

Data-Driven Innovations in Supply Chain Management with Qlik Insights

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1. Introduction

1.1 Overview

This project aims to revolutionize supply chain management by leveraging the advanced analytics capabilities of Qlik. By employing cutting-edge data-driven insights, the project seeks to enhance key aspects such as logistics, forecasting, and inventory management. The ultimate goal is to achieve higher operational efficiency and responsiveness, thereby transforming the traditional supply chain landscape.

1.2 Purpose

The primary purpose of this project is to utilize Qlik's advanced data visualization and analytics tools to provide a comprehensive overview of the supply chain ecosystem. By centralizing and analyzing data from various sources, stakeholders will gain clear and actionable insights, leading to improved decision-making and optimization of supply chain processes. The project aims to achieve:

- Enhanced logistics optimization
- Improved forecasting accuracy
- Efficient inventory management
- Increased operational efficiency
- Proactive responsiveness to changes in demand and unforeseen events

1.3 Technical Architecture

The technical architecture of this project involves the following key components:

1. **Data Integration:** Aggregating and centralizing relevant data from diverse supply chain sources.
2. **Data Storage:** Utilizing robust databases to store and manage the integrated data.
3. **Data Analytics:** Leveraging Qlik's advanced analytics features to process and analyze

historical and real-time data.

4. **Visualization:** Creating intuitive and dynamic dashboards using Qlik's visualization capabilities.
5. **Real-time Tracking:** Implementing solutions for real-time tracking and monitoring of goods.
6. **Decision Support:** Utilizing real-time analytics to facilitate quick decision-making

2. Define Problem / Problem Understanding

2.1 Specify the Business Problem

The traditional supply chain management systems face multiple challenges that hinder efficiency and responsiveness. Key issues include:

- **Logistics Inefficiencies:** Inefficient transportation routes and processes lead to higher costs and longer delivery times.
- **Inaccurate Forecasting:** Poor forecasting methods result in either overstocking or stockouts, both of which negatively impact business operations.
- **Suboptimal Inventory Management:** Ineffective inventory management causes increased holding costs and reduces the ability to meet customer demand promptly.
- **Limited Visibility:** Lack of real-time tracking and monitoring capabilities restricts visibility into the movement of goods, leading to delays and mismanagement.
- **Slow Decision-Making:** Traditional methods are not agile enough to respond swiftly to unforeseen events or demand fluctuations, causing operational bottlenecks.

These problems collectively increase operational costs, reduce customer satisfaction, and lower overall supply chain performance.

2.2 Business Requirements

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

1. **Robust Data Integration Strategy:** Develop and implement a comprehensive data integration strategy to aggregate and centralize relevant data from various supply chain sources. This will provide a unified view of the supply chain operations.
2. **Advanced Visualization Dashboards:** Utilize Qlik's advanced visualization capabilities to create intuitive and dynamic dashboards. These dashboards will offer stakeholders clear and actionable insights into the supply chain ecosystem, facilitating informed decision-making.
3. **Logistics Optimization:** Employ Qlik's advanced analytics features to analyze historical logistics data, identify patterns, and optimize transportation routes. This will reduce transportation costs and improve delivery times.
4. **Real-time Tracking Solutions:** Implement real-time tracking and monitoring solutions to enhance visibility into the movement of goods. This will help in reducing lead times and minimizing transportation costs.

5. **Proactive Decision-Making:** Leverage real-time analytics to enable quick and proactive decision-making in response to unforeseen events or changes in demand. This will ensure a responsive and adaptive supply chain.

2.3 Literature Survey

A comprehensive review of the existing literature on the use of data-driven insights and advanced analytics in supply chain management reveals several key points:

- **Increasing Role of Data Analytics:** There is a growing recognition of the critical role that data analytics plays in transforming traditional supply chain processes. Studies emphasize how leveraging advanced analytics tools like Qlik can significantly enhance visibility and decision-making capabilities in supply chain operations.
- **Positive Impact on Logistics and Forecasting:** Research highlights the effectiveness of data analytics in optimizing logistics and improving forecasting accuracy. By analyzing historical data and identifying patterns, organizations can streamline transportation routes and better predict demand, leading to reduced costs and improved efficiency.
- **Enhanced Inventory Management:** Advanced analytics tools help in achieving more efficient inventory management by providing insights into stock levels and demand patterns. This allows for better planning and reduces the likelihood of overstocking or stockouts.
- **Broader Data-Driven Transformations:** The literature explores the broader landscape of data-driven supply chain transformations, showcasing successful implementations across various industry sectors. These case studies demonstrate notable improvements in operational efficiency and responsiveness.
- **Challenges and Opportunities:** Despite the benefits, the adoption of data-driven insights in supply chain management also presents challenges. The literature emphasizes the need for robust data governance frameworks and a culture that supports data-driven decision-making. Addressing these challenges is crucial for organizations to fully unlock the potential benefits of advanced analytics.

