

Data-Driven Innovations in Supply Chain Management with Qlik Insights

Project by: **Kshitij Tiwari**

Acknowledgement: I would like to thank the entire team of SmartBridge and Qlik for giving me this opportunity to learn Business Analytics under their guidance. Thankyou.

Problem Statement

The project aims to revolutionize supply chain management through data-driven insights using Qlik Sense. By leveraging advanced analytics, it seeks to optimize logistics, forecasting, and inventory management, thereby enhancing operational efficiency and responsiveness. This includes improving transportation routes, reducing lead times, and implementing real-time tracking and monitoring solutions.

Business Requirements

1. Operational Efficiency:

- Improve the efficiency of the supply chain by optimizing logistics, reducing lead times, and ensuring timely deliveries.
- Implement real-time tracking and monitoring of goods.

2. Forecasting and Inventory Management:

- Enhance forecasting accuracy to match supply with demand better.
- Optimize inventory levels to reduce costs and avoid stockouts or overstock situations.

3. Data Integration:

- Aggregate and centralize data from diverse supply chain sources for comprehensive analysis.
- Ensure data consistency and accuracy for reliable insights.

4. Advanced Analytics:

- Utilize Qlik Sense's advanced analytics capabilities to identify patterns and insights from historical data.
- Implement real-time analytics to facilitate quick decision-making in response to changes in demand or unforeseen events.

5. Visualization and Dashboards:

- Create intuitive and dynamic dashboards that provide clear insights into the supply chain ecosystem.
- Enable stakeholders to access easily and interact with the data.

Literature Survey

To provide a robust foundation for this project, we review recent research on data-driven supply chain management. Below are summaries of key findings from relevant research papers:

Research Paper: "Real-Time Supply Chain Management: An Overview"

Source: Journal of Business Logistics, 2017.

Key Findings:

- Real-time data analytics allows companies to respond quickly to disruptions and changes in the supply chain.
- Enhancements in technology, such as IoT and AI, have made real-time tracking and monitoring more accessible.
- Implementing real-time analytics leads to a reduction in lead times and improved customer satisfaction.

Research Paper: "The Impact of Predictive Analytics on Supply Chain Performance"

Source: Supply Chain Management Review, 2018.

Key Findings:

- Predictive analytics helps in anticipating market trends and customer behavior, enabling proactive decision-making.
- Companies using predictive analytics have reported a 15% improvement in forecast accuracy and a 30% reduction in stockouts.

Research Paper: "The Role of Big Data Analytics in Supply Chain Management"

Source: International Journal of Production Economics, 2016.

Key Findings:

- Big Data Analytics (BDA) significantly improves decision-making capabilities in supply chain management.
- BDA helps in predicting demand more accurately, optimizing inventory levels, and improving overall supply chain visibility.
- Case studies indicate that companies adopting BDA in supply chain management have seen a reduction in operational costs by up to 20% and an increase in efficiency by 25%.

Social or Business Impact

1. Social Impact:

- **Efficient Resource Distribution:** Enhanced supply chain management ensures timely delivery of essential goods, such as medical supplies and food, especially in emergencies.
- **Environmental Benefits:** Optimizing transportation routes and reducing lead times can lead to lower fuel consumption and reduced carbon emissions.
- **Improved Accessibility:** By streamlining logistics, products can be made more accessible to remote areas, improving the quality of life.

2. Business Impact:

- **Cost Reduction:** By optimizing inventory levels and logistics, companies can significantly reduce operational costs.
- **Increased Revenue:** Better demand forecasting and timely delivery lead to improved customer satisfaction and potentially higher sales.
- **Competitive Advantage:** Companies that leverage advanced analytics can gain a competitive edge by being more responsive to market changes and customer needs.

Sector-Specific Impacts:

- **Banking:** Efficient supply chains can lead to cost savings in cash handling and distribution.
- **Telecommunications:** Improved logistics for equipment and materials can enhance service delivery.
- **E-commerce:** Streamlined supply chains can improve delivery times, reducing customer churn and boosting sales.

Data Collection

- Type: Type Count
- Days for shipping (real): Product shipment days
- Days for shipment (scheduled): product getting prepared for shipment
- Benefit per item: profit earned per product
- Sales per customer: No of products purchased by the customer
- Delivery: Products delivery date.
- Late_delivery_risk: percentage of late delivery risk
- Category Id: product category ID
- Category: product category
- Customer City: Customer purchase city
- Customer Country: Customer purchase country
- Customer Email: Customer purchase Email
- Customer Fname: Customer First name.
- Customer ID: Customer order ID
- Customer Lname: Customer's last name
- Customer Segment: Types of Customer
- Customer State: Customer order state
- Customer Street: Customer address
- Customer Zipcode: Customer area code.
- Market: top 10 country Market
- Order City: Customer purchase city
- Order Country: Customer purchase country
- Order Customer ID: Customer
- order date (DateOrders): Customer order date
- Order Item Product Price: product price
- Order Item Profit Ratio: profit ratio
- Order Item Quantity: No of orders placed
- Sales: total no of sales
- Order Item Total: total price of the order placed
- Order Profit Per: product
- Order Region: order placed region
- Order State: order placed State
- Order Status: order delivery status
- Order Zipcode: customer area code
- Product Card ID: product number
- Product Category Id: a product whose category belongs to
- Product: what product

- Product Image: image of the product
- Product Price: Price of the product.

Data Source: The dataset for this project was sourced from Kaggle. The dataset, named "DataCoSupplyChain," contains various attributes related to order and customer details, shipping information, and product categories.

