

Data-Driven Innovations in Supply Chain Management with Qlik Insights

Introduction:

1.1 Overview:

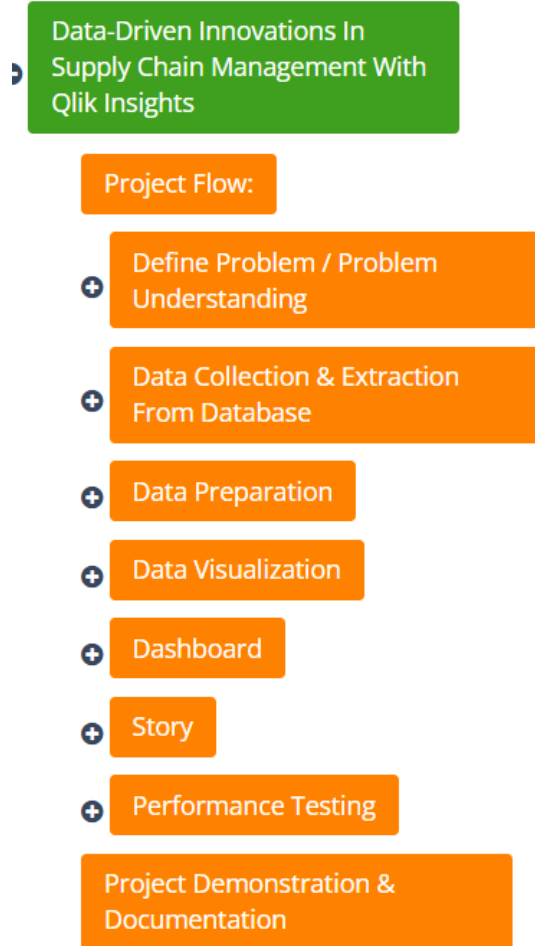
This project, "Data-Driven Innovations in Supply Chain Management with Qlik Insights," utilizes supply chain data to derive valuable insights and support decision-making for manufacturers, distributors, and related stakeholders. The data encompasses various aspects of supply chain operations, including inventory levels, supplier performance, logistics, and demand forecasting. By leveraging Qlik's powerful analytical and visualization capabilities, we aim to uncover patterns, trends, and correlations within this data to address key business challenges.

1.2 Purpose:

The primary purpose of this project is to demonstrate how Qlik can be used to analyze and visualize supply chain data to achieve specific business objectives:

- **Inventory Optimization:** Analyzing historical inventory levels to identify optimal stock levels and reduce holding costs.
- **Supplier Performance Management:** Enhancing supplier relationships by identifying performance trends and areas for improvement.
- **Operational Efficiency:** Improving logistics and transportation efficiency by predicting peak demand periods and optimizing routes.
- **Customer Satisfaction:** Enhancing customer satisfaction by understanding and responding to demand variability and supply chain disruptions.

1.3 Technical Architecture:



2. Define Problem / Problem Understanding

2.1 Specify the Business Problem:

The supply chain industry faces several challenges that can be addressed through data analysis:

1. **Inventory Optimization:** Companies need to manage inventory efficiently to reduce holding costs while avoiding stockouts.
2. **Supplier Performance Management:** Organizations must ensure that suppliers meet quality and delivery standards consistently to maintain smooth operations.
3. **Operational Efficiency:** Supply chain operations, including logistics and transportation, must be optimized to reduce costs and improve delivery times.

4. **Customer Satisfaction:** Companies aim to meet customer demand reliably and quickly, enhancing satisfaction and loyalty through effective supply chain management.

2.2 Business Requirements:

To address these problems, the following business requirements are identified:

- **Detailed Analysis of Inventory Data:** To optimize stock levels and minimize costs.
- **Assessment of Supplier Performance:** To identify trends, forecast risks, and improve supplier relationships.
- **Logistics Optimization:** To enhance routing efficiency and reduce transportation costs.
- **Demand Forecasting:** To align supply with demand, ensuring product availability and minimizing excess inventory.
- **Customer Feedback Analysis:** To improve service delivery and customer satisfaction by addressing pain points in the supply chain.