3. Data Collection

While data collection gathers information relevant to your needs, data extraction focuses on retrieving specific data points from various sources. Combining these approaches allows you to analyze comprehensive datasets, leading to informed decisions and maximized business efficiency, all without sacrificing accuracy. To collect and extract data from databases effectively for your supply chain management project using Qlik Insights, you should follow a structured approach to ensure data accuracy, consistency, and usability.

3.1 Collect the dataset

The dataset is taken by using kaggle from the below link

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

In simple terms, data was first collected and combined into a dataset. Then the dataset was made available publically in kaggle at the link provided For this project, the relevant dataset was downloaded so it could be extracted and analysed to understand the supply chain management more efficiently.

Understanding the Data:

The dataset includes:

1. Customer Information: Customer demographics, IDs, and purchase history.
2. Product Details: Product IDs, categories, and pricing.
3. Order Information: Order IDs, dates, and delivery status.
4. Sales and Revenue Data: Sales figures and revenue metrics.
5. Logistics Data: Shipment routes, transportation methods, and delivery times.

3.2 Connect Data with Qlik Sense

Login and Account Creation:

1. Access the Qlik Sense website(<https://www.qlik.com/us/try-or-buy/download-qlik-sense>) and create a new account.
 2. Apply for Qlik sense academic license which provides the access for 1 year to the college students.
 3. After the account creation, we can start making the App in the Qlik sense Cloud
- OR

4. Download the Qlik Sense Desktop unlock file and start making the project.

Note: It is feasible to use the Qlik sense cloud version as it is having more features to work with.

Creating a New App and Upload Data

1. Click on the "Add new" button and select New Analytics App to start a new project.

Upload the Dataset:

1. Go to Skill Wallet and download the project data set.

2. In Qlik Sense, upload this data set into the new app.

3. Now, we are ready to generate various insights using the dataset.

4. Data Preparation

Data preparation encompasses the process of cleaning the data by eliminating duplicates, null values, and irrelevant or missing information. It also involves transforming the data and assigning meaningful labels or categories to data points. Additionally, the data is formatted for easy visualization, enabling exploration to identify patterns and trends. This process includes addressing missing values, converting data types, and standardizing units.

Data filtering is performed to focus on specific information, ensuring that the data is ready for visualization software, with accuracy and completeness. This preparation facilitates a clear understanding of the data and aids in creating visualizations that provide insights into performance and efficiency. With the data cleaned and organized, we can proceed directly to the visualization phase.

4.1 Preparing the Data for Visualization

When preparing data for visualizations in the context of Data-Driven Innovations in Supply Chain Management with Qlik Insights, the following steps are crucial to ensure data accuracy, consistency, and meaningful representation:

1. Data Collection

The first step in preparing data for visualization is to gather relevant data from various sources. This includes:

- **ERP Systems:** Extracting data from enterprise resource planning systems that contain information on production, sales, and supply chain operations.
- **Logistics Databases:** Collecting data from logistics databases that track the movement of goods, transportation schedules, and delivery statuses.
- **External APIs:** Integrating data from external APIs, such as market trends, weather conditions, and traffic information, which can impact supply chain efficiency.

Ensuring data quality is paramount at this stage. Addressing issues such as missing values, duplicates, and inconsistencies helps maintain the integrity of the dataset. This involves:

- **Cleaning Data:** Removing or imputing missing values to avoid skewed analysis.
- **Deduplication:** Identifying and eliminating duplicate records to ensure each data point is

unique.

- **Consistency Checks:** Ensuring that data entries are consistent across different datasets, such as having standardized date formats and uniform units of measurement.

2. Data Transformation

Once the data is collected, the next step is to transform the raw data into a consistent format suitable for analysis. This involves:

- **Format Conversion:** Converting data into common formats such as CSV or Excel, which are compatible with Qlik's data integration tools.
- **Standardization:** Standardizing units of measurement (e.g., converting all quantities to metric units), aligning time zones to a single standard, and ensuring that data structures are consistent across datasets.
- **Data Cleaning:** Addressing any anomalies or outliers in the data to ensure that subsequent analysis is accurate and reliable.