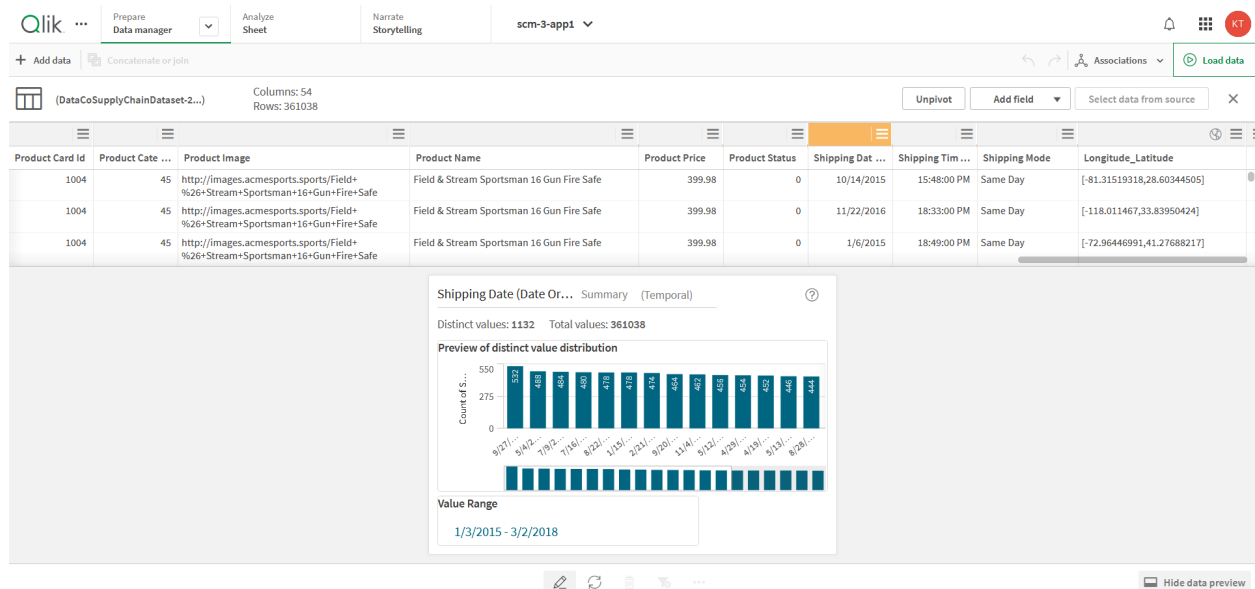
<https://www.kaggle.com/datasets/shashwatwork/dataco-smart-supply-chain-for-big-data-analysis>

Data Preparation

Data Cleaning and Transformation:

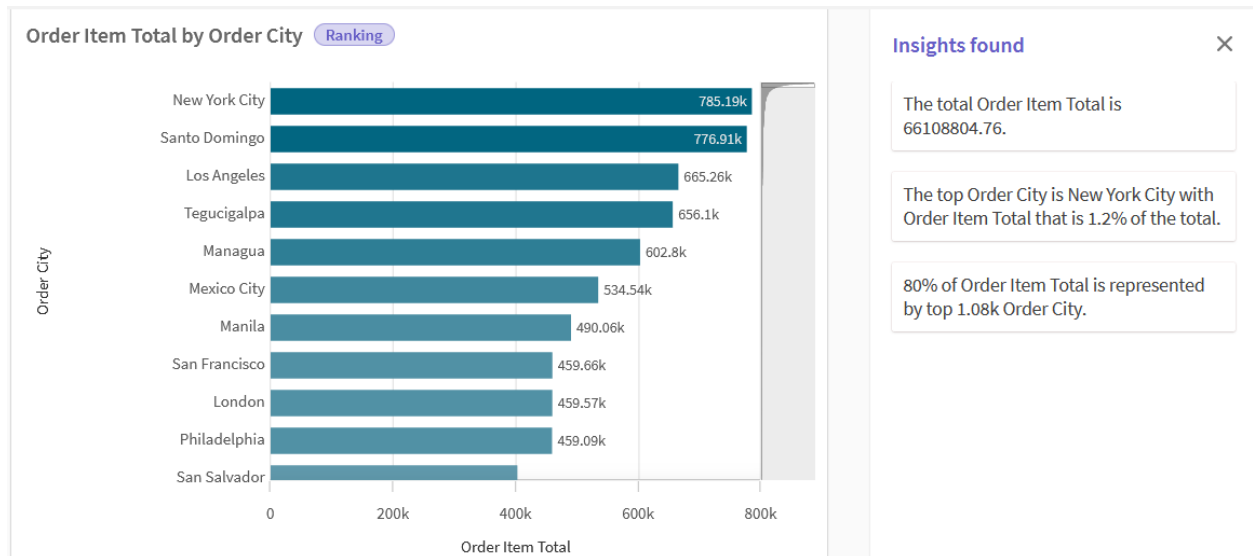
Splitting Shipping Date and Time:

1. The original dataset had shipping dates combined with times. To split them into separate columns, I used the preprocessing in Qlik Sense.
2. Same was the case with Order Time and Date column.

