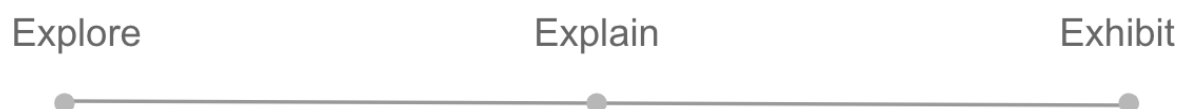


Visualizations of Retail American Company

Introduction

Tableau, a business intelligence program, is used by many organizations which are using data-driven in their work, from private companies to public institutions. Using visualization tools like Tableau allows companies or organizations to understand the data they have and gain insights and analyze it. Regardless of the size of the organization, data visualization is very important to extract insightful and useful information by analyzing data. Such organizations collect data for many purposes; international trade, employee performance, logistics, production, inventory management, marketing strategies etc. Because the more data brings the more efficiency. Where there is so much competition, collecting data becomes inevitable. At this point, visualization software programs like Tableau or Power BI are a fast way to condense data and share information. Staring at hundreds, thousands, or millions of rows of data does not help to understand trends in the data or answer questions for the company. Clear visualizations of the data may provide rapid insights and generate important questions for the entire team and the analyst, so saving much time for reaching such conclusions.

Range of Data Visualization Goals



The problem here is to make useful observations from this vast amount of data on the retail business in America. The aim here is to visualize this dataset appropriately in order to develop the company in a more profitable and optimized way and to make developmental

decisions for the future. To give an example of these optimization works; understanding customer behaviour, inventory levels, understanding sales performance, discount performance, who uses which ship mode feature, customer segmentation, and the aim is to examine subheadings such as decision-making mechanism and strategic visualizations.(Hoelscher,2018) <https://github.com/jarrodtky/Superstore>
[Global Visualization Tableau/blob/main/Superstore-Global Dataset.xls](https://github.com/jarrodtky/Superstore/blob/main/Superstore-Global%20Dataset.xls) this dataset is used for this project.

This dataset contains sales data belonging to the retail company and allows data analysis with tools such as Tableau or Power BI.(Dewi,2024) This data allows analyzing different aspects of retail operations. First of all, data such as customer information, sales volumes and profitability are useful in examining customer purchasing behaviour. Having order time data is effective in examining sales trends and determining seasonal products. At the same time, having regional sales data in the dataset is used to make inferences to increase company performance in inventory and stock control. Of course, since there is no data of competitors in the foreign market, competitive analysis cannot be done. In addition, the dataset does not include external factors such as economic factors.

This data source contains a variety of sub-segments of product and customer. These are categorized enough to make analysis easier. This data provides detailed information about orders, customers, products, sales, shipping, and profitability. The strengths of this dataset are large granularity about both customer and product. This allows segmentation to be done under many headings. It also allows analysis to be done about logistic and price/profitability levels of product categories. In addition, the dataset is up-to-date. (2024) However, the fact that it is only 2024 and not in previous years may bring some limitations in terms of time. For example, observations cannot be made from past data. The graph of the last 5 years cannot be looked at. Therefore, more specific topics such as product-customer-price can be examined. There is no missing data and outliers in this dataset.

This dataset contains the following data; order ID, order data, ship date, ship mode, customer ID, customer name, segment, country/region, city, state, postal code, product ID, category, sub-category, product name, sales, quantity, discount, profit. Each order ID and the time the order was placed are given. Also, the shipping mode is divided into three sections as

standard, first and second class. Then, each customer ID, segment and detailed where they live are in the dataset. Another important category is product details. Here, each product ID, the category it belongs to (e.g. technology, office supplies...), the more specific sub-category of the product (e.g. storage, bookcases, accessories...) and the name of the product are given. And finally, there is numerical data related to the product. These show the detailed features of the product and which customer it was sold to, when and in what quantity.

2. Formulation

One of the most powerful features of Tableau is calculation fields. This is to create new and usable new data titles from the data contained in the dataset. The new data created for this dataset are; profit per order, return rate, customer lifetime value, profit margin, sales per customer and average order value. The formulas are given below. In addition, filters and visual elements that will be used in the project and to expand the research area of the project are shown below.

Calculation Fields

Profit per Order: Total Profit / Total Orders

*Return Rate: (Number of return orders) / (Total Orders) * 100*

*Profit Margin: (Profit / Sales) * 100*

Sales per Customer: Total Sales / Number of Unique Customers

Average Order Value: Total Sales / Number of orders

Filters:

Profit Range Per Order Filter: How profitable is each order?

Shipping Duration Filter: To analyze how shipping speed impacts customer satisfaction, repeat purchases, and profitability.

Category/Sub-Category Filter: Uncover insights of specific categories or subcategories

Customer Lifetime Value Filter: It is necessary to examine the purchasing behavior of customers and make strategic moves.

Customer Segmentation Filter: To analyze different customer segments.

Visual Elements:

Sales and Profit by Customer Segments: It shows which customers are profitable and not.

Sales and Profit by Product Segments: It shows which product group is sold with the most profit.

Cumulative Sales and Profit: It shows a graph of growth and decline times. Useful for understanding trends.

Discount Effectiveness: It shows the relationship between discount levels and total sales or profit. It helps to identify maximize discount strategies.

Sales Heatmap: Sales performance by time

Sales Forecast: It is an important factor in observing future sales based on past data and making strategic decisions accordingly. (Jena,2018)

Top Cities by Sales and Profit: This helps in identifying high-performing locations for potential expansion or targeted marketing.

3. Implementation

Calculated Fields;

Profit Range per Order

```
SUM([Profit]) / COUNT([Order ID])
```

Total profit is divided by the total number of orders to calculate how much profit is per order.

Return Rate

```
(COUNT([Returns]) / COUNT([Order ID])) * 100
```

Calculates what percentage of total orders have a return rate.

Profit Margin

```
(SUM([Profit]) / SUM([Sales])) * 100
```

Calculates what percentage of total sales is profit

Sales Per Customer

```
SUM([Sales]) / COUNTD([Customer ID])
```

Calculates how much profitability per customer

Average Order Value

```
SUM([Sales]) / COUNT([Order ID])
```

Calculates on how many sales are made per order.

Shipping Duration

```
DATEDIFF('day', [Order Date], [Ship Date])
```

It reveals the difference between the order time and shipping time.