3. Data Integration

Data integration is the process of combining data from different domains to create a comprehensive dataset. This is achieved by:

- **Combining Datasets:** Merging data from sales, inventory, and transportation databases to provide a holistic view of the supply chain.
- **Using Qlik's Data Connectors:** Leveraging Qlik's robust data connectors to seamlessly integrate data from diverse sources. These connectors support a wide range of data formats and systems, facilitating smooth data integration.

4. Data Modeling

Designing an effective data model is crucial for supporting supply chain use cases. This involves:

- **Data Model Design:** Creating a data model that accurately represents the relationships between different entities in the supply chain, such as shipments, products, and suppliers.
- **Defining Relationships:** Establishing clear relationships between tables to ensure that data can be queried and analyzed effectively. For example, linking shipment records to product and supplier information enables comprehensive analysis of supply chain performance.

5. Data Visualization

The final step is to leverage Qlik's powerful visualization tools to create insightful dashboards and reports. This involves:

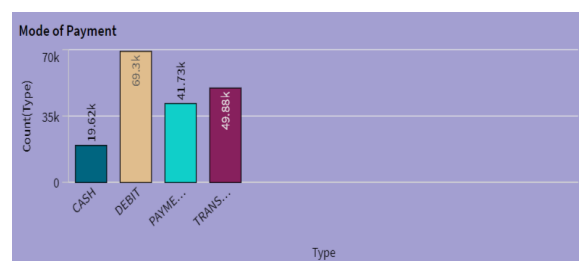
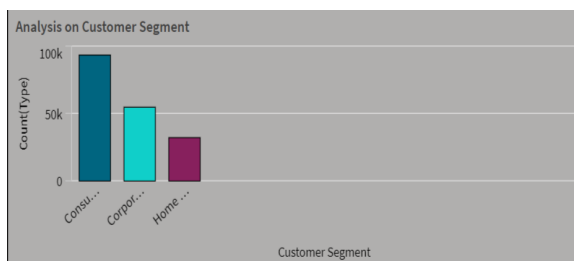
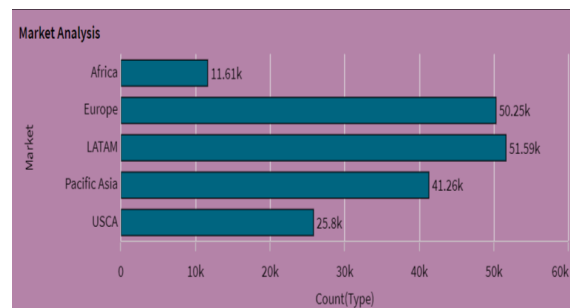
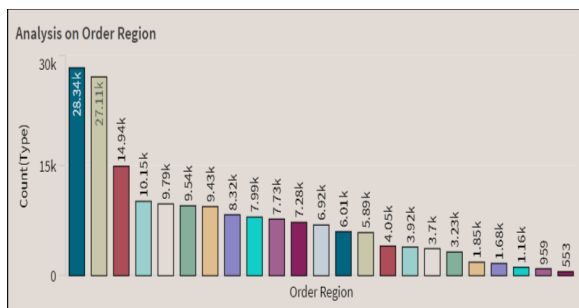
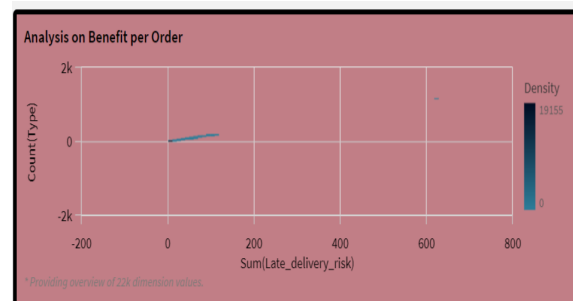
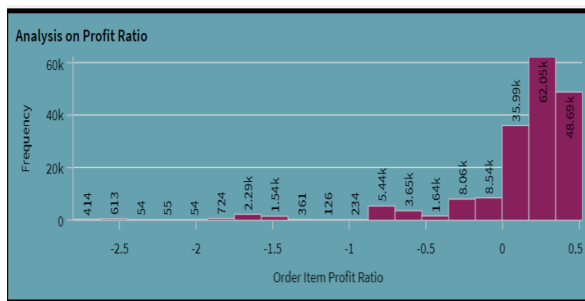
- **Creating Dashboards:** Using Qlik's intuitive interface to design dashboards that display key supply chain metrics in a clear and concise manner.
- **Visualizing Metrics:** Employing charts, graphs, and maps to visualize important metrics such as on-time delivery rates, inventory turnover, and transportation costs. These visualizations help stakeholders quickly understand the current state of the supply chain and identify areas for improvement.
- **Interactive Reports:** Designing interactive reports that allow users to drill down into specific data points, filter information based on various criteria, and gain deeper insights into supply chain operations.