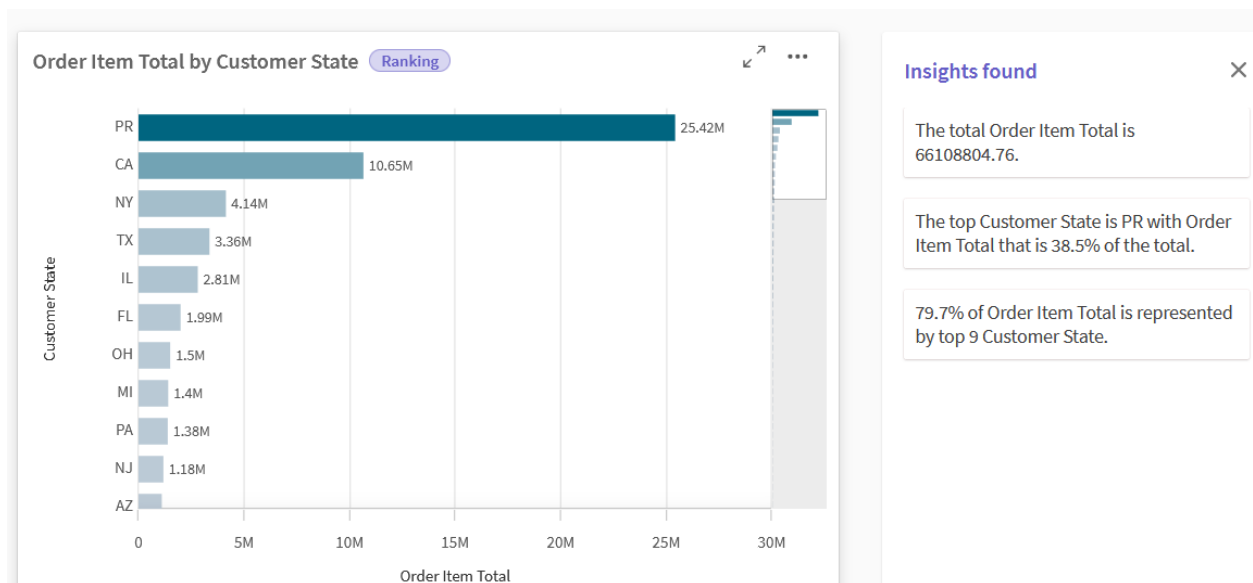


3. Then, I Identify missing values and treat them. I impute missing values for numerical columns using the mean and impute missing values for categorical columns with mode or a specific value.
4. Then, I convert fields to their correct datatypes

Data Visualization

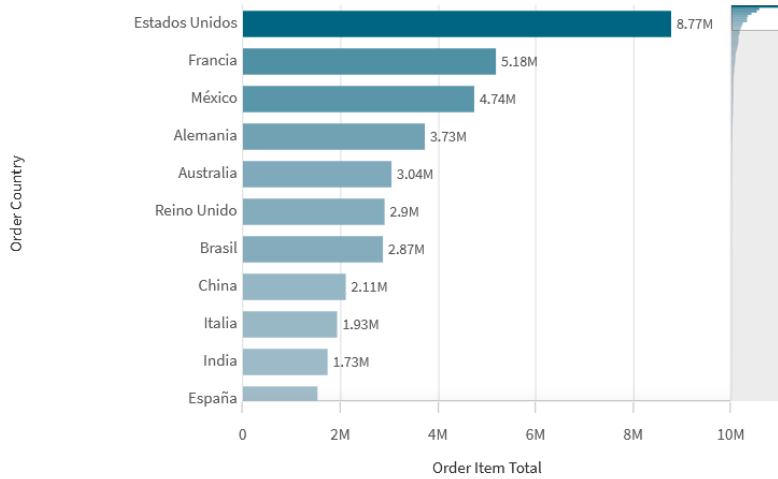


This shows the count of total order items according to their order cities.



This shows the count of total order items based on Customer States.

Order Item Total by Order Country Ranking



Insights found

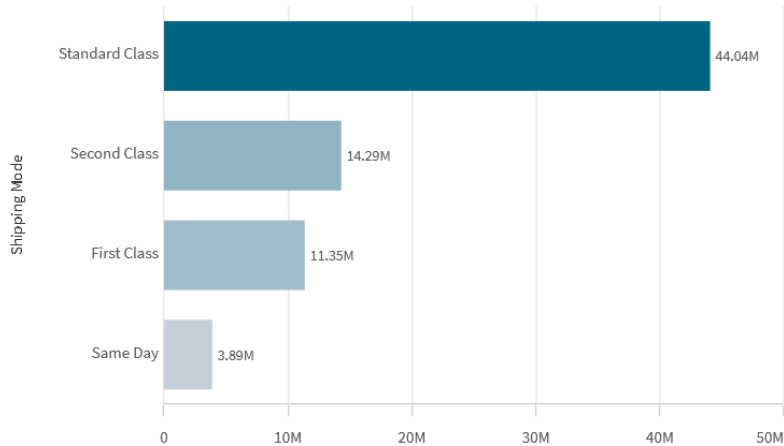
The total Order Item Total is 66108804.76.

The top Order Country is Estados Unidos with Order Item Total that is 13.3% of the total.

80% of Order Item Total is represented by top 25 Order Country.

This shows the total order items according to Country.