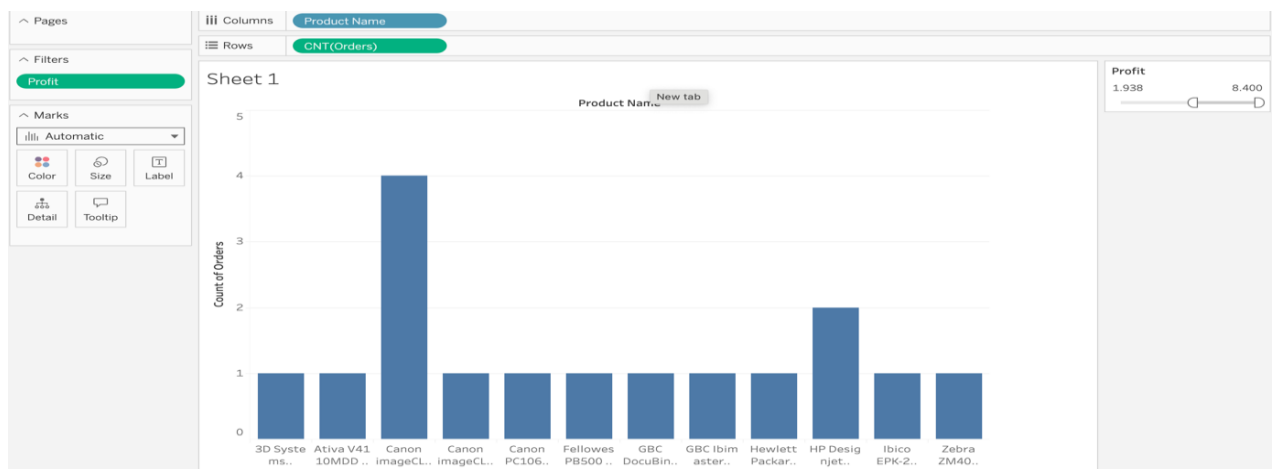
Total Sales Per Customer

```
{ FIXED [Customer ID] : SUM ([Sales]) }
```

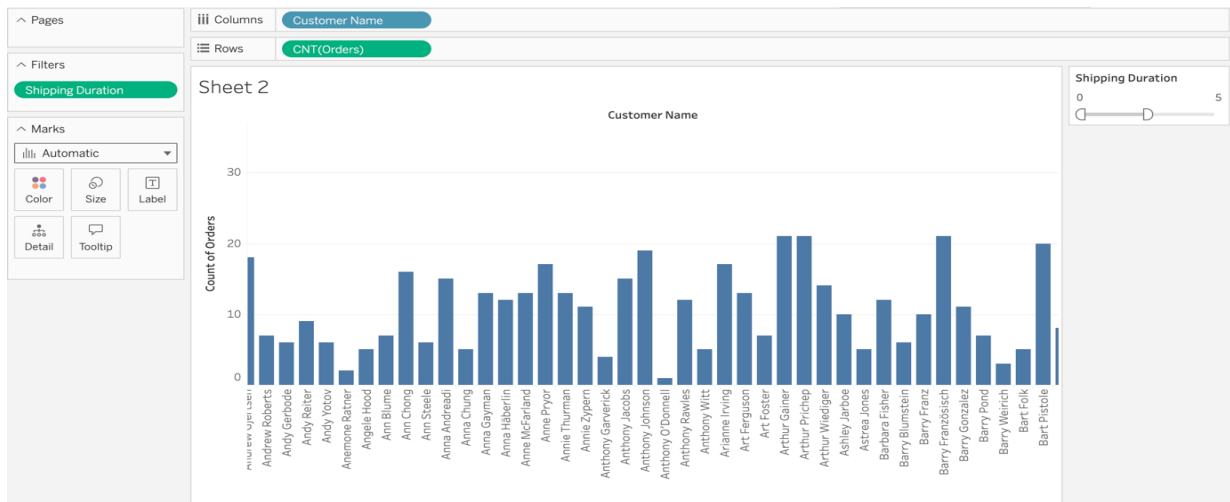
It calculates exact customer by sales

Filters;

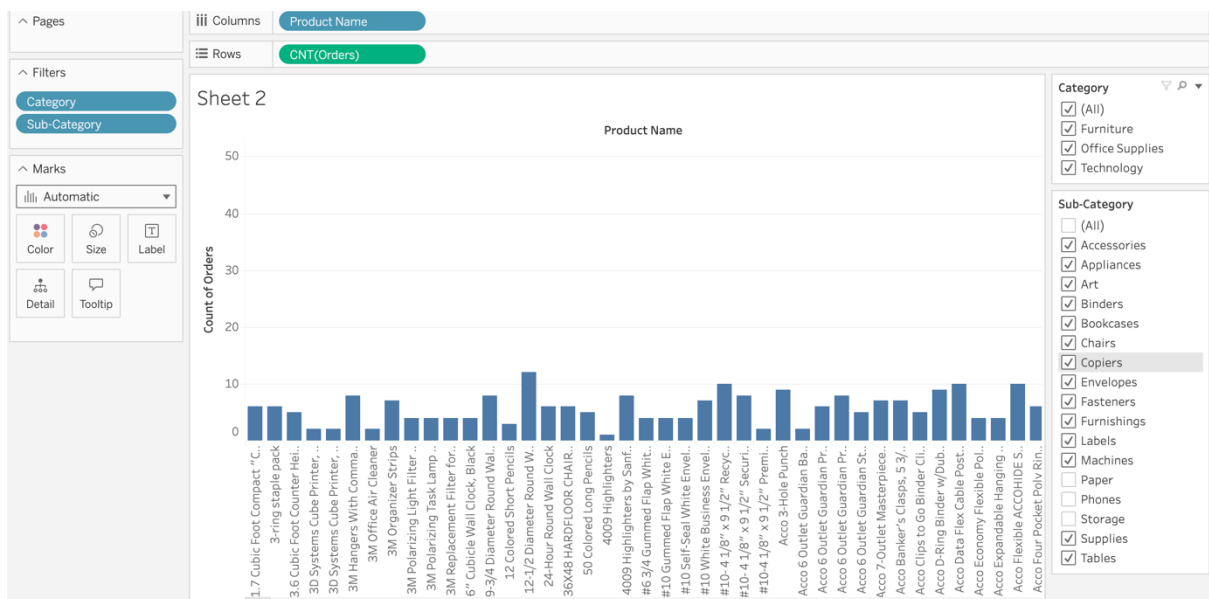
High Profit Products: In this way, it can be observed which products are sold at a high profit rate and in how many units. It is checked how much of which products are ordered. Putting a region section in the column section of this chart is effective in inventory planning.



Shipping Duration Filter: It shows how many orders each customer placed and how many of those orders arrived within the desired time. The effect of order time on sales and customer based visualizations are made. This graph, which shows which customers earn the most money, provides information about who should apply new marketing strategies to when observed by the marketing department. In addition, information about the customer's purchasing habits is obtained from this graph.



Category / Sub-Category Filter: In this way, it can be filtered out desired and unwanted categories or subcategories.



Customer Lifetime Value Filter:

Customer Lifetime Value

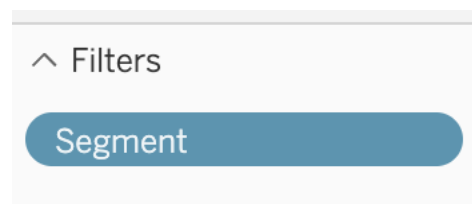
```
IF [Total Sales Per Customer] > 1000 THEN "High"  
ELSEIF [Total Sales Per Customer] > 500 THEN "Medium"  
ELSE "Low"  
END
```

Customer lifetime value segment does segmentation by sales per customer.