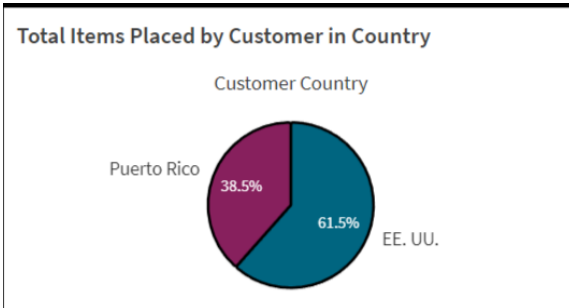
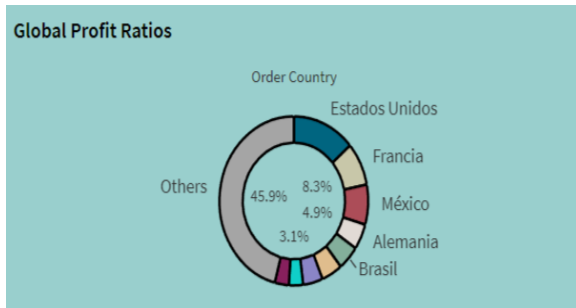
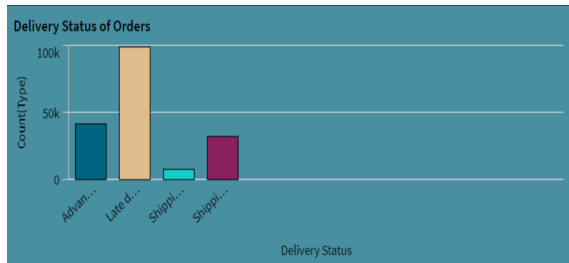
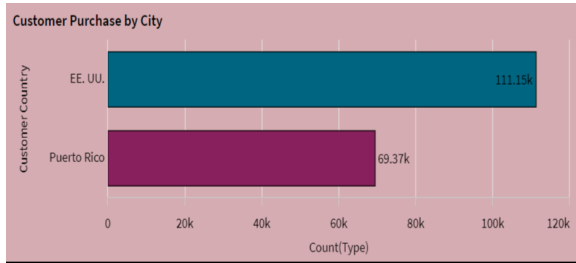
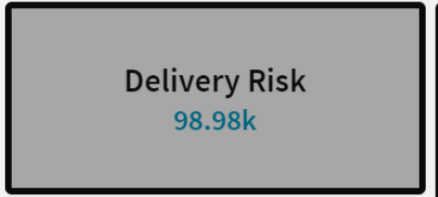
By following these steps, the data is prepared in a way that maximizes its potential for providing valuable insights through visualizations, thereby enhancing the overall effectiveness of supply chain management using Qlik Insights.

5. Data Visualizations

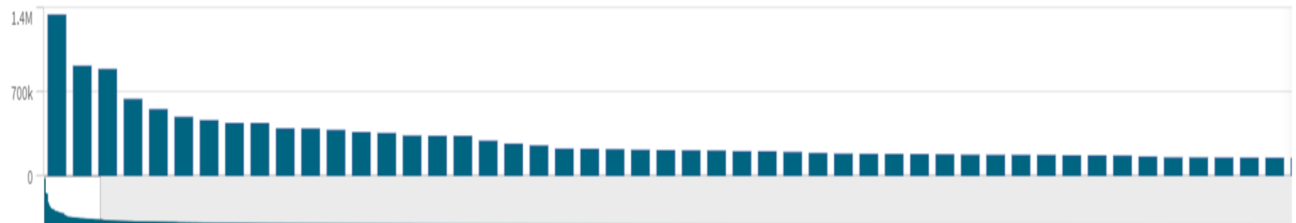
Data visualization in supply chain management using Qlik Insights involves preparing data for easy analysis by cleaning duplicates, null values, and irrelevant information. The data is transformed to standardize units, convert data types, and handle missing values, then labeled and categorized meaningfully. Filtering ensures focus on specific information, making the data accurate and complete for visualization software. This preparation enables the creation of intuitive visualizations like charts, graphs, and maps, helping stakeholders understand performance and efficiency metrics and gain clear insights into the supply chain ecosystem.