2.3 Literature Survey:

A review of existing literature highlights the importance of data analytics in supply chain management. Previous studies have shown how data-driven decision-making can lead to significant improvements in inventory management, operational efficiency, and customer satisfaction. Here are a few relevant studies:

- **"Supply Chain Analytics: An Overview" (Journal of Supply Chain Management):** This study provides a comprehensive overview of how companies use data analytics to improve various aspects of supply chain management. It discusses the role of data in optimizing inventory, improving supplier performance, and enhancing customer satisfaction. The findings emphasize that companies leveraging data analytics can achieve significant competitive advantages.
- **"Predictive Analytics in Supply Chain Operations: A Case Study" (Journal of Operations Management):** This article explores the use of predictive analytics in supply chain operations. It highlights how companies can use historical data to forecast demand, predict supplier reliability, and optimize logistics. The study demonstrates that predictive analytics can lead to more efficient operations and cost savings.
- **"Improving Customer Satisfaction Through Supply Chain Data Analysis" (Journal of Business Logistics):** This research focuses on how companies can use supply chain data to enhance customer satisfaction. By analyzing demand patterns and customer feedback, companies can tailor their supply chain strategies to better meet customer needs. The study shows that data-driven supply chain management can increase customer satisfaction and retention.
- **"Data-Driven Approaches to Supply Chain Optimization" (Annals of Operations Research):** This paper discusses various data-driven approaches to optimizing supply

chain processes. It examines how companies use data to manage inventory, optimize logistics, and forecast demand. The findings suggest that data-driven supply chain management strategies can significantly increase efficiency and profitability.

These studies collectively illustrate the transformative potential of data analytics in supply chain management. They provide valuable insights into how companies can leverage data to innovate and improve their supply chain operations.

3. Data Collection:

3.1 Collect the Dataset:

The dataset used for this project is sourced from Kaggle, specifically a dataset related to supply chain management. This dataset includes detailed information on product shipments, customer demographics, and purchase behavior. The key features of the dataset include:

1. **Days for Shipping (Real):** The actual number of days it takes for a product to be shipped to the customer.
2. **Days for Shipment (Scheduled):** The number of days scheduled for the product to be prepared and shipped.
3. **Benefit per Item:** The profit earned per product sold.
4. **Sales per Customer:** The number of products purchased by each customer.
5. **Delivery:** The delivery date of the products.
6. **Late Delivery Risk:** The percentage risk of a delivery being late.
7. **Category ID:** A unique identifier for the product category.
8. **Category:** The category to which the product belongs.
9. **Customer City:** The city where the customer made the purchase.
10. **Customer Country:** The country where the customer made the purchase.
11. **Customer Email:** The email address of the customer.
12. **Customer First Name:** The first name of the customer.
13. **Customer ID:** A unique identifier for each customer order.
14. **Customer Last Name:** The last name of the customer.

This dataset provides comprehensive metadata about the columns described in the CSV files, enabling detailed analysis of various aspects of the supply chain, including shipment timing, customer behavior, and product profitability.

3.2 Connect Data with Qlik Sense

To analyze the supply chain dataset using Qlik Sense, follow these steps:

1. Extract the Dataset:

- After downloading the dataset, extract the files to a specific location on your device.

2. Create a New Qlik Sense App:

- Open Qlik Sense and create a new app named "Data-Driven Innovations in Supply Chain Management."
- Open the newly created app.

3. Add Data to Qlik Sense:

- Click on "Data Manager."
- Click on "Add data" and select the dataset file from the location where it was extracted.

4. Data Integration:

- Ensure that all relevant fields from the dataset are correctly mapped in Qlik Sense.
- Check for any inconsistencies or missing values in the dataset and clean the data if necessary.

5. Data Mapping:

- Map fields such as Days for Shipping (Real), Days for Shipment (Scheduled), Benefit per Item, Sales per Customer, Delivery, Late Delivery Risk, Category ID, Category, Customer City, Customer Country, Customer Email, Customer First Name, Customer ID, and Customer Last Name to ensure they are correctly recognized by Qlik Sense for analysis.

By following these steps, you can successfully integrate and prepare your supply chain dataset in Qlik Sense for comprehensive analysis and visualization.