CLV Filter

```
[Customer Lifetime Value] = [CLV Segment]
```

Customer Segmentation Filter;



Parameter:

Create Parameter

×

Name

Customer Lifetime Value

Properties

Data type

String

▼

Display format

High

▼

Current value

High

▼

Value when workbook opens

Current value

▼

Allowable values

☐ All

☒ List

☐ Range

Value	Display As
High	High
Medium	Medium
Low	Low
Click to add	

☒ Fixed

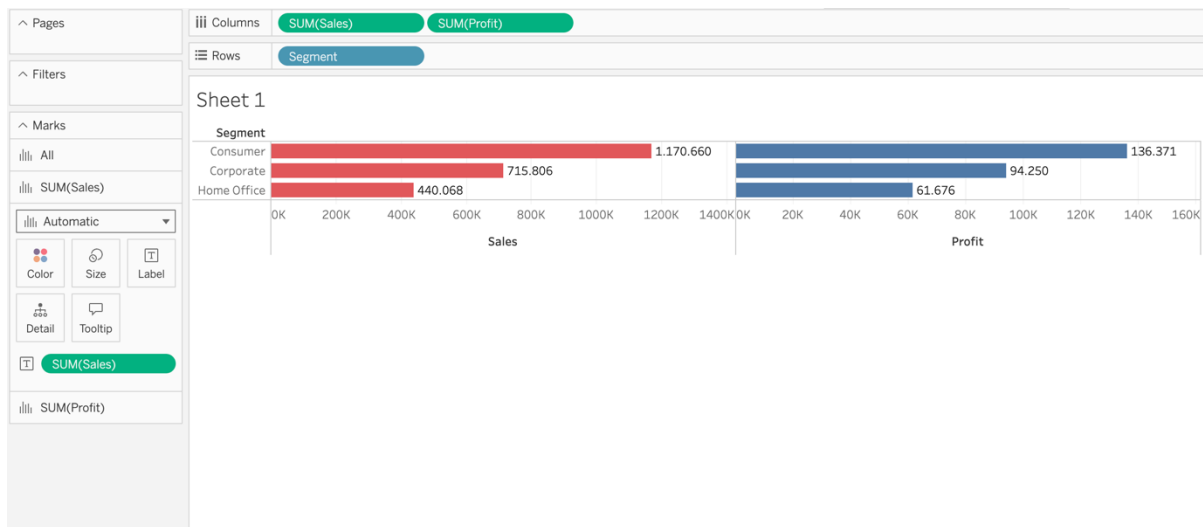
☐ When workbook opens

Add values from ▼

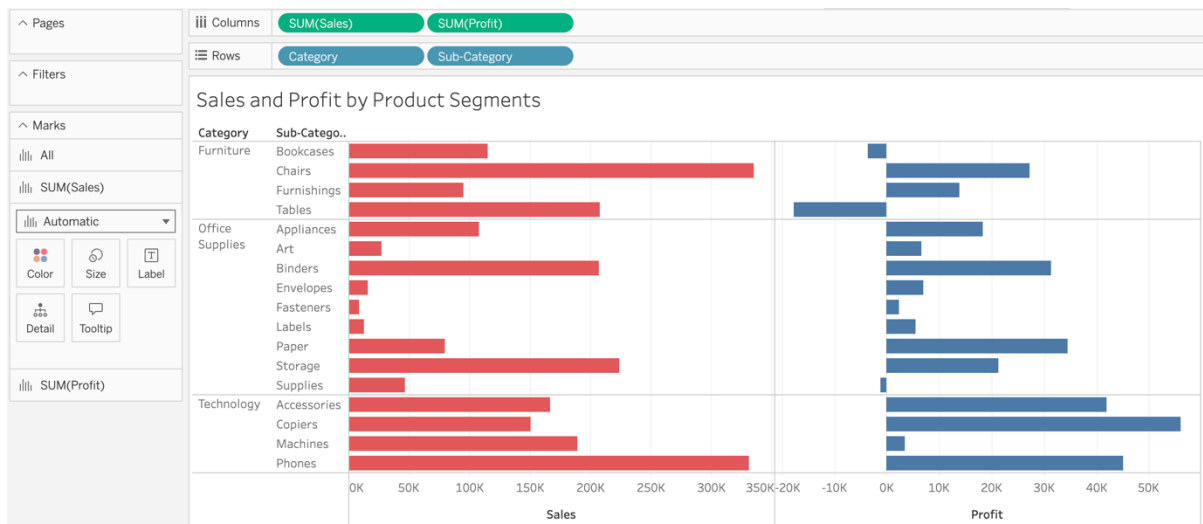
This parameter defines sales rates greater than 1000 as 'High', sales between 500 and 1000 as 'Medium' and sales below 500 as 'Low'.

Visual Elements

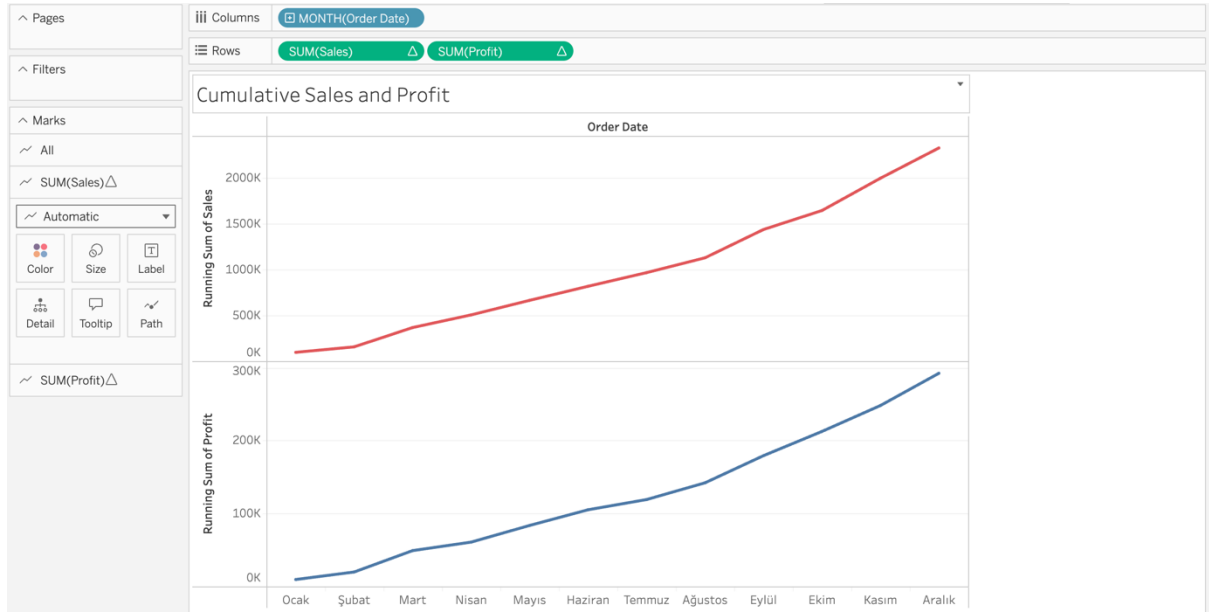
Sales and Profit by Customer Segments: It shows total sales and profit of each customer segment. Sales and profits are identified as label.