Sales by Shipping Mode Ranking



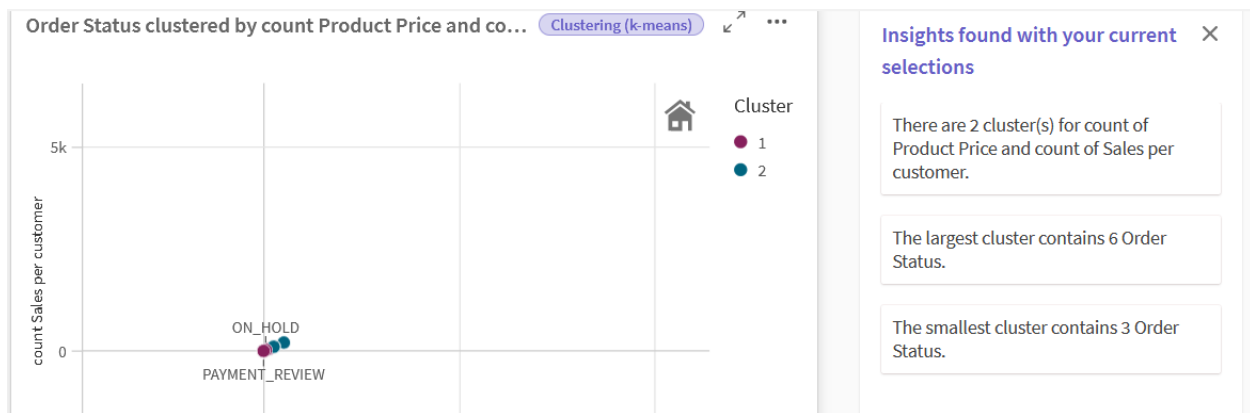
Insights found

The total Sales is 73.57M.

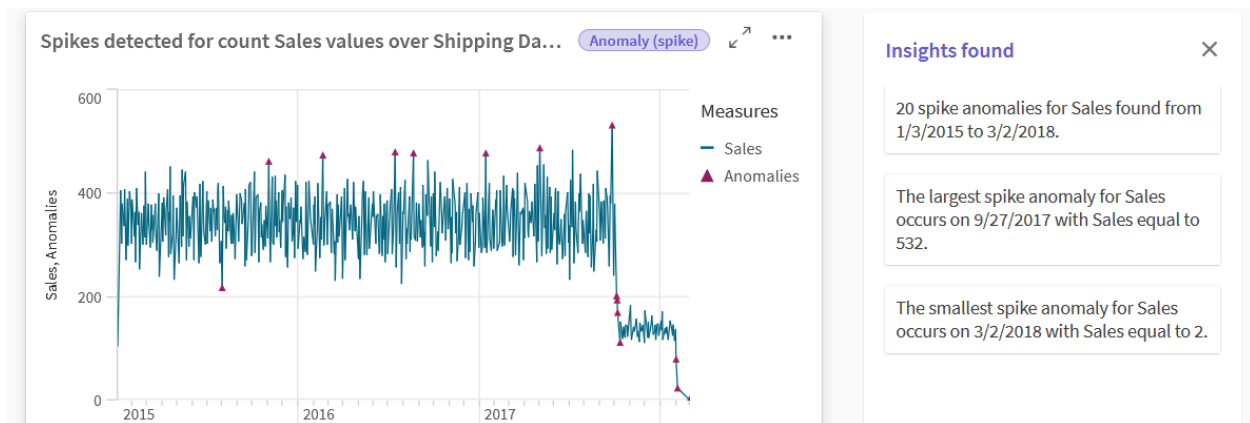
The top Shipping Mode is Standard Class with Sales that is 59.9% of the total.

79.3% of Sales is represented by top 2 Shipping Mode.

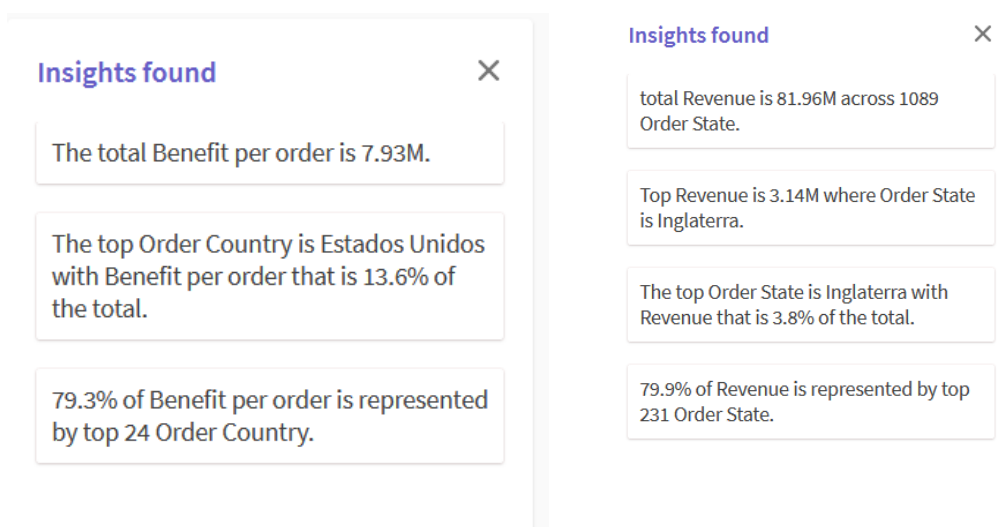
This shows the sales as per various shipping modes.