The screenshot displays the Qlik Sense Data Manager interface. At the top, the 'Data manager' tab is active, showing a diagram with two tables: 'tokenized_access_logs' and 'DataCoSupplyChainDataset'. The 'DataCoSupplyChainDataset' table is highlighted with a red circle. On the right, the 'Recommended associations' panel shows 'Total tables: 2', 'Unassociated tables: 2', and 'Recommendations: 0'. Below this, a table lists the fields of the 'DataCoSupplyChainDataset'.

Type	Days for shi...	Days for shi...	Benefit per o...	Sales per cu...	Delivery Status	Late_deliver...	Category Id	Category Name	Customer City	Customer C...	Customer E...	Customer Fn...
CASH	0	0	-1088.949951	395.980011	Shipping on time	0	45	Fishing	Winter Park	EE, UU,	XXXXXXXXXX	Helen
CASH	0	0	-854.960022	379.980011	Shipping on time	0	45	Fishing	Buena Park	EE, UU,	XXXXXXXXXX	Dylan
CASH	0	0	-652.7700195	383.980011	Shipping on time	0	45	Fishing	West Haven	EE, UU,	XXXXXXXXXX	Samantha
CASH	0	0	-595.1699829	383.980011	Shipping on time	0	45	Fishing	Princeton	EE, UU,	XXXXXXXXXX	Sarah
CASH	0	0	-594.9699707	339.980011	Shipping on time	0	45	Fishing	Caguas	Puerto Rico	XXXXXXXXXX	Mary

4. Data Preparation

4.1 Prepare the Data for Visualization:

- Preparing the data for visualization is a crucial step in the analytical process. It involves several key tasks: first, transforming the data into a format that can be easily visualized, ensuring that all relevant fields are correctly structured for analysis. Next, it's important to thoroughly explore the data to identify any underlying patterns, trends, or anomalies that may influence decision-making. This exploration helps in understanding the nuances of the data, such as seasonal variations in demand or common delays in shipments.

Clean the Data

- **Remove Inconsistencies:**
 - After downloading the dataset and converting it from CSV to Excel format, thoroughly inspect the data for any inconsistencies or anomalies that might affect the analysis.
 - Correct any discrepancies in the data entries to ensure uniformity across all fields, such as ensuring consistent formats for dates and numerical values.
- **Handle Missing Values:**
 - Identify any missing values within the dataset, as they can lead to inaccurate analyses if not addressed.
 - Handle these missing data points by either filling them in with appropriate estimates or removing records that have substantial missing information to maintain the integrity of the dataset.