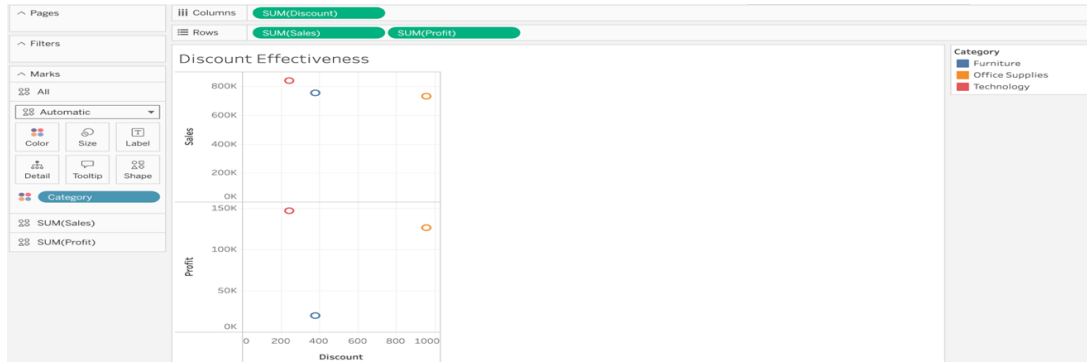
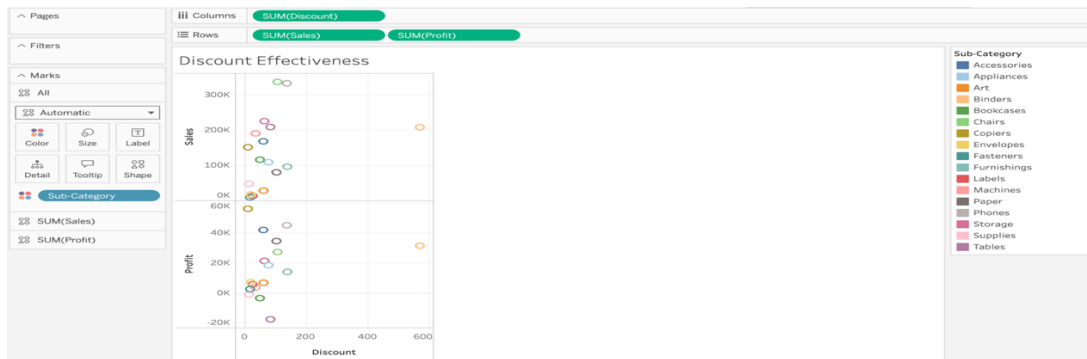
Sales and Profit by Product Segments: It shows both category and sub-category by sales and profit. It helps us to understand the volume of categories and subcategories. Here, it has been observed that some sub-categories are losing money. The products in these categories can be examined and which products have low profitability can be examined and action can be taken to increase the company's performance.



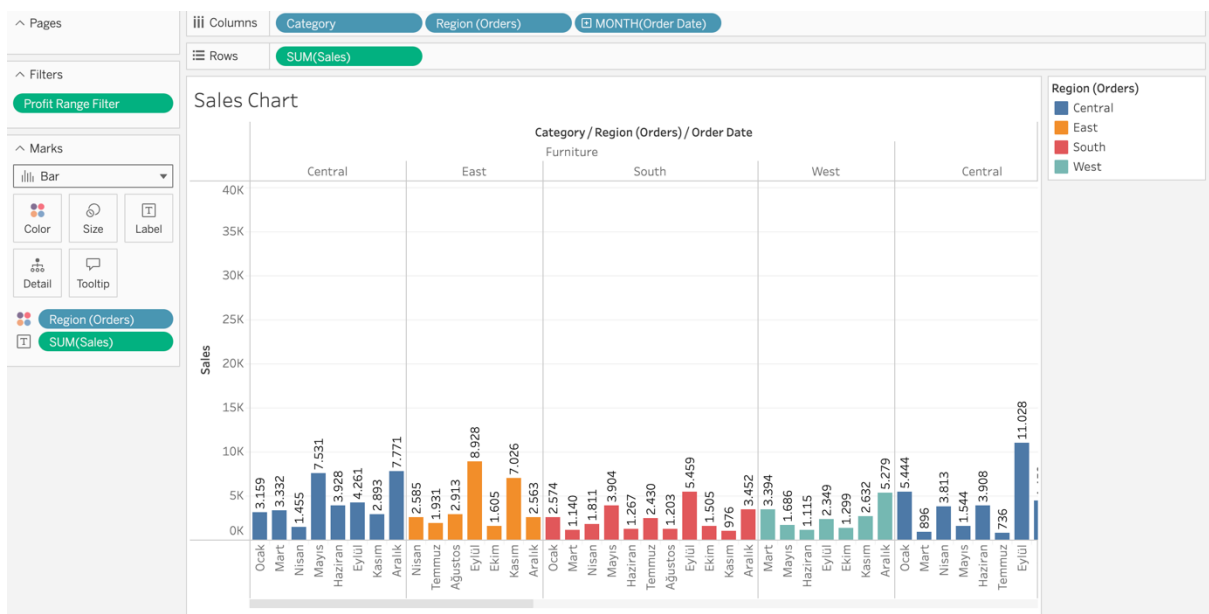
Cumulative Sales and Profit: Shows the trend line of total sales and profitability over time. By analyzing the slopes, it is observed what kind of transitions occur in which periods.



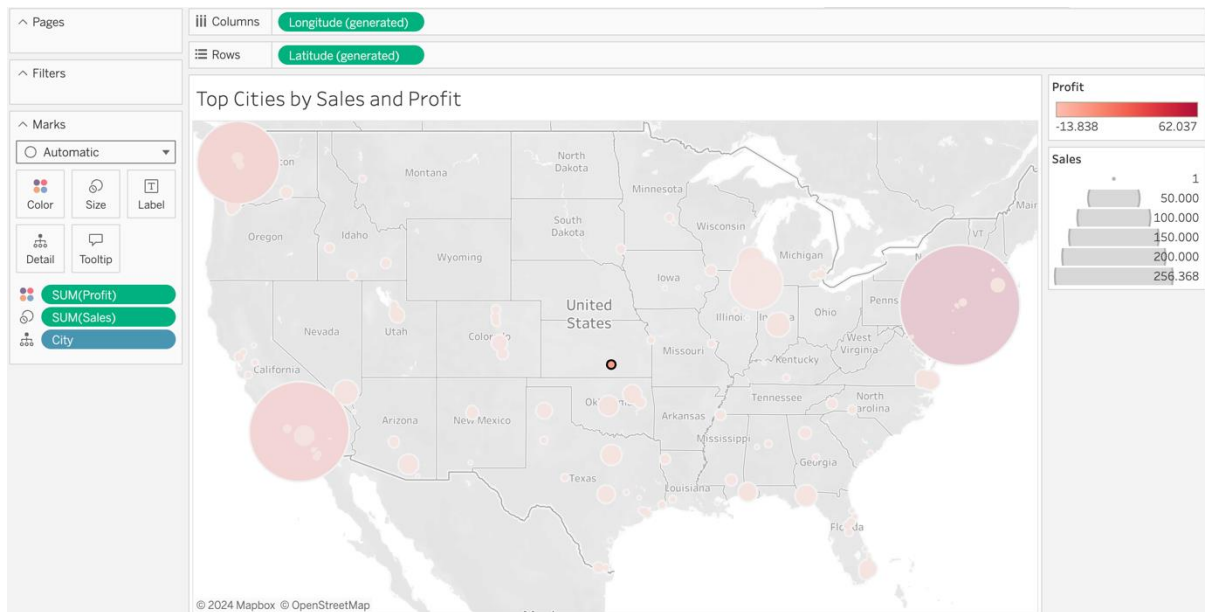
Discount Effectiveness: The aim is to show the relationship between discounts and sales. Here, it was observed that the technology category sold products at minimum discount rate but maximum profit. In the Furniture category, although the products were sold, the profit rate dropped significantly.