5.1 Visualizations





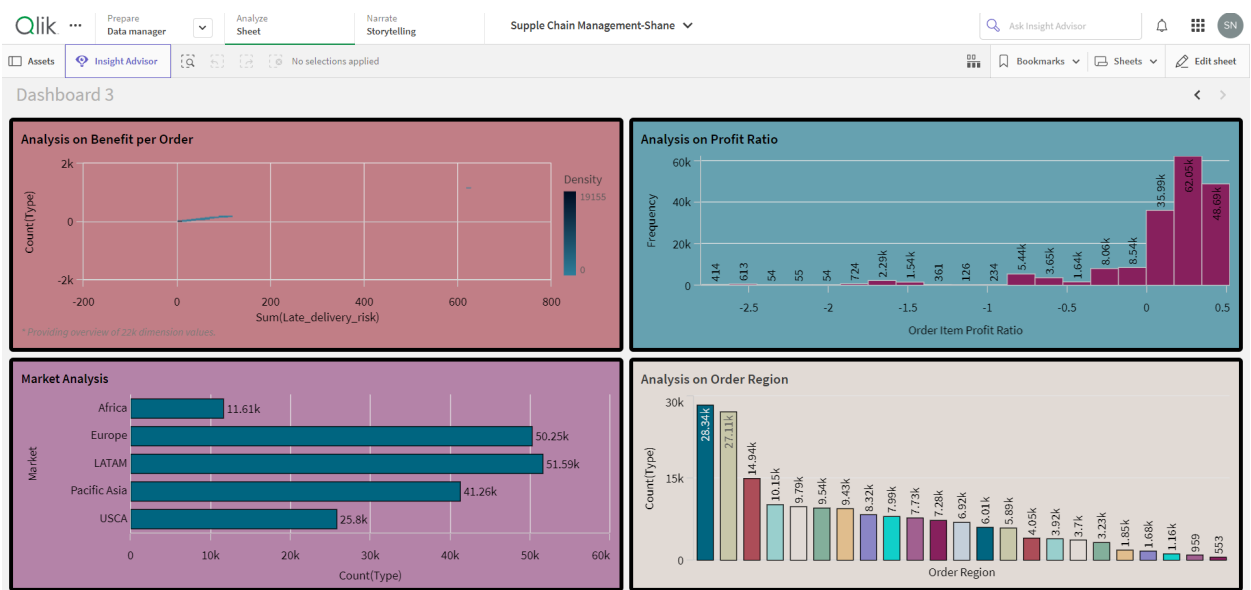
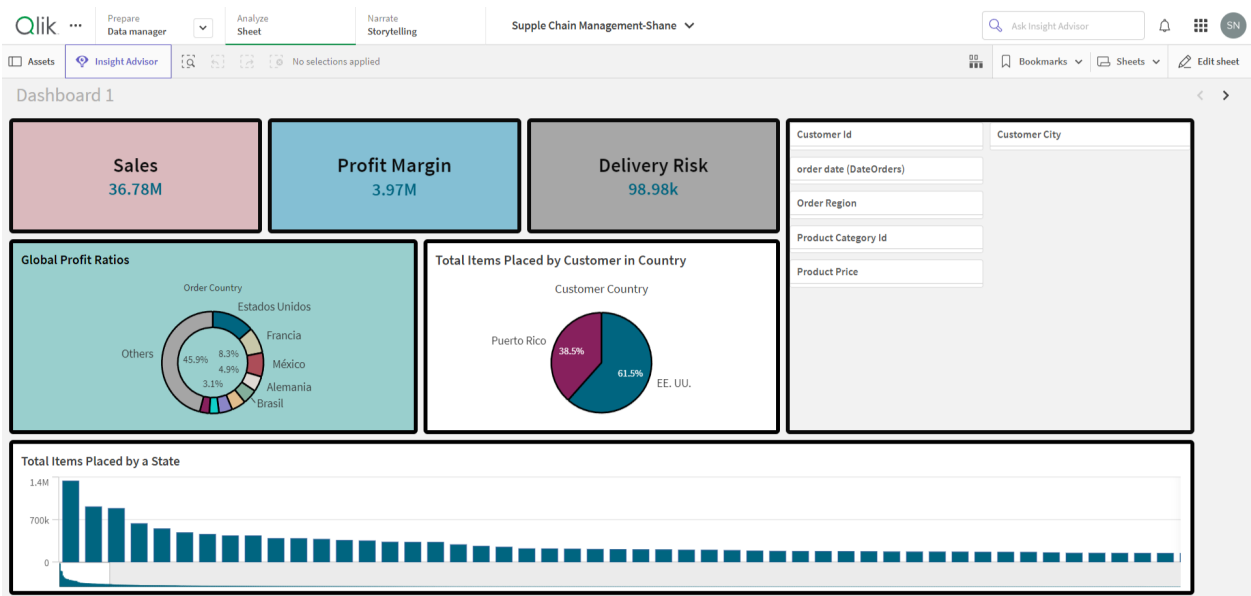
Total Items Placed by a State