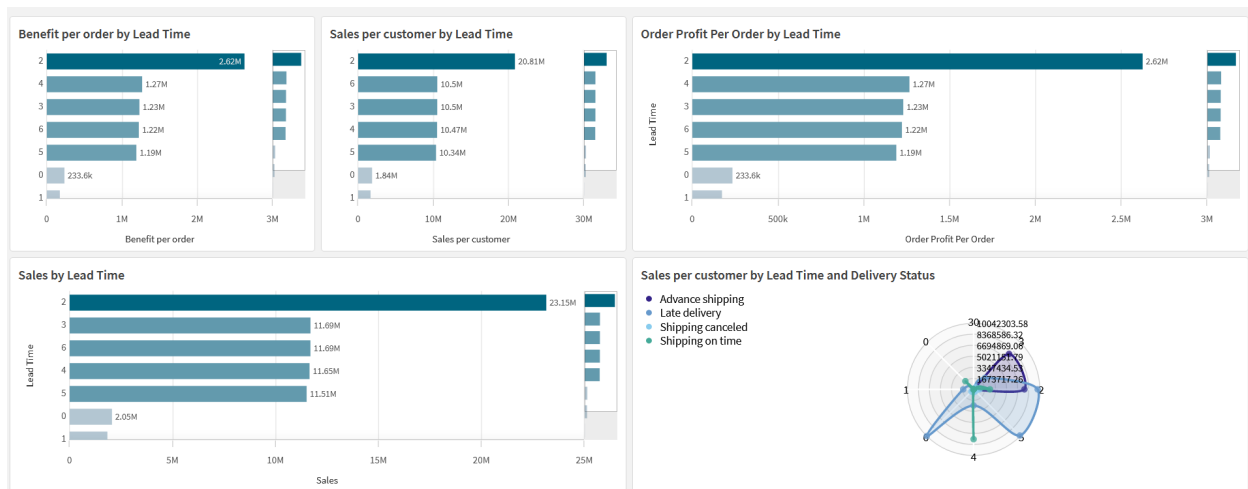


It clusters data based on price and sales per customer.



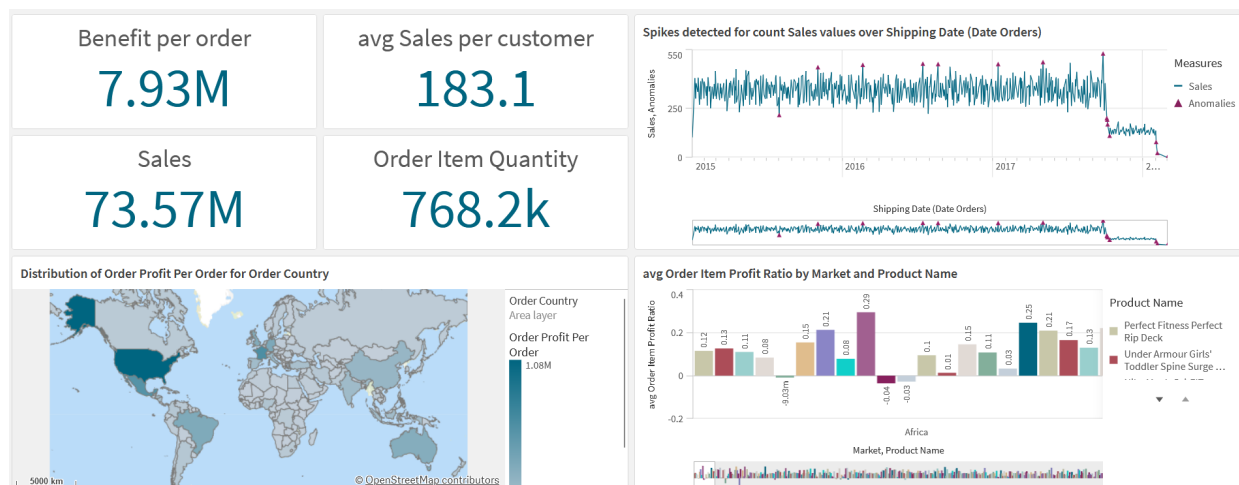
Largest sales occurred on 9/27/2017 with 532 sales.