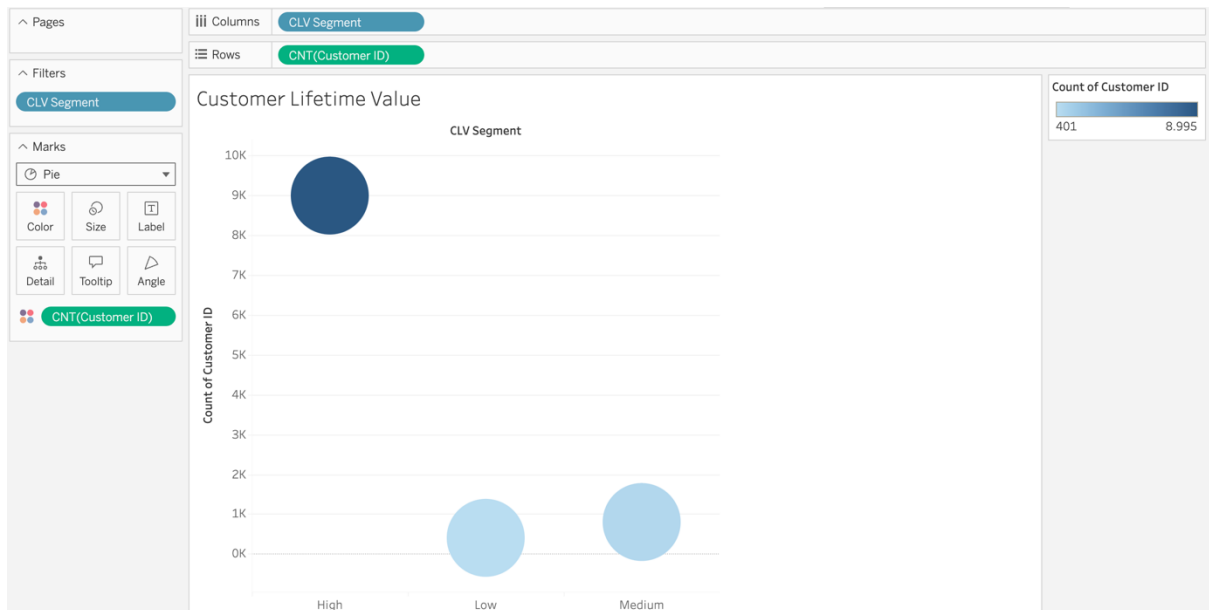
Sales Chart by Category: It shows how much sales were made in which regions for each month. Profit range margin is applied here as filter.



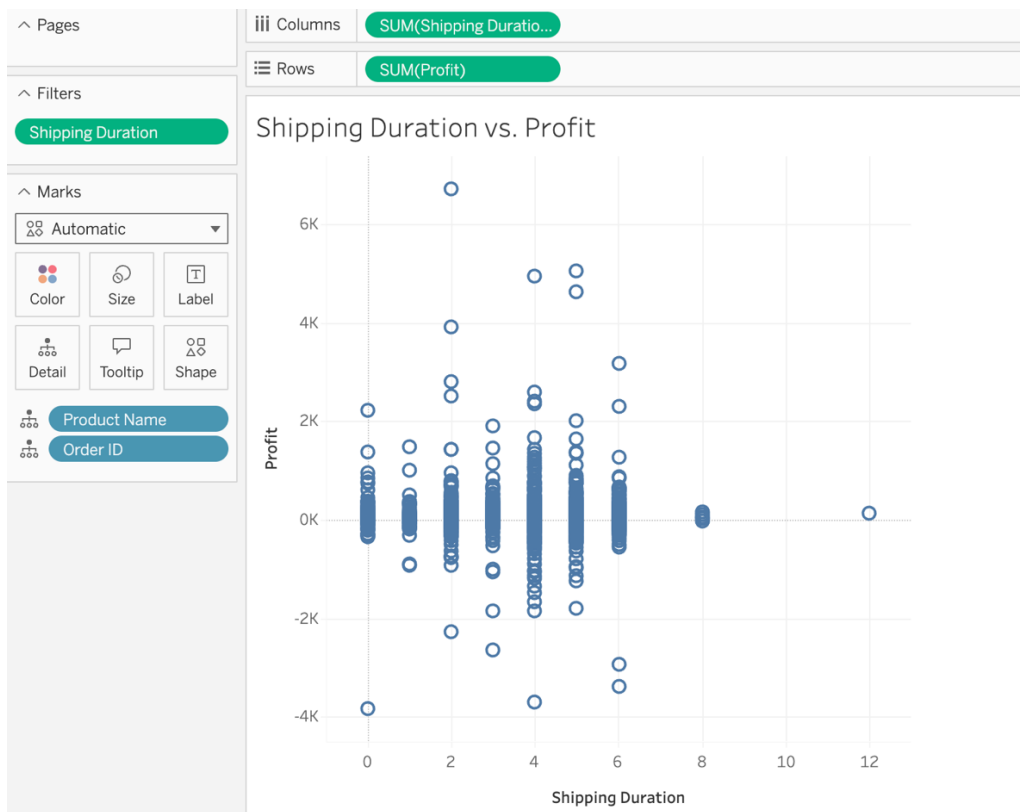
Top Cities by Sales and Profit: The regions with the highest sales are shown on the map.



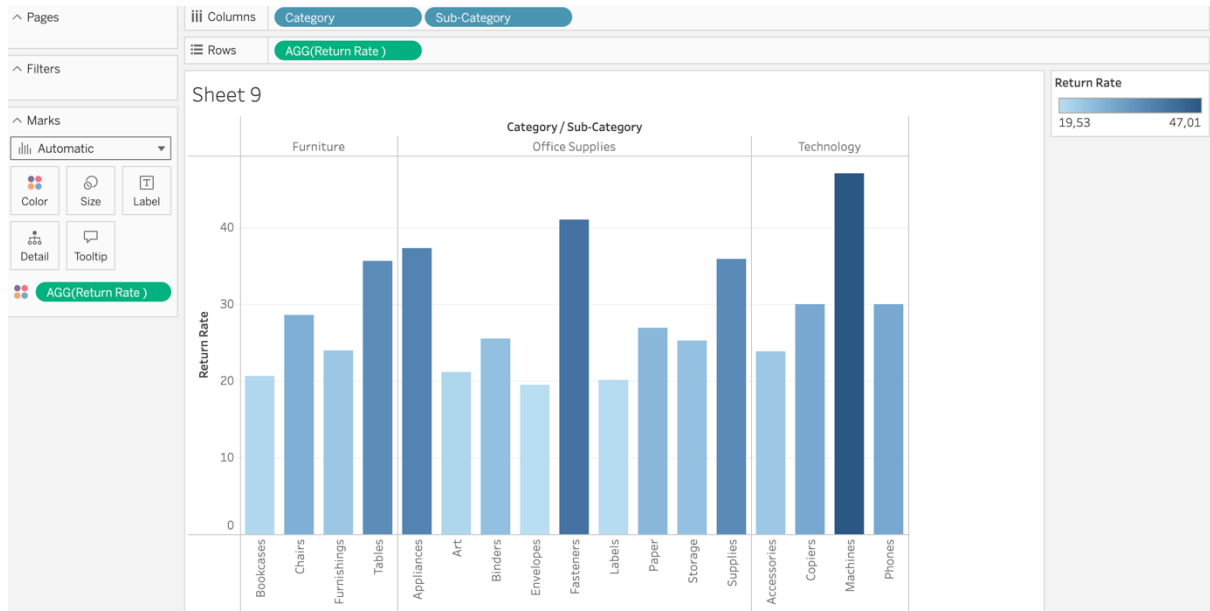
Customer Lifetime value: The graph of customer numbers was observed by applying the CLV filter. It is observed that the number of customers who make high sales is much higher than those who make low sales. It is observed that the number of low and average earning customers is low. When making a marketing strategy, the large number of customers who bring the most profit requires making marketing strategies focused on these customers. In this way, the company's profit rate will increase even more.



