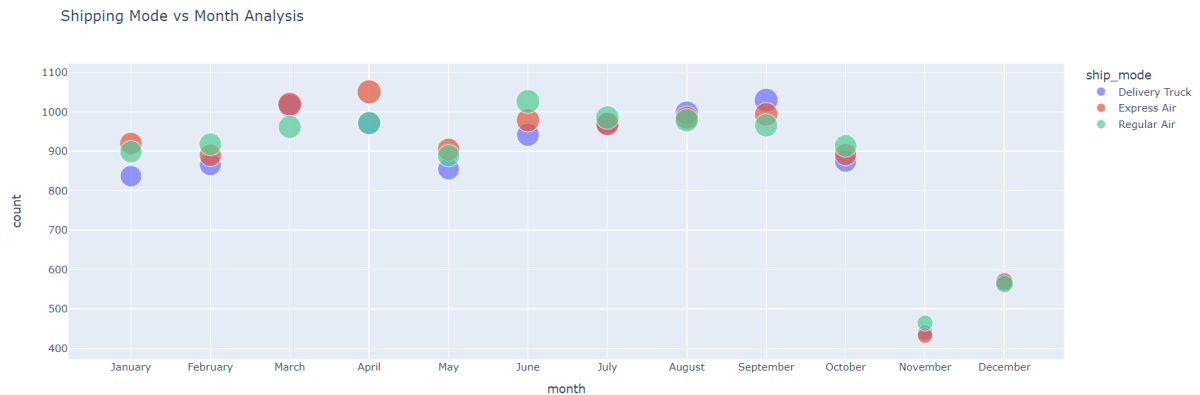
Insights for Inventory Management:

- The line chart showcases the profitability trends among various product sub-categories.
- **Leveraging Insights for Inventory Management:**
- Identifying highly profitable sub-categories helps Walmart focus on maximizing revenue from these categories.
- Allocate more resources and inventory management attention to the most profitable sub-categories to sustain or enhance profitability.
- Investigate factors contributing to higher profitability in certain sub-categories and replicate successful strategies in other categories.
- Exploring further features or combinations could offer deeper insights into inventory management.

Additional Suggestions:

- **Date and Seasonality:** Analyze if profitability fluctuates seasonally or over time for specific sub-categories.
- **Markdowns and Sales:** Correlate profitability trends with sales and markdowns to understand their impact on profits for different sub-categories.
- **Location-Based Profitability:** Explore if profitability varies across different store locations and optimize stocking strategies accordingly.

3) How Does Sales Volume Vary Across Different Shipping Modes Throughout the Year at Walmart?



Insights for Inventory Management:

- The scatter plot visualizes the distribution of shipment counts across various shipping modes throughout the months.
- It reveals how each shipping mode is utilized across different months of the year.
- Understanding shipping mode preferences across months can aid in logistics planning and inventory stocking.
- Align inventory management strategies with shipping trends to optimize stock levels based on expected shipping demands.
- Offer incentives or promotions for certain shipping modes during specific months to balance inventory and meet customer expectations.

4) Which product categories generate the highest profits across different stores at Walmart?