Designing the Dashboard

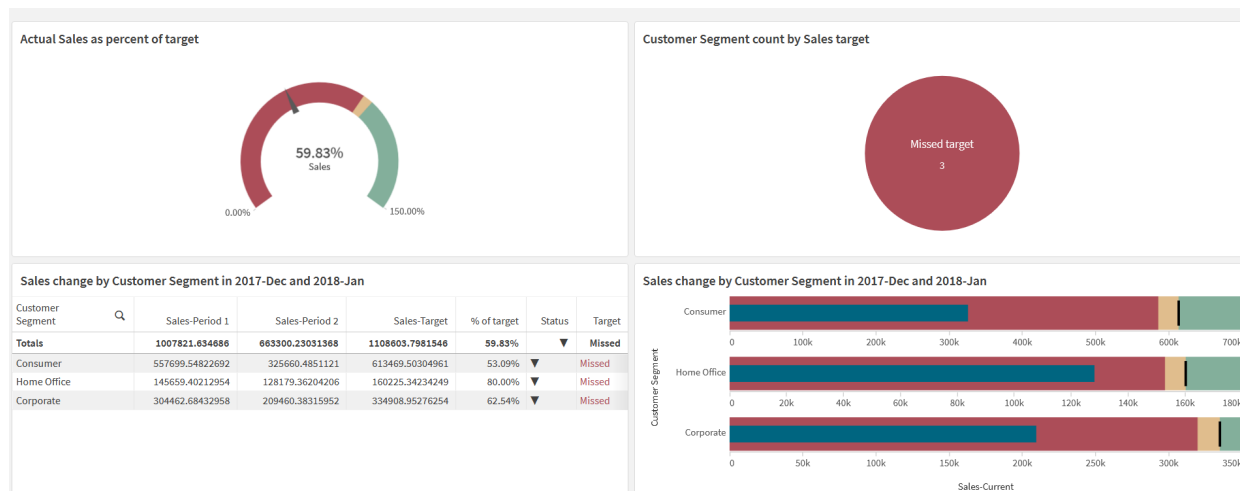
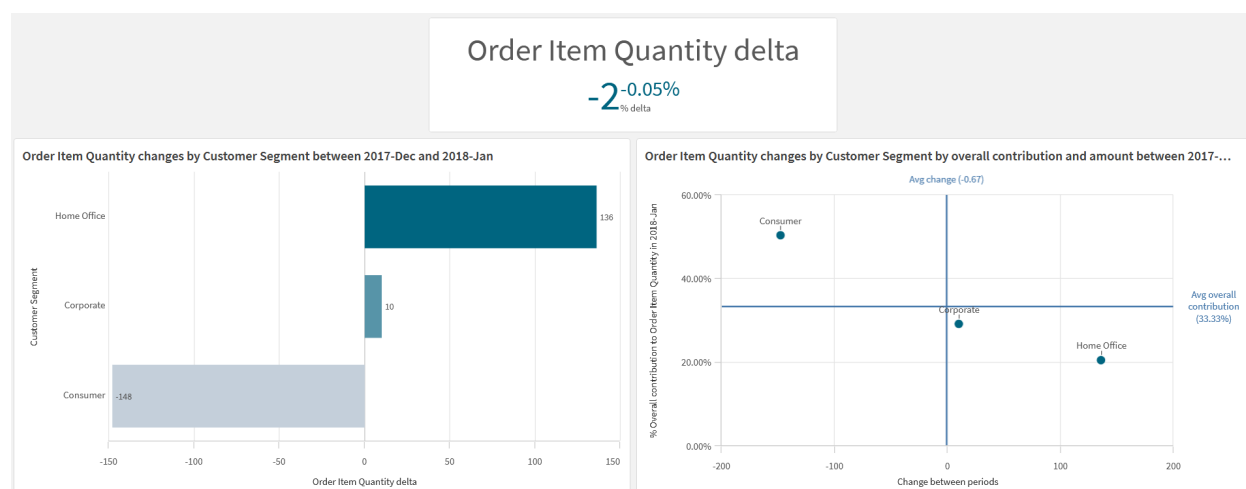
- **Sales Over Time:**
 - Dimensions: Order Date (DateOrders)
 - Measures: Sales
- **Profit by Product Category:**
 - Dimensions: Category
 - Measures: Benefit per item
- **Shipping Performance:**
 - Dimensions: Order Region, Order State
 - Measures: Late_delivery_risk
- **Customer Segmentation:**
 - Dimensions: Customer Segment
 - Measures: Sales per customer
- **Market Analysis:**
 - Dimensions: Market
 - Measures: Sales