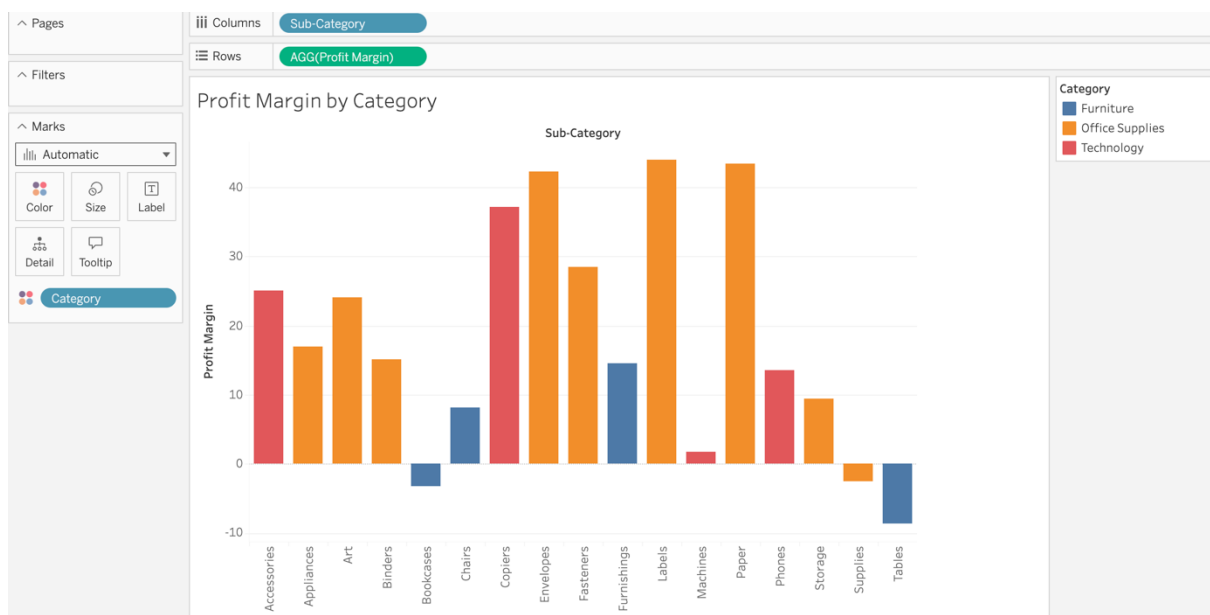
Shipping Duration vs Profit: This chart shows in detail which product arrives on which order date and the profit ratio it brings.



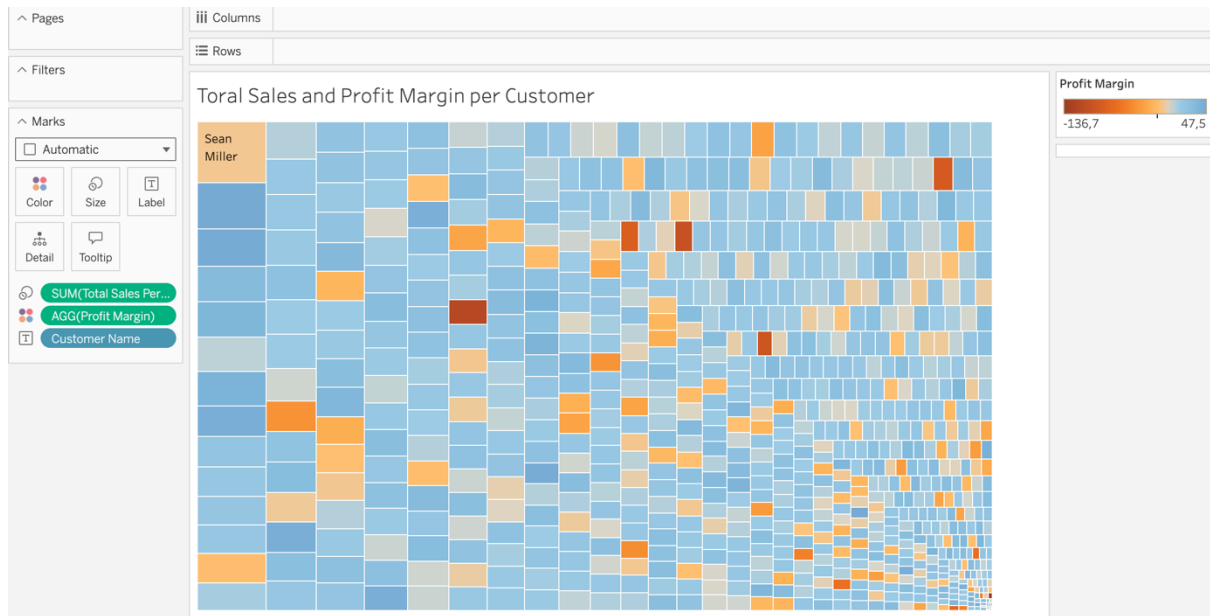
Return Rate by Category: This chart shows which sub-category and category the products are returned at what percentage. Product groups with large quantities can be reduced to product details and improvements can be made by making inferences.



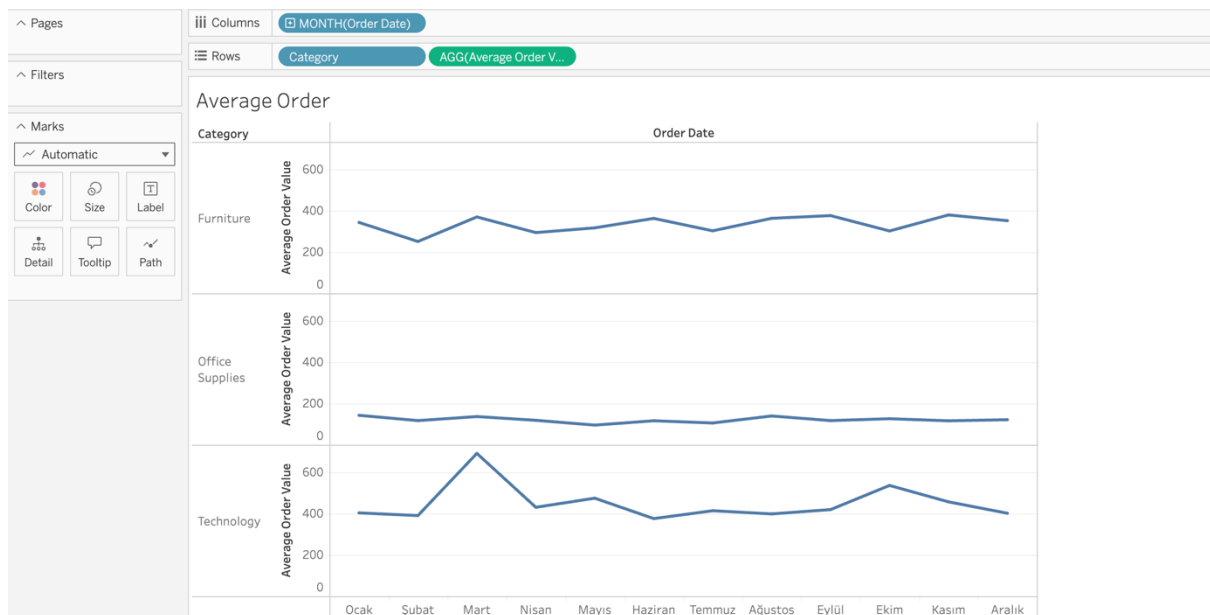
Profit Margin by Category: The chart shows the average profit for which products are sold on a sub-category basis. It has been observed that the profit rates of some sub-categories are below zero or very low.



