# PREDICTIVE MODEL FOR INVENTORY MANAGEMENT

## Forecasting Inventory for Efficiency

**Objective**:
The objective of the project is to develop a robust predictive model for inventory management leveraging historical sales data and inventory records. By analyzing these datasets, the model aims to forecast product demand accurately, enabling businesses to maintain optimized inventory levels. Additionally, the project includes integrating the predictive model into a Tableau dashboard to provide real-time insights and recommendations for inventory management strategies.

**GITHUB LINK**:
https://github.com/komatineniapoorva/Project8-Inventory-Management

### Dataset Description:

The dataset comprises various columns including:

- **Order Details**: Row ID, Order ID, Order Date, Ship Date, Ship Mode, Order Priority.
- **Customer Information**: Customer ID, Customer Name, Segment.
- **Location Details**: City, State, Country, Postal Code, Region.
- **Product Details**: Product ID, Category, Sub-Category, Product Name.
- **Sales Information**: Sales, Quantity, Discount, Profit, Shipping Cost.
- **Market Information**: Market.

The initial dataset contains approximately 51,000 records and 24 columns. After data preprocessing, including handling null values and removing outliers, the dataset size reduced to 36,311 records and 22 columns.

### Observations:

- Office Supplies category shows the highest profit, while the Technology category has higher sales.
- Furniture category has comparatively lower sales but profitable margins.
- India shows the highest sales followed by Australia and the United States.
- Sales increased steadily from 2011 to 2014, with a slight dip in 2013.
- Profit variations across years indicate that higher sales (2014) didn't directly translate to higher profits.
- Profitability was better in some years despite lower sales volumes.
- Scatter plot analysis shows a spread between sales and profit, indicating varied profit margins across sales amounts.
- Most orders are shipped on the same day or via first-class shipping.
- Initially planned to use Sales as the target variable but revised to Quantity due to concerns about high dimensionality caused by product names.

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| Sub-Category | Actual_Quantity | Predicted_Quantity_RF |
|---|---|---|
| **Accessories** | 715 | 660.660000 |
| **Appliances** | 272 | 283.561000 |
| **Art** | 1332 | 1292.029226 |
| **Binders** | 1652 | 1609.943402 |
| **Bookcases** | 157 | 171.360000 |
| **Chairs** | 538 | 561.900000 |
| **Copiers** | 106 | 102.020000 |
| **Envelopes** | 639 | 648.899667 |
| **Fasteners** | 754 | 715.430857 |
| **Furnishings** | 880 | 866.520000 |
| **Labels** | 838 | 800.121385 |
| **Machines** | 147 | 140.000000 |
| **Paper** | 1181 | 1143.606095 |
| **Phones** | 501 | 504.412500 |
| **Storage** | 995 | 948.901405 |
| **Supplies** | 727 | 752.810754 |
| **Tables** | 37 | 32.580000 |

**Recommendations for inventory management:**

- Increase inventory for Bookcases, Copiers, and Machines to avoid stock shortages.
- Review and potentially reduce inventory levels for Appliances, Art, and Fasteners.
- Implement dynamic monitoring and automated replenishment systems.
- Adjust inventory based on seasonal demand variations.
- Collaborate closely with suppliers for faster restocking and reduce lead times.
- Monitor customer feedback and market trends to align inventory with demand patterns.
- By following these recommendations, businesses can optimize inventory levels, reduce carrying costs, and improve overall supply chain efficiency to meet customer demand effectively.
- Continuously monitor inventory turnover rates, stockout rates, carrying costs, and fill rates across segments and categories. Use these metrics to fine-tune inventory management strategies and forecast accuracy.
- Establish feedback loops between inventory management systems, predictive models, and decision-makers to iterate and improve forecasting accuracy over time.
- Collaborate with sales, marketing, and procurement teams to validate model predictions against real-time market feedback and sales insights.
- Customer Feedback: Incorporate customer feedback, product reviews, and market surveys to adjust inventory assortments, introduce new products, or phase out underperforming items proactively.