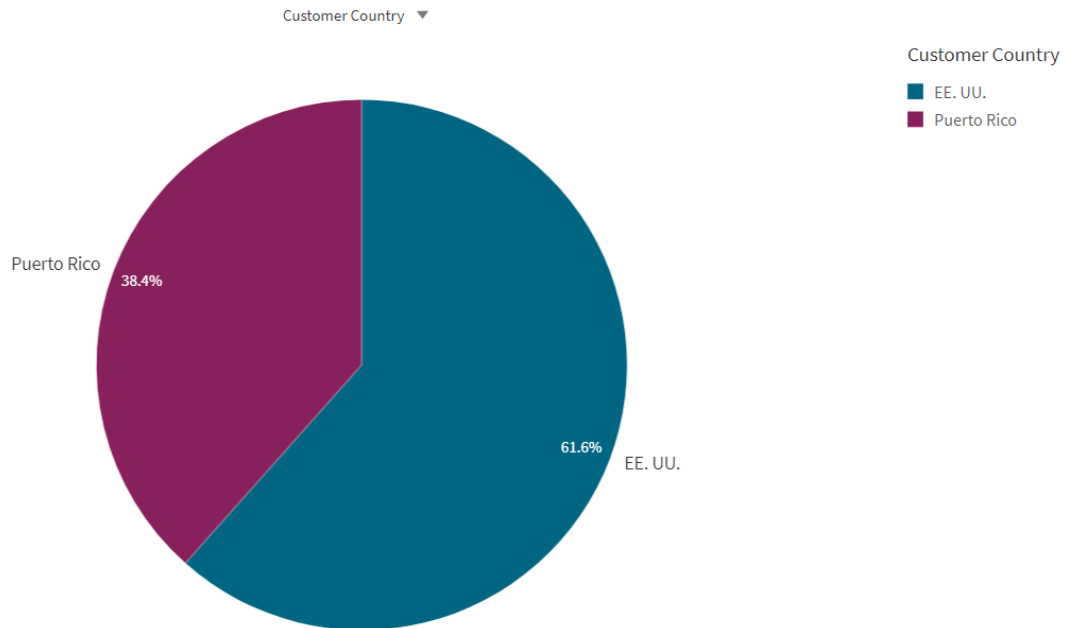
Transform the Data

- **Format for Analysis:**
 - Ensure the data is properly formatted and ready for analysis and visualization in Qlik Sense.
 - Check that dates, times, and numerical values are correctly formatted to align with the software's requirements.
 - Ensure all fields are appropriately labeled, making it easy to identify and map data points during the visualization process.

5. Data Visualization

5.1 Pie Chart:

Total Items placed by customer in country



This pie chart visualizes the distribution of total items placed by customers across two countries: the United States (labeled as "EE. UU.") and Puerto Rico. The chart shows that:

- **61.6%** of the total items were placed by customers in the United States.
- **38.4%** of the total items were placed by customers in Puerto Rico.

This suggests that the majority of the orders come from the United States, with Puerto Rico contributing a smaller but significant portion of the total items placed.

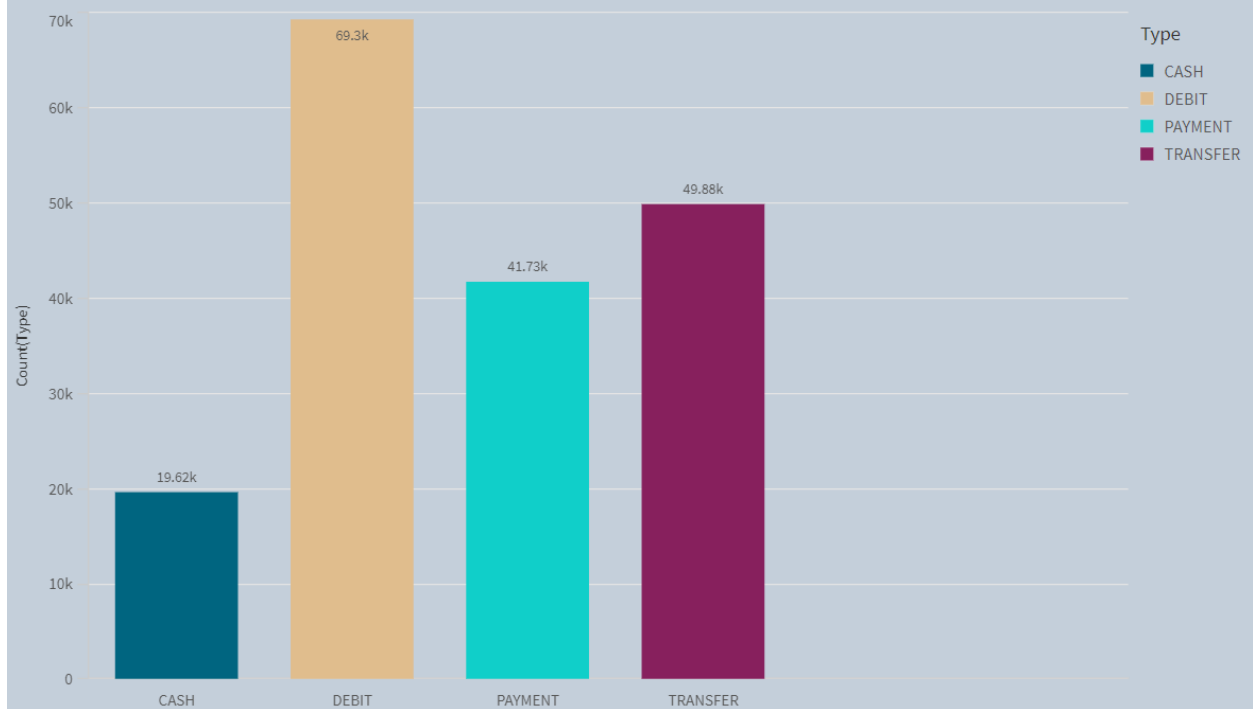
5.2 Bar Chart:

Below Bar Chart Shows the mode of Payment of Different Items. Most of the payments are made in Debit Mode. Approximately 69.3K transactions are made in Debit Mode.