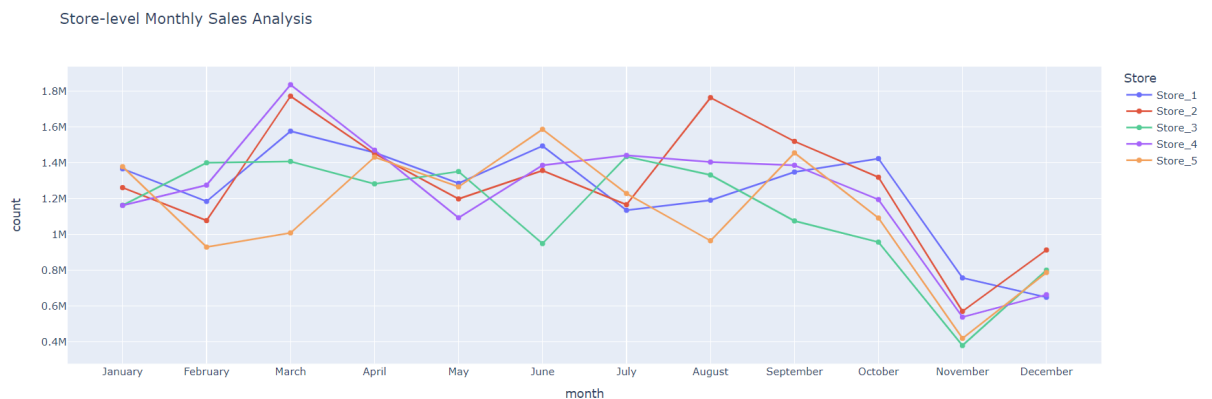


Insights for Inventory Management:

- The grouped bar chart showcases the profits generated by distinct product categories within each store.

- It delineates the profitability trends for different product categories across the store chain.
- Understanding category-specific profits across stores can guide inventory stocking strategies and store-level management.
- Prioritize stocking product categories with higher profits across all stores to maximize revenue.
- Tailor inventory allocation strategies by considering both store-specific preferences and profitable product categories.
- Region or State: Investigate if certain product categories are more profitable in specific regions or states, influencing stocking decisions.
- Sales and Promotions: Analyze if profits align with sales trends and promotional activities for different product categories across stores.
- Customer Segmentation: Explore if profits vary based on customer demographics and preferences to fine-tune inventory stocking.

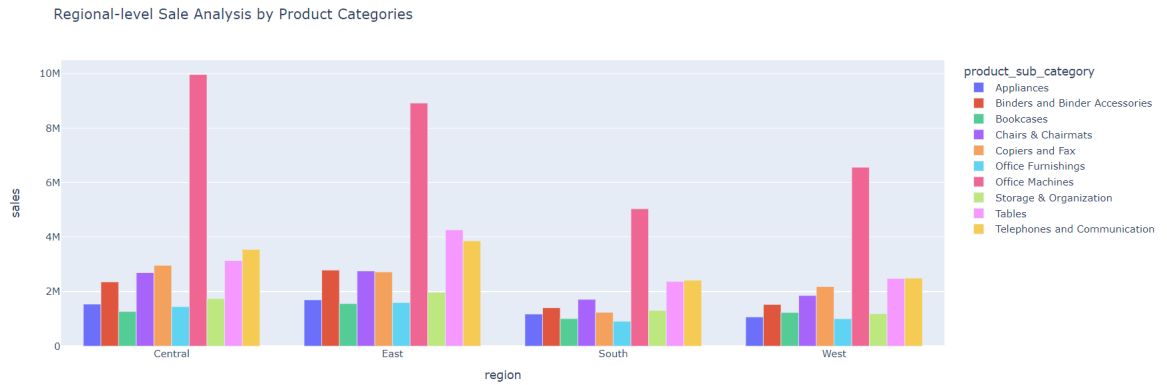
5) How Do Monthly Sales Vary Across Different Stores Throughout the Year at Walmart?



Insights for Inventory Management:

- The line chart exhibits the variations in sales trends across different stores on a monthly basis.
- It highlights which months witness higher or lower sales performances for each store.
- Understanding monthly sales trends per store aids in optimizing inventory levels and stocking strategies.
- Allocate inventory based on store-specific sales trends to ensure adequate stock during peak months.
- Tailor promotions or marketing strategies for certain stores during months with historically lower sales to drive revenue.

6) How can we identify popular products across different regions to optimize inventory?

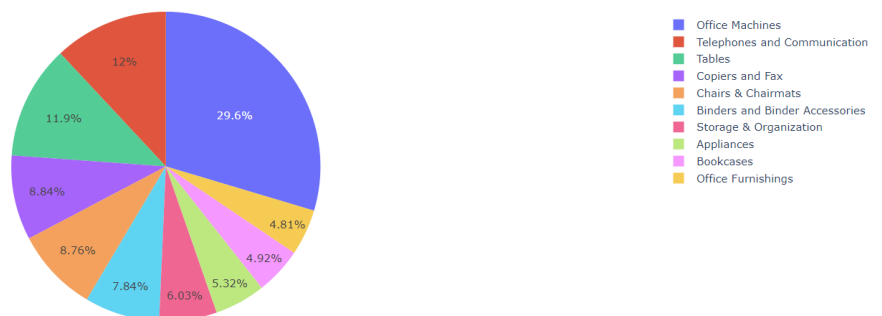


Insights for Inventory Management:

- The grouped bar chart depicts sales distribution across regions for the top product categories.
- It offers a comparative view of sales performances across regions within each product category.
- Understanding regional preferences for specific product categories can guide inventory allocation and stocking strategies.
- Identifying regions where certain product categories perform exceptionally well can help tailor marketing or promotional campaigns.
- Regional Inventory Allocation: Allocate inventory based on regional demand patterns to optimize stock levels.
- Targeted Marketing: Tailor marketing efforts or promotions to match regional preferences for specific product categories.
- Seasonal Variations: Investigate if certain regions display seasonal sales variations for particular product categories.

7) Which product subcategories consistently exhibit high sales, indicating a need for increased inventory stocking to maximize revenue?

Top 10 Product Sub-Categories by Sales

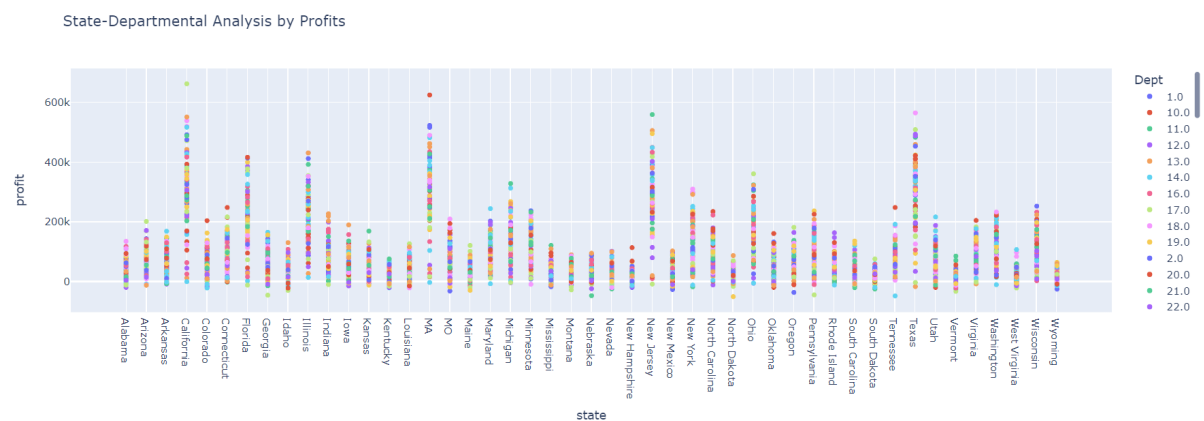


Insights for Inventory Management

- The visualization presents the distribution of sales among the top 10 product sub-categories.
- It highlights which sub-categories contribute the most to overall sales at Walmart.
- Walmart can focus on optimizing inventory levels for these top-selling sub-categories.

- It allows for better stocking strategies to cater to customer demand and minimize stockouts.
- Develop tailored inventory management plans for the top-selling sub-categories to ensure sufficient stock availability.
- Implement targeted marketing campaigns or promotions for these subcategories to further boost sales.
- Analyze the profitability of these subcategories and optimize pricing strategies accordingly.

8) How Does Profits Vary Across Different Departments in Different States at Walmart?



Insights for Inventory Management:

- Understanding department-specific sales trends per state can assist in optimizing department-level inventory allocation.
- Allocate inventory based on department-specific sales trends across states to ensure efficient stocking of products.
- Tailor marketing or promotional strategies for specific departments in different states to capitalize on sales opportunities.
- Exploring additional features or combinations could provide more nuanced insights into inventory management:
- Seasonality: Analyze if certain departments exhibit seasonal sales patterns in specific states to adjust inventory levels accordingly.
- Customer Behavior: Incorporate customer behavior data to understand how departmental sales vary among different consumer segments in each state