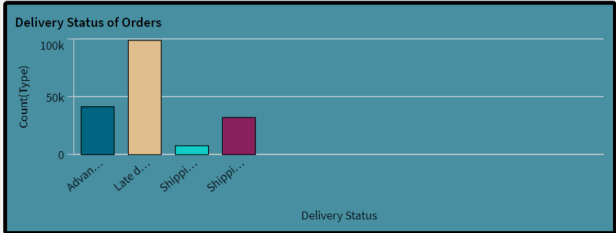
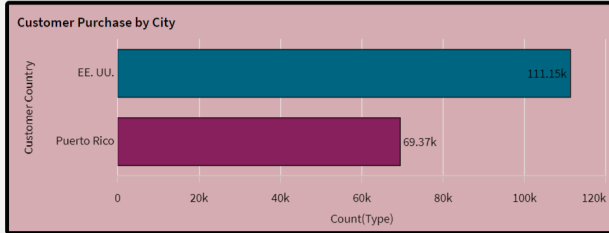
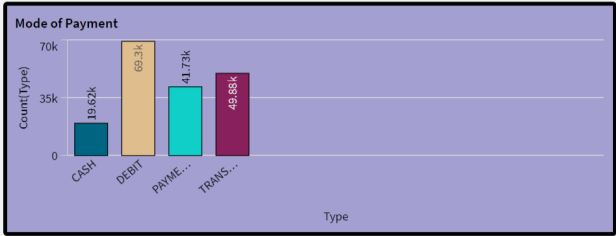
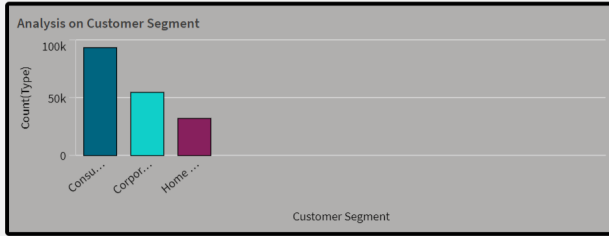
6. Dashboard

The dashboard provides a comprehensive view of key supply chain metrics through intuitive visualizations, enabling stakeholders to monitor performance and make informed decisions. Utilizing Qlik's advanced tools, it presents real-time data insights in a clear and actionable format.

6.1 Responsive and Design of Dashboard



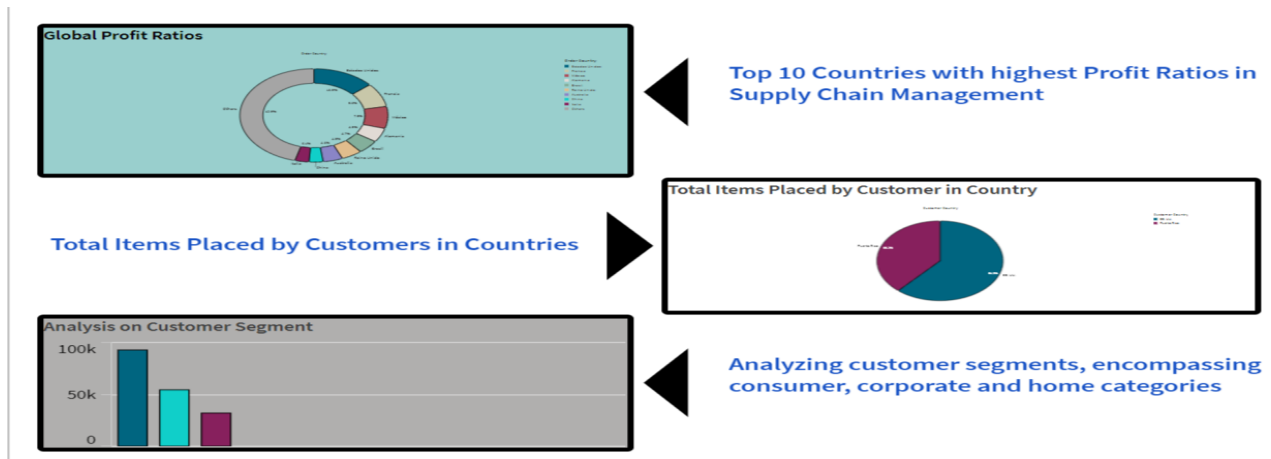
My new sheet (1)