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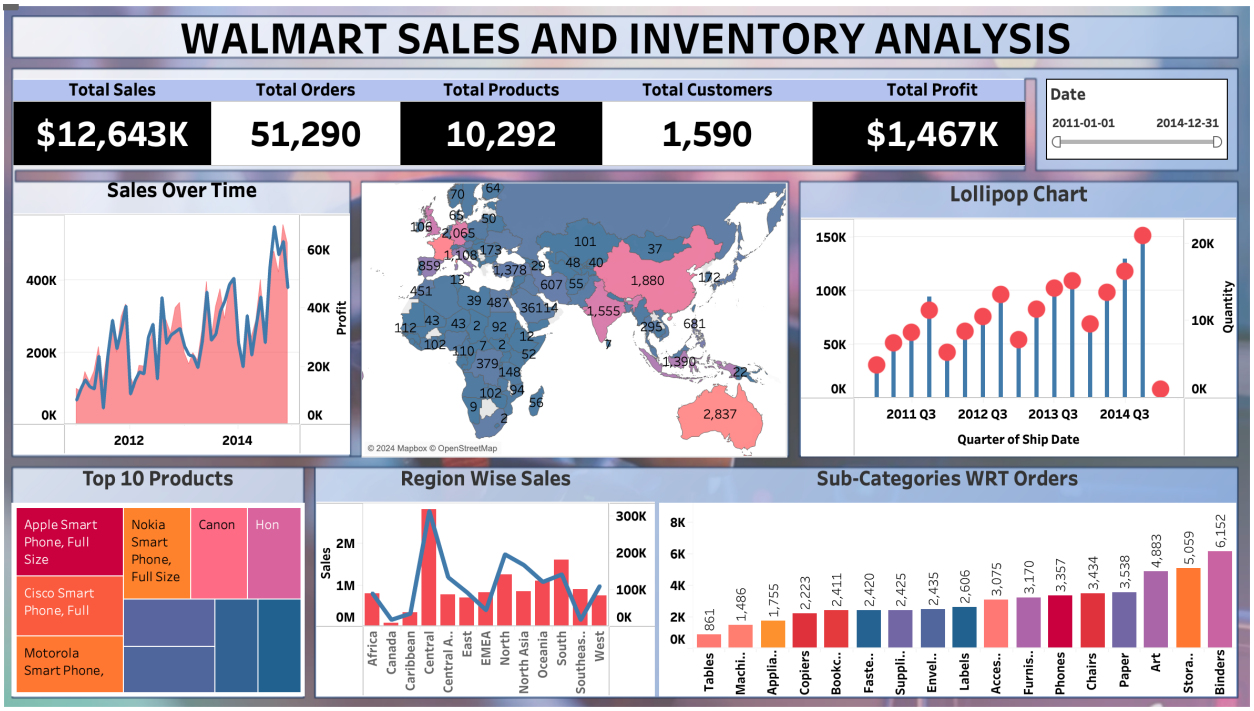
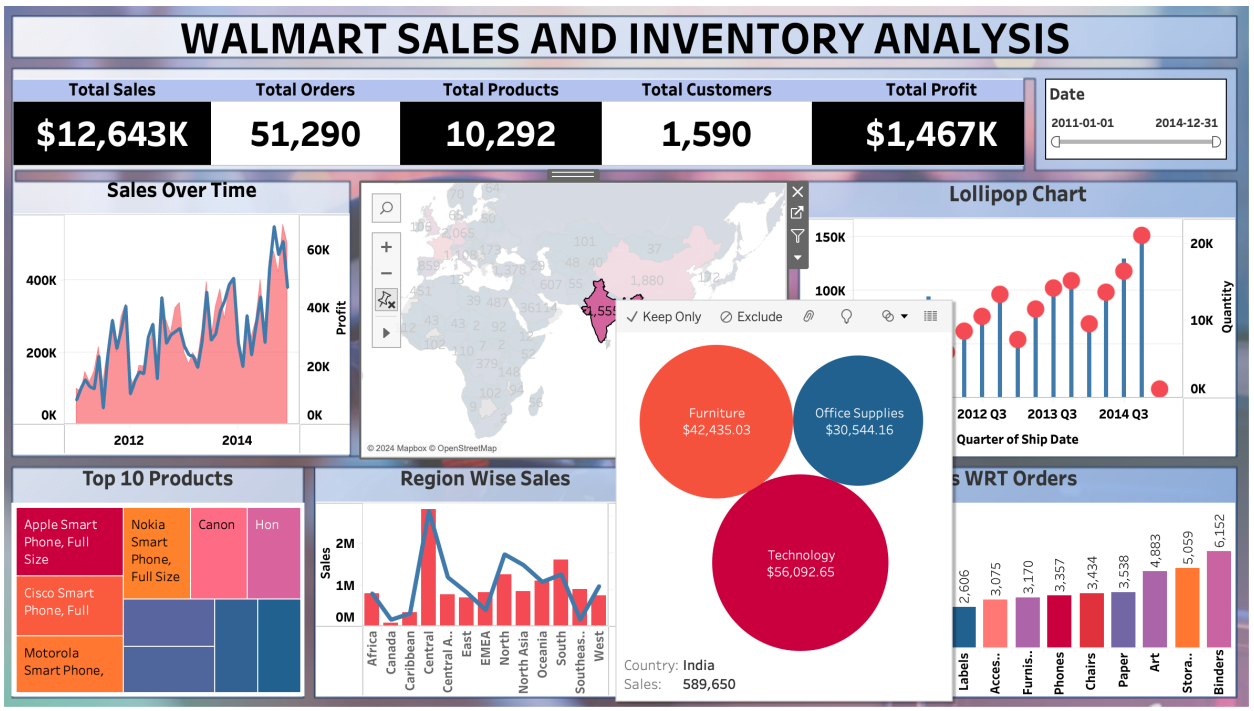
**DashBoard:**

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