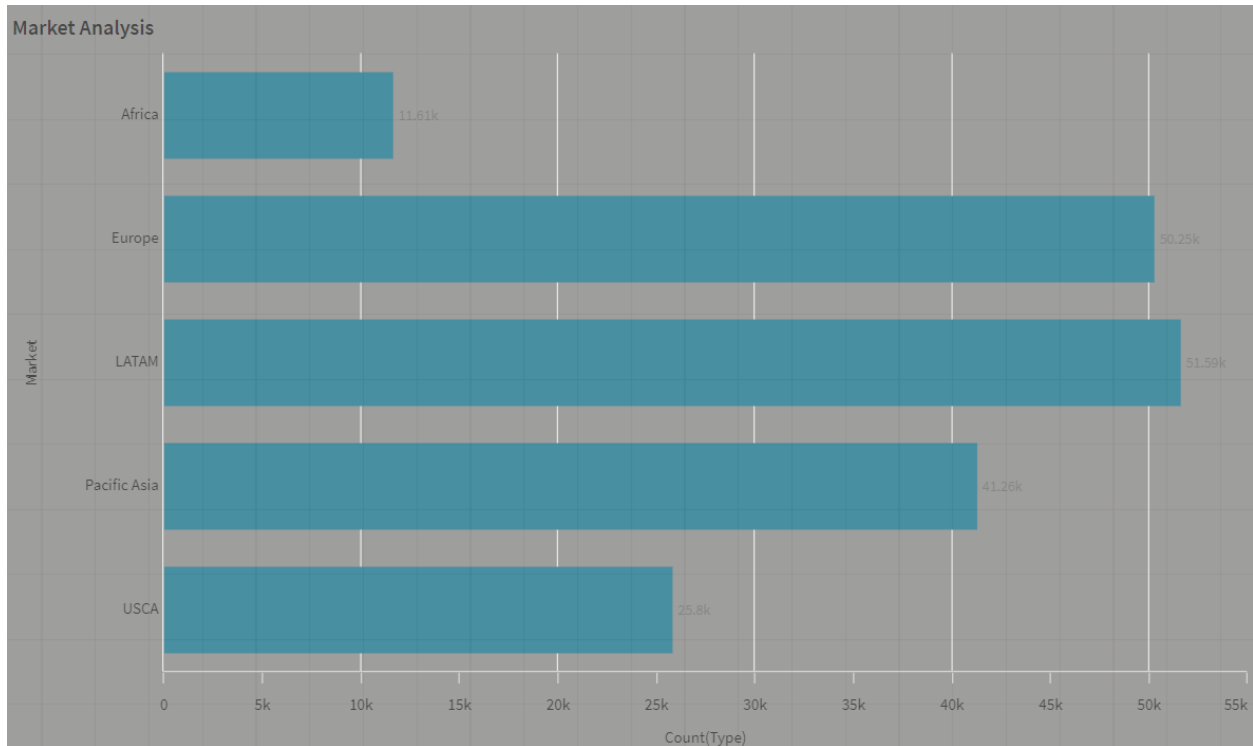
After Debit, the second most common payment method is Transfer with 49.88 k Transactions Approximately.