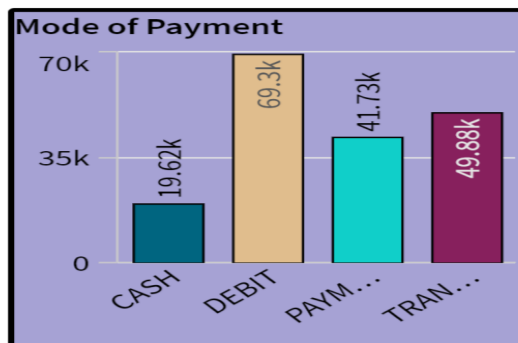
7. Report

7.1 Report Creation

Supply Chain Management Analysis Story

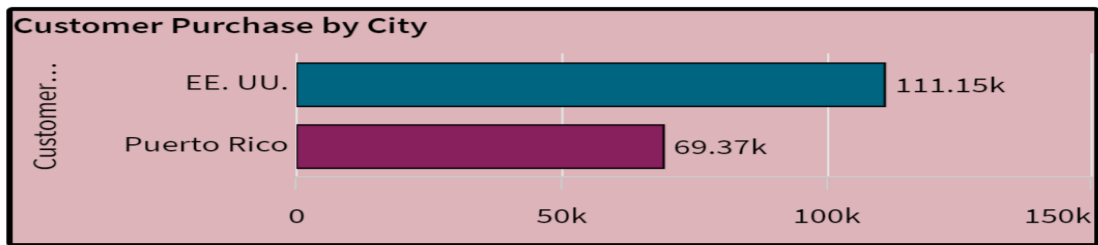


Mode of Payment for Purchase



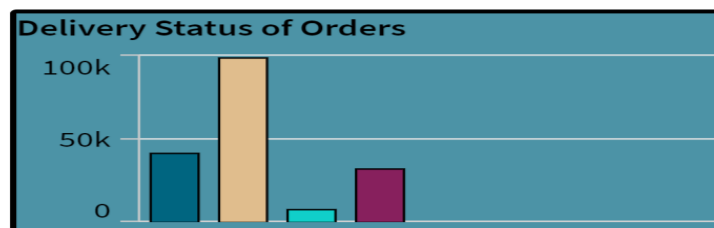
- Cash Transactions offer immediate liquidity, providing a straight forward and tangible method of payment.
- Debit payments directly linked to bank accounts offer convenience and real time deduction of funds.
- Credit payments provide a deferred payment option, allowing customers to make purchases.
- Transfer payments leverage electronic methods for seamless and secure fund

Customer Purchase Item by City



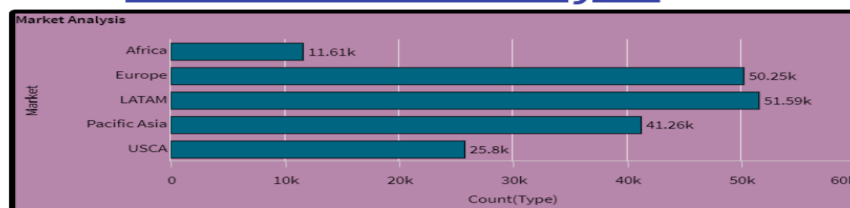
- Customer purchase count in Puerto Rico reflects the transactional dynamics in this vibrant location, capturing the local consumer behavior and market engagement.
- Customer purchase count in the United States provides a comprehensive overview of buying patterns across diverse cities.