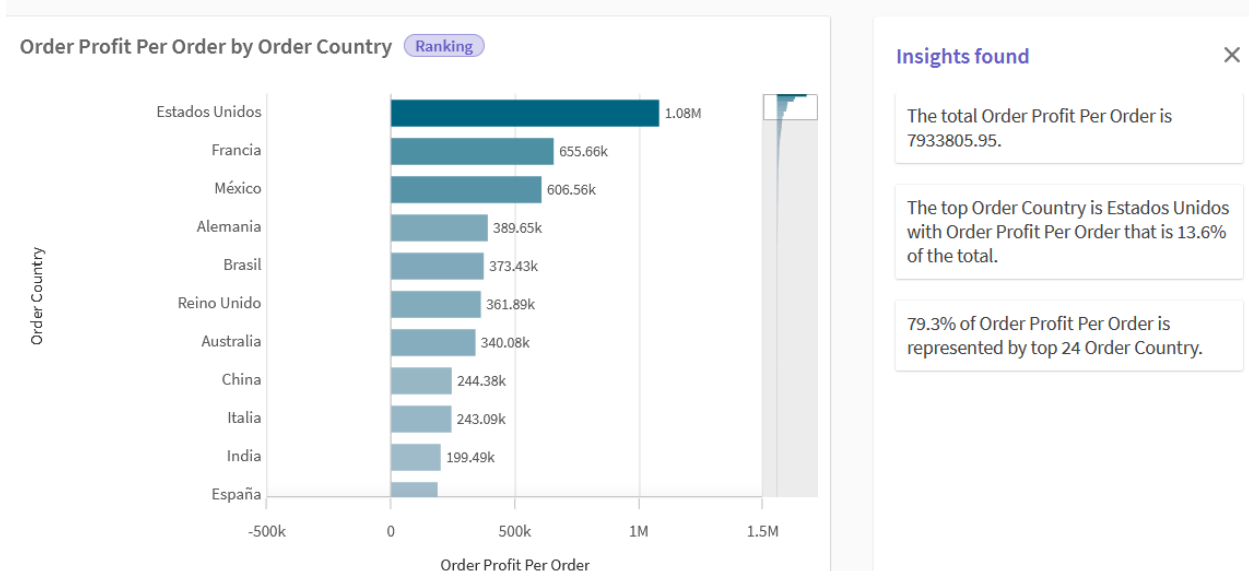
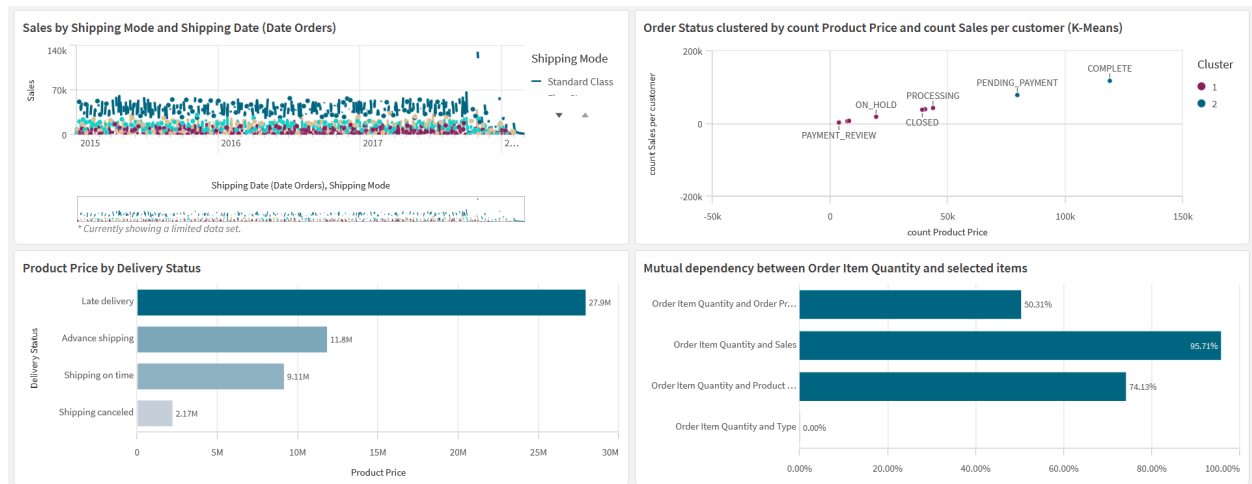
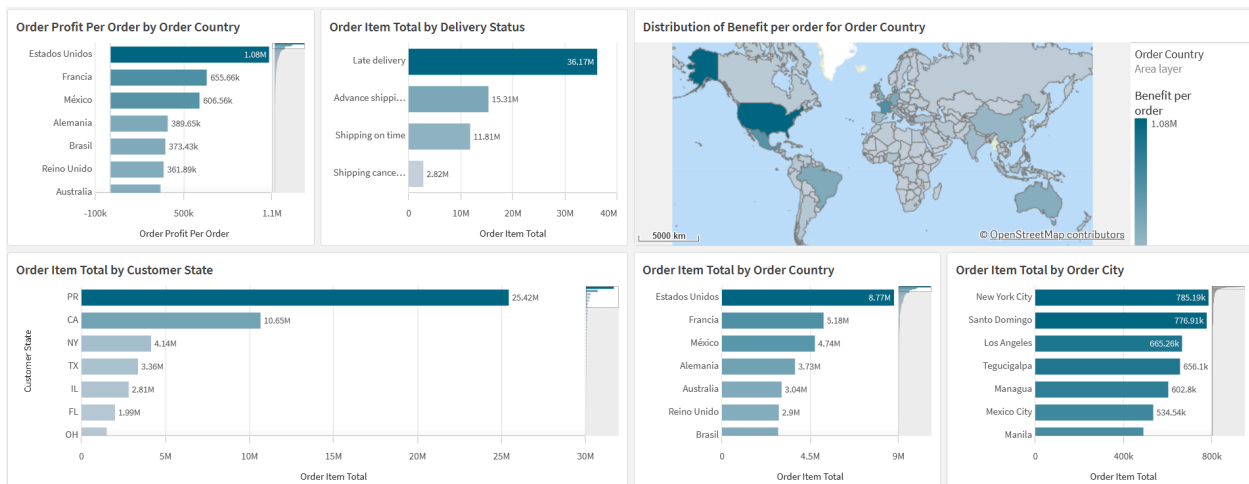


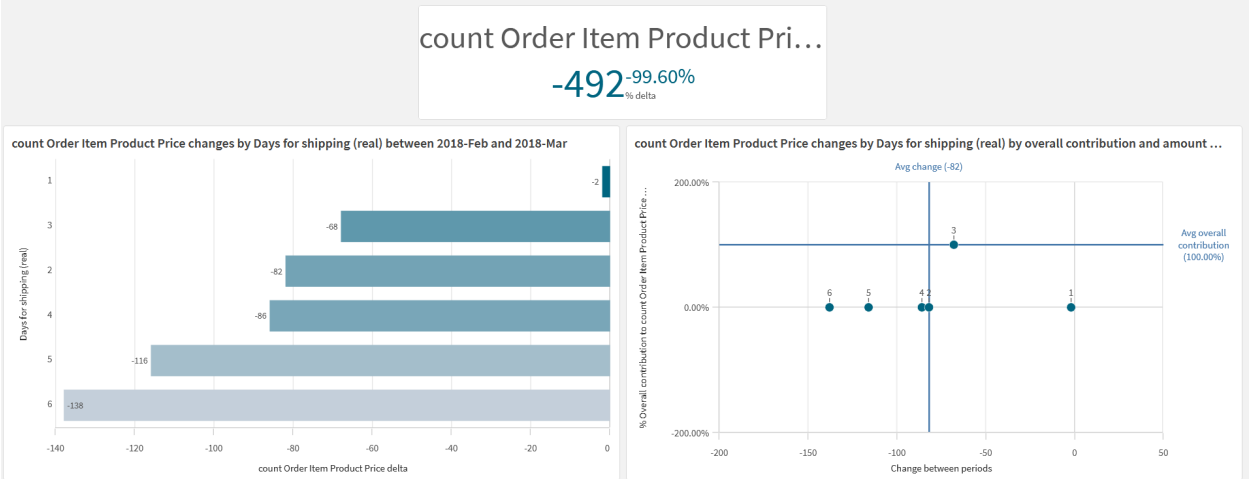
Distribution of Order Profit Per Order for Order Country

Spikes detected for count Sales values over Shipping Date (Date Orders)

avg Order Item Profit Ratio by Market and Product Name







Number of Unique Vizualizations: 22

Story

In today's fast-paced business environment, efficient supply chain management is crucial for maintaining competitive advantage. This project leverages Qlik Sense to transform our supply chain operations through advanced data analytics. By analyzing logistics, forecasting, and inventory management, we aim to enhance operational efficiency and responsiveness, ensuring timely delivery and customer satisfaction.