Below is the Graphs,

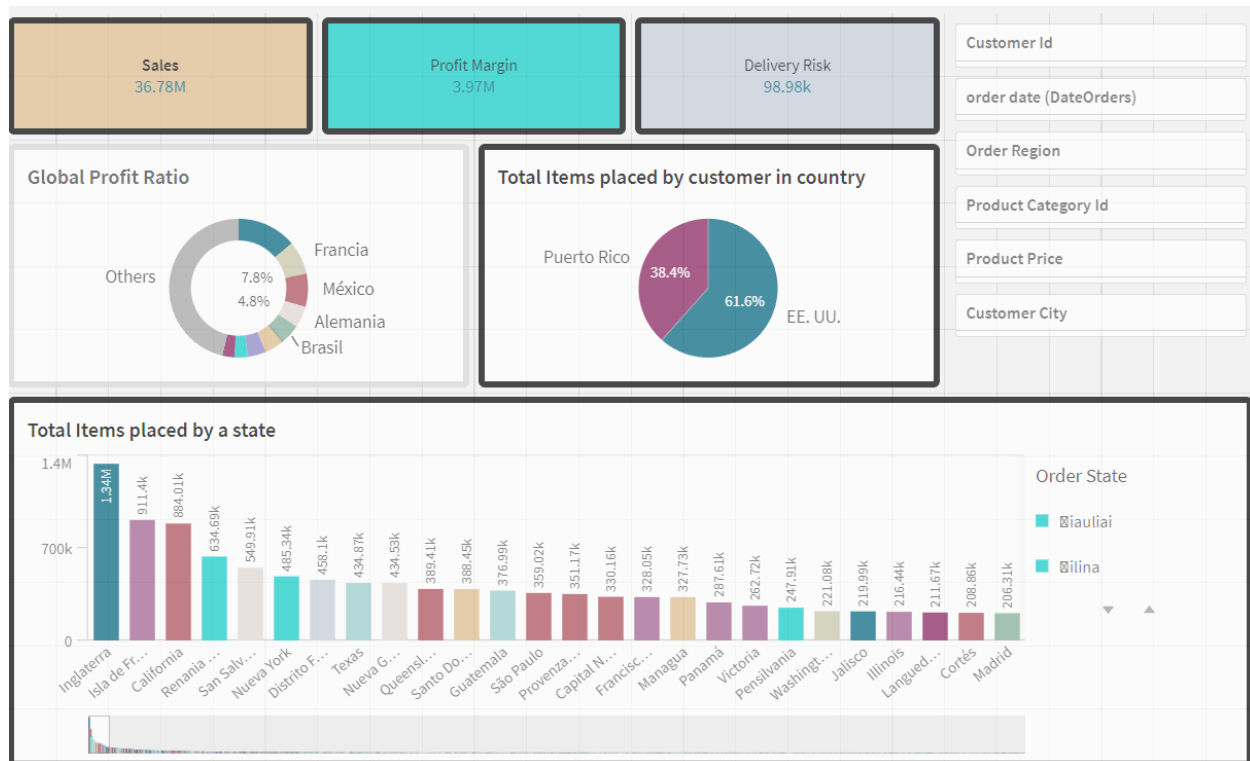
Mode of payment



5.3 Bar Chart:



6. Dashboards:



This dashboard provides an overview of key business metrics and insights related to sales, profit, and customer order distribution across different regions and states. Here's a breakdown of the main components:

1. Sales, Profit Margin, and Delivery Risk:

- **Sales:** Shows total sales amounting to **36.78M**.
- **Profit Margin:** Indicates the profit margin of **3.97M**.
- **Delivery Risk:** Highlights a delivery risk metric, which is at **98.98k**.