Delivery Status of Orders



- Analyzing the delivery status of orders, including Advanced Shipping, Late Shipping, Shipping Cancelled and Shipping on Time.
- This allows businesses to evaluate the efficiency of their logistics operations, address potential delays and enhance customer satisfaction.
- Ensuring timely and reliable deliveries based on varied shipping scenarios

Global Market Analysis



- Conducting a market analysis across Africa, Europe, LATAM(Latin America), Pacific Asia and USCA(United States and Canada) enables businesses to gain strategic insights.
- Regional economic landscapes, consumer behaviors and market dynamics.
- This comprehensive assessment supports informed decision making tailored marketing strategies and targeted expansion efforts to capitalize on diverse opportunities within each distinct market

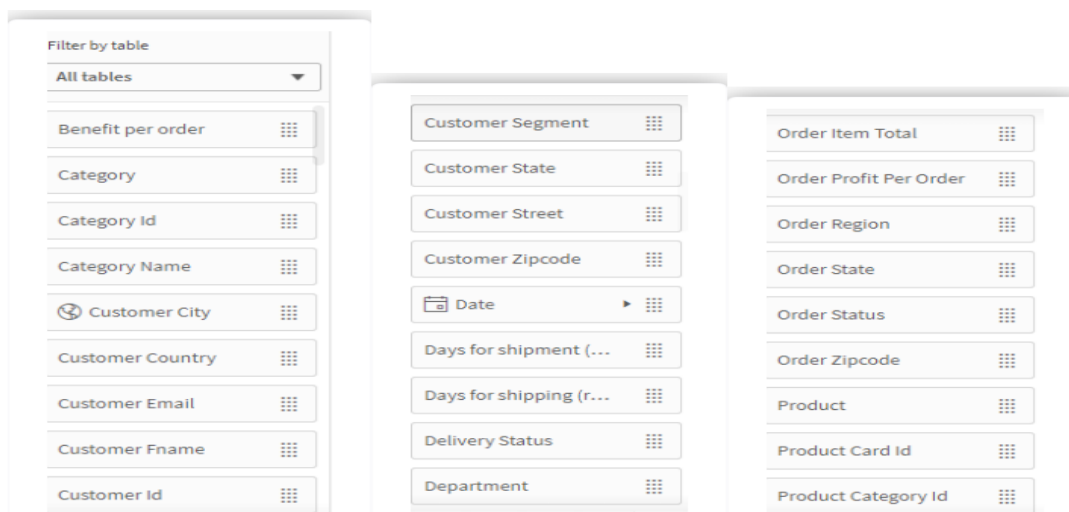
8. Performance Testing

Performance Testing

In Data-Driven Innovations in Supply Chain Management with Qlik Insights, performance testing ensures efficient platform operation. Key aspects include evaluating system responsiveness, dashboard load handling, data refresh rates, and scalability. By simulating various scenarios, organizations can optimize resource allocation and improve overall performance.

8.1 Amount of Data Rendered

In supply chain management, the data rendered encompasses the extensive information generated and processed across various stages, from sourcing raw materials to delivering finished products to customers. This data includes inventory levels, transportation schedules, supplier performance, and customer orders, among other details. Effective management and analysis of this data enable businesses to enhance efficiency, cut costs, and respond swiftly to market demands. Advanced technologies such as big data analytics, IoT, and AI are essential in interpreting this data, aiding companies in optimizing their supply chain operations.



8.2 Utilization of Data Filters

Data filters enable the creation of a wide range of unique visualizations from a given dataset. Common visualizations for analyzing the performance and efficiency of banks include bar charts, line charts, heat maps, scatter plots, pie charts, and maps. These visualizations facilitate comparisons of performance, tracking changes over time, illustrating distributions and relationships between variables, and breaking down revenue, customer demographics, workload, resource allocation, and bank locations.

9.Conclusion

In summary, data-driven innovations in supply chain management, powered by Qlik Insights, offer a transformative approach to enhancing efficiency, transparency, and decision-making. Utilizing advanced data integration, real-time analytics, and dynamic visualizations, Qlik Insights provides comprehensive visibility into supply chain operations. This enables proactive inventory management, optimization of transportation routes, and effective risk mitigation. Predictive analytics and real-time monitoring allow businesses to swiftly anticipate and respond to market demands and disruptions. Integrating Qlik Insights into supply chain management ultimately reduces operational costs, improves customer satisfaction, and creates a more resilient and agile supply chain, helping organizations thrive in a competitive and rapidly evolving market.