Amount of Data Loaded

(DataCoSupplyChainDataset-2...)

Fields: 54

Type	Days for shi...	Days for shi...	Benefit per ...	Sales per cu...	Delivery Status	Late_deliver...	Category Id	Category Name	Customer City	Customer C...	Customer E...	Customer Ph...
CASH	0	0	-1088.95	395.98	Shipping on time	0	45	Fishing	Winter Park	EU	XXXXXXXXXX	Helen
CASH	0	0	-854.96	379.98	Shipping on time	0	45	Fishing	Buena Park	EU	XXXXXXXXXX	Dylan
CASH	0	0	-652.77	383.98	Shipping on time	0	45	Fishing	West Haven	EU	XXXXXXXXXX	Samantha
CASH	0	0	-595.17	383.98	Shipping on time	0	45	Fishing	Princeton	EU	XXXXXXXXXX	Sarah
CASH	0	0	-594.97	339.98	Shipping on time	0	45	Fishing	Caguas	Puerto Rico	XXXXXXXXXX	Mary
CASH	0	0	-443.63	260.96	Shipping on time	0	17	Cleats	Caguas	Puerto Rico	XXXXXXXXXX	Jennifer

No. of fields: 54

Size of File: 93.3 MB

No. of rows: 180520

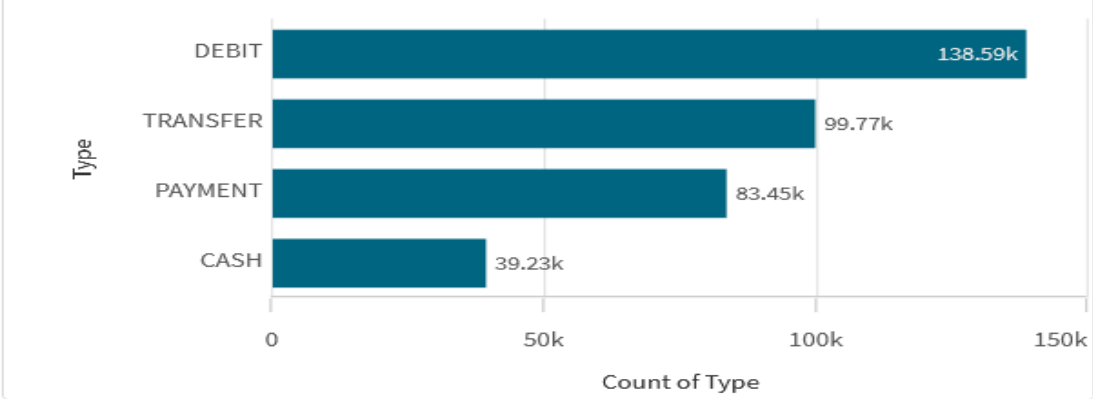
Utilization of Data Filters

Type Summary (Dimension)



Distinct values: 4 Total values: 361038

Preview of distinct value distribution

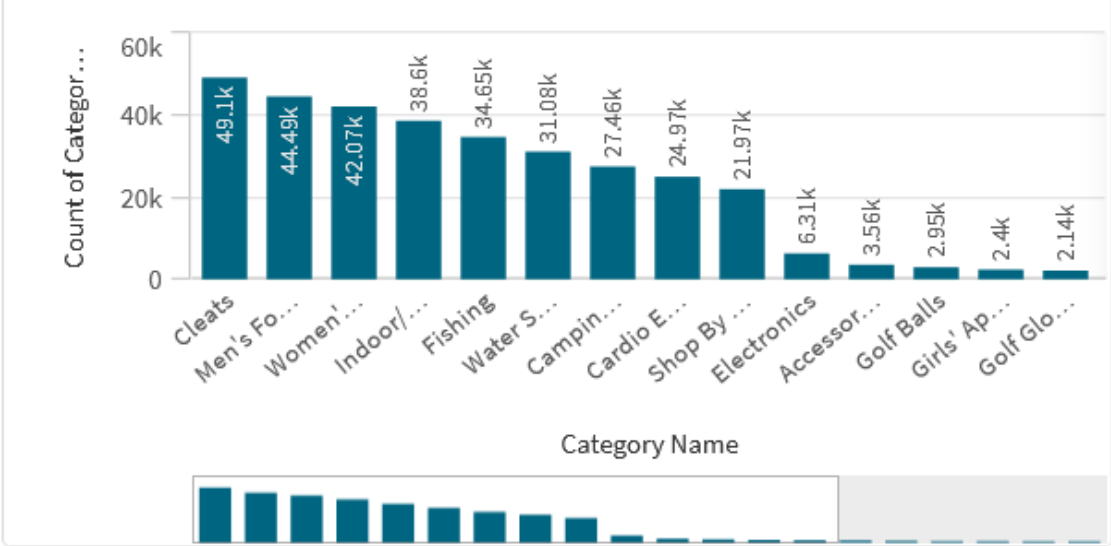


Category Name Summary (Dimension)



Distinct values: 50 Total values: 361038

Preview of distinct value distribution



Order Country Summary (Dimension)



Distinct values: 164 Total values: 361038

Preview of distinct value distribution