Total Sales and Profit Margin per Customer: Total sales and profit margin for each customer are shown in the heat map.



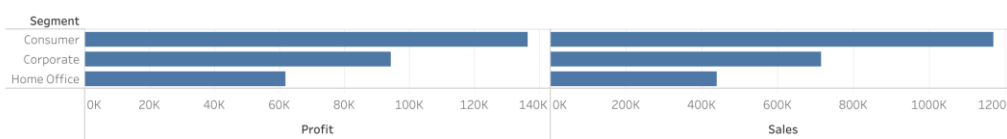
Average Order Value by Category: Shows the average order value of the categories on a monthly basis.



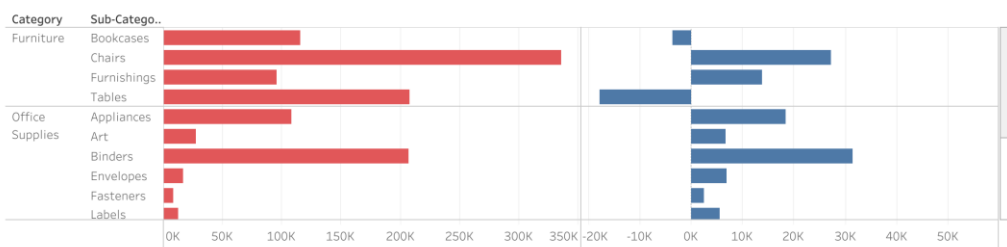
Dashboards:

This first dashboard shows visualizations based on sales and profitability. While the first table provides visualizations divided into categories, sub-categories can also be observed in the table below. In the second table, it is observed that sub-categories such as tables and bookcases do not bring profit, on the contrary, they make losses. The graph below shows the monthly cumulative sales and profit curve depending on the order times. It is designed to observe seasonal monthly changes. In the graph on the right, it is aimed to investigate the effect of the discount rate on sales and profitability. The category that brings a lot of profit with a small discount is the technology category. Although the sales of the furniture category are high, the same cannot be seen for profitability.

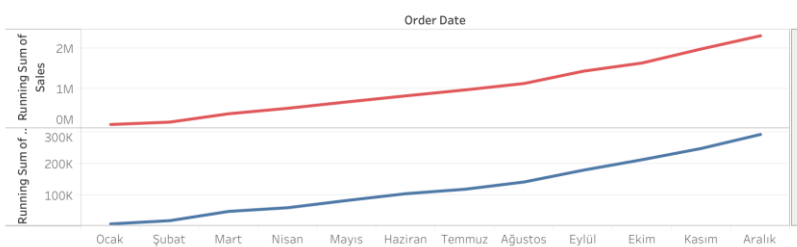
Sales and Profit by Customer Segments



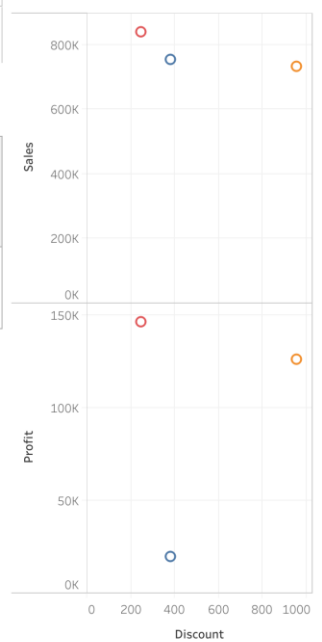
Sales and Profit by Product Segments



Cumulative Sales and Profit

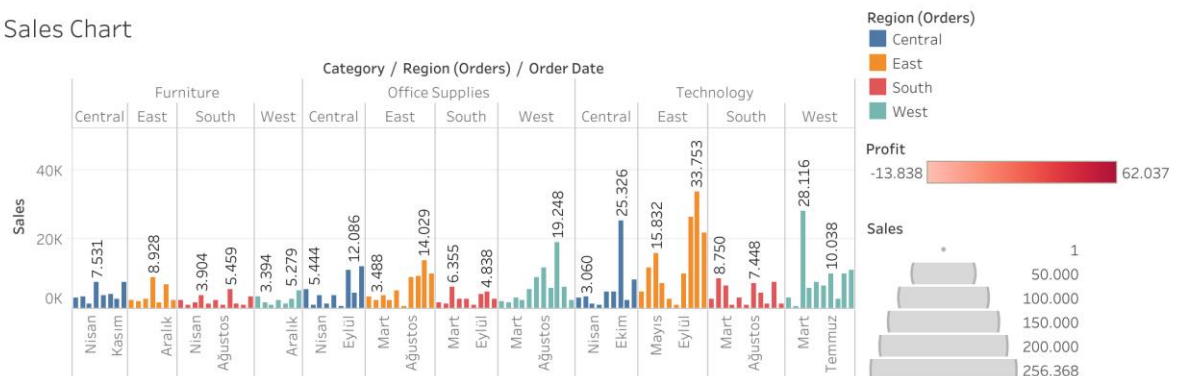


Discount Effectiveness

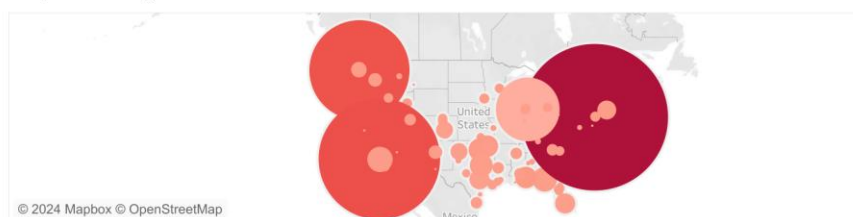


The first two tables in the second dashboard are investigated based on region. In the first table, the changes in monthly sales on a regional basis are observed on a categorical basis. In this way, it is possible to observe what kind of sales are in which categories in which months. In addition, by entering the categories, it is possible to observe which products are seasonal products. The graph below shows how much sales and profitability there are in which cities in the American region. It can also be observed numerically with the numerical profitability information on the right side. The graph below investigates how shipping duration affects profitability. In this way, it can be observed where inventory optimization is needed. The graph on the right side has a filter. The graph has a CLV depending on how much money each customer makes the company. Here, a large number of customers bring very high profits, while a very small minority bring little profit. In addition, the CLV segment can be determined thanks to the filtering.