2. Global Profit Ratio:

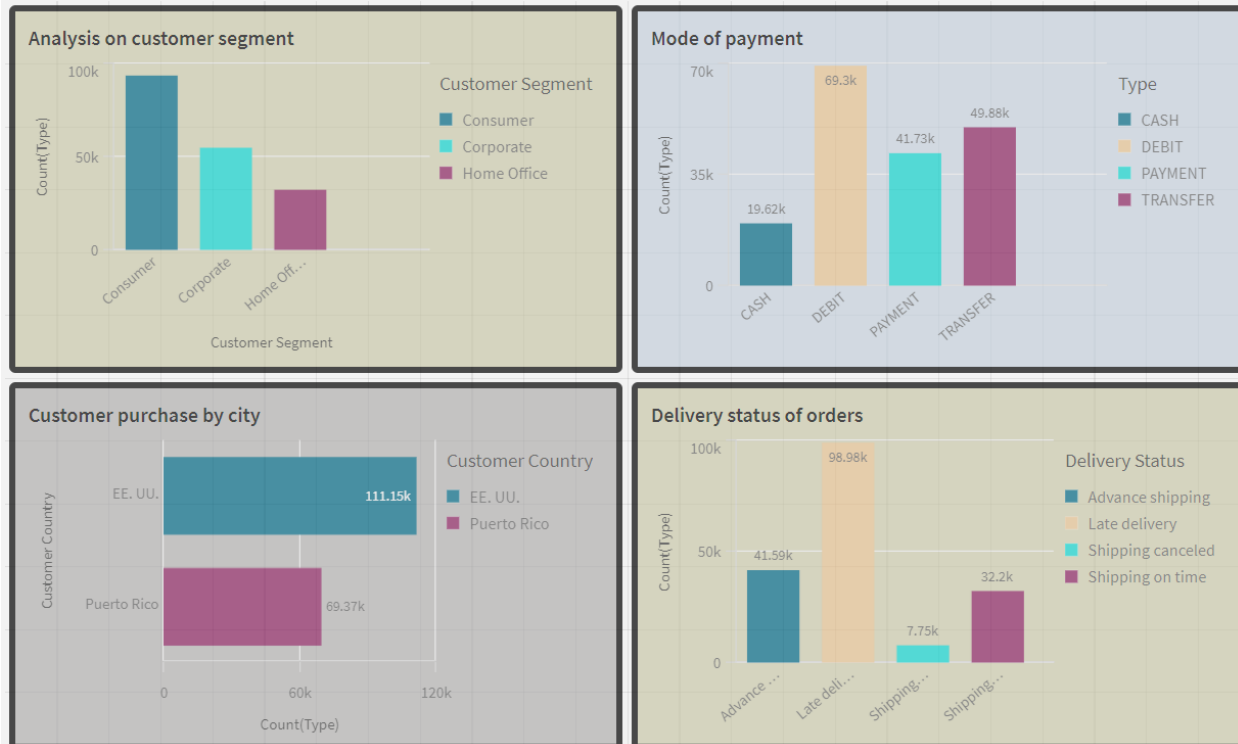
- This donut chart presents the distribution of profit by country. It shows that **France** has the highest profit ratio at **7.8%**, followed by **Mexico**, **Germany**, and **Brazil**. The "Others" category comprises all other regions.

3. Total Items Placed by Customer in Country:

- A pie chart breaks down the total items ordered by customers in two countries: **Puerto Rico** (38.4%) and the **United States** (61.6%).

4. Total Items Placed by a State:

- A bar chart visualizes the total items ordered across various states, with **England** (Inglaterra) having the highest number of orders (**1.34M**), followed by other states like **Isla de Francia**, **California**, and **Romania**. The chart displays a clear drop in orders as it progresses through other states.



This dashboard provides a detailed analysis of customer segments, payment modes, customer purchases by city, and delivery status of orders. Here's a brief explanation of each section:

1. Analysis on Customer Segment:

- This bar chart shows the distribution of customers across different segments: **Consumer**, **Corporate**, and **Home Office**.
- **Consumer** is the largest segment with the highest count, followed by **Corporate** and **Home Office**.

2. Mode of Payment:

- This chart visualizes the different modes of payment used by customers: **Cash**, **Debit**, **Payment**, and **Transfer**.
- **Debit** is the most common payment method, followed by **Transfer** and **Payment**. **Cash** is the least used payment method.

3. Customer Purchase by City:

- This bar chart shows the number of purchases made by customers in two countries: **United States (EE. UU.)** and **Puerto Rico**.
- **United States** has a higher purchase count (111.15k) compared to **Puerto Rico** (69.37k).

4. Delivery Status of Orders:

- This chart presents the status of deliveries: **Advance shipping**, **Late delivery**, **Shipping canceled**, and **Shipping on time**.
- **Late delivery** is the most common status, followed by **Shipping on time** and **Advance shipping**. **Shipping canceled** has the lowest count.



This image shows a dashboard with four distinct visualizations analyzing different aspects of a dataset:

1. **Benefit Per Order:** The top left chart analyzes the distribution of benefits per order based on late delivery risk. The data points are densely concentrated around a small area, suggesting limited variation.
2. **Profit Ratio:** The top right chart is a histogram showing the distribution of order item profit ratios, with most values clustered around a positive ratio, indicating profitability in most orders.
3. **Market Analysis:** The bottom left bar chart compares different markets (Africa, Europe, LATAM, Pacific Asia, USCA) by the count of a certain type, showing Europe and Pacific Asia as leading markets.
4. **Order Region:** The bottom right bar chart compares the count of orders across various regions, highlighting Central Asia and Western Europe as significant contributors.

Each visualization provides insights into different performance metrics and regional analyses.