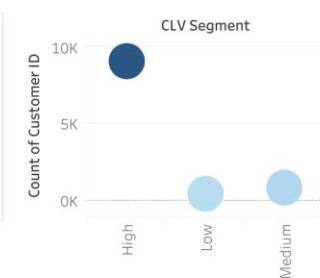
Sales Chart



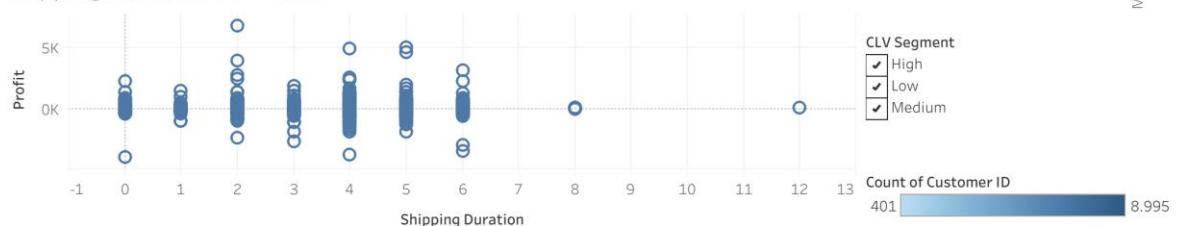
Top Cities by Sales and Profit



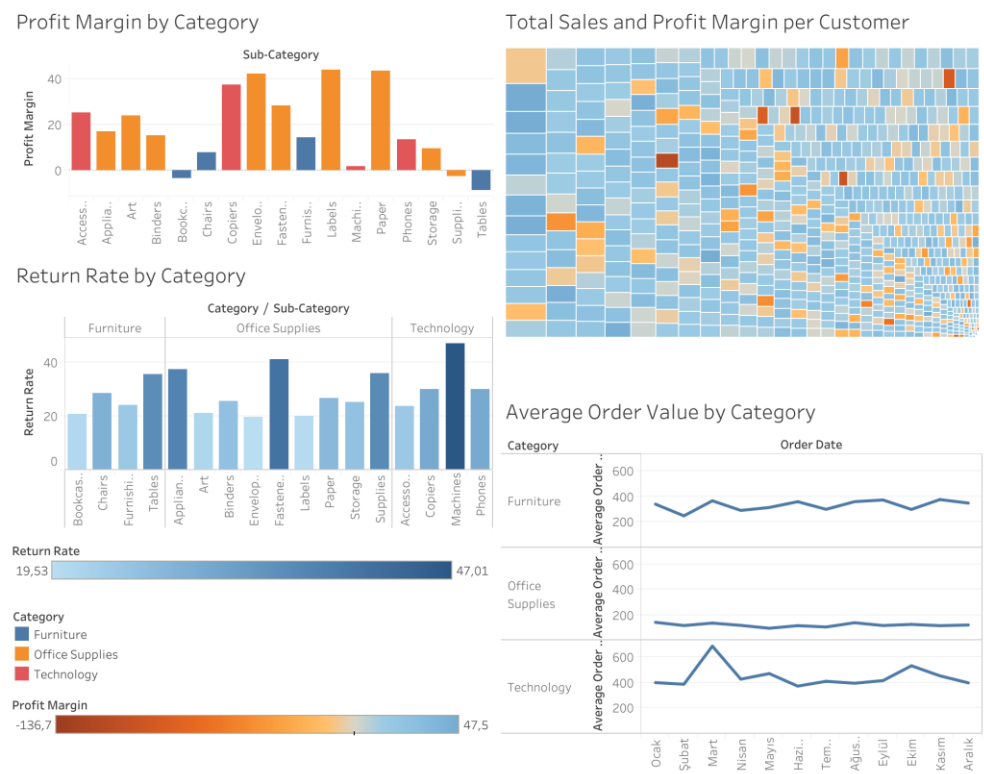
Customer Lifetime Value



Shipping Duration vs. Profit



The last dashboard is observed below. In the upper left table, the profitability of the company can be observed on a sub-category basis. We can observe that some sub-categories are losing money. The graph just below shows the rate of return of the products sold in the categories and sub-categories. We can find the numerical values corresponding to these bars below. In the upper right table, it can be observed how much sales and profit each customer makes. Their sizes are their total sales, and their colors are their profitability. In the table, their sizes are their total purchases, and the rate of profitability of the same customer is understood from the lower left graph. The lower right graph is the average price of the products of the monthly categories.



Discussion

To sum up, apart from these tables, there are many improvements that can be made to this dataset. One of these is inventory turnover analysis. It can be shown with a bar or line chart. This chart allows us to approach how fast products are sold. If used in region-based visualization, it is very effective for inventory management. $\text{Inventory Turnover} = \text{SUM}([\text{COGS}]) / \text{AVG}([\text{Inventory}])$ In this way, it calculates the inventory turnover rate by comparing costs with the inventory amount. It shows how long it takes for stocks to be depleted. Researching the relationship between sales realized during the year and targeted sales tells us to what extent the company's performance is going as desired. Target analysis using bullet charts can be included in future studies. Calculating ROI (return of investment), which is an effective key element especially in digital marketing, also allows to see the return on investment. It shows which project is profitable and which project investment should be removed. It examines the relationship between the investment and profitability and can be shown with a bar chart.

Some problems have been identified in the dataset. For example, it has been analyzed that some sub-categories sell products with negative values. This is a situation that harms performance. It should be analyzed on a product basis and action should be taken to increase performance. In fact, products that lose money in the returns of investments can be identified and improvements can be made on these products. When focusing on customer segmentation, optimizing the habits of high-profit customers instead of low-profit customers is another step that can increase company performance. Another important risk is inventory optimization. Mismanagement of stocks and incorrect determination of demanded products negatively affect storage costs and cash flow. At this point, evaluating high-turnover products in the foreground would be more effective in inventory management. Another risk is incorrect examination of conversion rates. Low conversion rates indicate that potential customers cannot be effectively converted into sales. By analyzing the stages where conversion rates are low, it can be determined at which stages customer loss occurs. This may mean that the investment made in potential customers is wasted and if improvements are not made on these stages, it may lead to loss of income.

References

- Dewi, N.L.P.T.K., Nilawati, N.K.U. & Anandita, I.B.G., 2024. Visual analysis of marketplace sales data for strategic decision making using Tableau. *TECHNOVATE: Journal of Information Technology and Strategic Innovation Management*, 1(3), pp.156-169.
- Hoelscher, J. & Mortimer, A., 2018. Using Tableau to visualize data and drive decision-making. *Journal of Accounting Education*, 44, pp.49-59.
- Jena, B., 2019. An approach for forecast prediction in data analytics field by Tableau Software. *International Journal of Information Engineering & Electronic Business*, 11(1).
- Loth, A., 2019. Visual analytics with Tableau. John Wiley & Sons.
- Meyer, B.C. & Bishop, D.S., 2022. A lesson in Tableau dashboard design: Playing the beer game with a real-time data connection. *Decision Sciences Journal of Innovative Education*, 20(4), pp.212-223.
- Milligan, J.N. & Guillevin, T., 2018. *Tableau 10 complete reference: Transform your business with rich data visualizations and interactive dashboards with Tableau 10*. Packt Publishing Ltd.
- Murray, D.G., 2013. *Tableau your data!: Fast and easy visual analysis with Tableau software*. John Wiley & Sons.