7. Performance Testing

7.1 Amount Of Data Loaded:

"Amount of Data Loaded" refers to the quantity or volume of data that has been imported, retrieved, or loaded into a system, software application, database, or any other data storage or processing environment. It's a measure of how much data has been successfully processed and made available for analysis, manipulation, or use within the system.

Filter by table

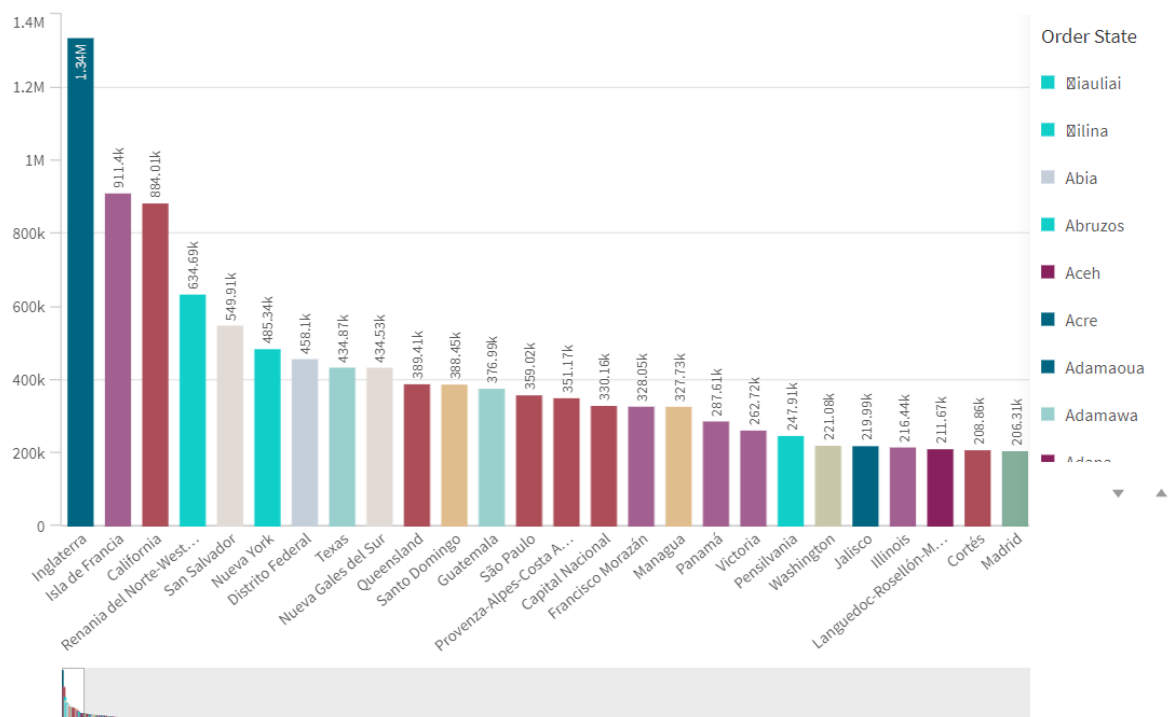
All tables ▼

Benefit per order	Customer Segment	Order Item Total
Category	Customer State	Order Profit Per Order
Category Id	Customer Street	Order Region
Category Name	Customer Zipcode	Order State
🌐 Customer City	📅 Date ▶	Order Status
Customer Country	Days for shipment (...)	Order Zipcode
Customer Email	Days for shipping (r...)	Product

7.2 Utilization Of Data Filter:

"Utilization of Filters" refers to the application or use of filters within a system, software application, or data processing pipeline to selectively extract, manipulate, or analyze data based on specified criteria or conditions. Filters are used to narrow down the scope of data, focusing only on the relevant information that meets certain predefined criteria.

Total Items placed by a state



The image is a bar chart titled "Total Items placed by a state," displaying the total number of items ordered by various states. The chart is organized in descending order, with **Inglaterra** (England) leading at 1.34 million items, followed by **Isla de Francia** at 911.4K, and **California** at 884.0K. Other states, such as **Renania del Norte-West** and **San Salvador**, follow with lower counts ranging from around 63K to 206K. The chart visually emphasizes the significant differences in order volumes across these regions, highlighting the top states with the highest order counts.

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