

DATA-DRIVEN INNOVATIONS IN SUPPLY CHAIN MANAGEMENT WITH QLIK INSIGHTS

1.Introduction

1.1. Overview

This groundbreaking project aims to redefine supply chain management using Qlik's advanced analytics. By harnessing the power of data-driven insights, it seeks to revolutionize logistics, forecasting, and inventory management. The project's core objective is to elevate operational efficiency and responsiveness to unprecedented levels, reshaping the landscape of supply chain dynamics.

1.2. Purpose

- **Empowerment through Data:** Unleashing the potential of Qlik's advanced analytics to empower supply chain management with real-time, actionable insights.
- **Precision in Logistics:** Transforming how logistics are managed by optimizing routes, reducing lead times, and enhancing delivery accuracy.
- **Forecasting Foresight:** Revolutionizing forecasting accuracy through predictive analytics, ensuring businesses anticipate demand shifts effectively.
- **Operational Agility:** Enhancing operational agility to swiftly adapt to market changes, ensuring competitiveness and customer satisfaction.
- **Innovation Catalyst:** Acting as a catalyst for innovation in supply chain practices, setting new benchmarks for industry standards.

2. Define Problem/Problem Understanding:

2.1. Specifying the Business Problem:

The project Supply chain Management aims to modernise and revolutionize supply chain management using well-informed, data-driven insights with the help of Qlik. Utilizing advanced analytics, we aim to optimize logistics, forecasting, and inventory management, significantly boosting operational efficiency and responsiveness. This groundbreaking initiative aims to redefine supply chain management by leveraging Qlik's data-driven insights. Through state-of-the-art analytics, our goal is to revolutionize logistics, forecasting, and inventory management, ultimately enhancing operational efficiency and responsiveness to unprecedented levels.

2.2. Business Requirements:

It includes developing a robust data integration strategy to gather and centralize pertinent information from various supply chain sources. It involves harnessing Qlik's advanced visualization capabilities to craft intuitive, dynamic dashboards, offering stakeholders clear insights across the entire supply chain landscape helping them to make more informed decisions. Utilizing Qlik's sophisticated analytics tools to examine historical logistics data, detect trends, and streamline transportation routes. To implement real-time tracking and monitoring solutions to enhance visibility into goods movement, slashing lead times and trimming transportation expenses. To deploy real-time analytics to support agile decision-making in response to unexpected events or shifts in demand, ensuring a proactive and adaptable supply chain approach.

2.3. Literature Survey:

A review of current literature on revolutionizing supply chain management through data-driven insights and advanced analytics reveals a growing body of research and scholarly articles dedicated to similar initiatives. This body of work underscores the increasingly acknowledged role of data analytics in reshaping traditional supply chain processes. Researchers emphasize the effectiveness of utilizing advanced analytics of Qlik to improve visibility and decision-making within supply chain operations.

The literature highlights significant benefits in terms of optimizing logistics, improving forecasting accuracy, and enhancing efficiency in inventory management. Furthermore, it explores a wide range of analytical techniques and technologies driving data-driven transformations in supply chains across various industries. Successful case studies demonstrate marked enhancements in operational efficiency and responsiveness.

Moreover, the literature dives into the complexities and opportunities associated with adopting data-driven insights in supply chain contexts. It emphasizes the necessity for organizations to establish robust data governance frameworks and foster a data-centric culture to fully harness the potential benefits of advanced analytics. Additionally, researchers discuss emerging trends such as the integration of artificial intelligence and machine learning in supply chain analytics, paving the way for further advancements in efficiency and agility.

2.4.Social Impact Analysis:

1.Visualizing Demographic Distribution in Supply Chain Management:

- Developing visual representations to illustrate how different demographic groups are engaged in supply chain management roles.
- Making use of interactive charts and maps to depict regional variations in participation and representation within the supply chain workforce.

2.Impact of Data-Driven Innovations on Social Welfare Programs:

- Conducting a comprehensive analysis to assess how advancements in data-driven approaches within supply chain management have influenced social welfare initiatives.
- Exploring various case studies and empirical data to highlight specific improvements in accessibility, efficiency, and effectiveness of social welfare programs.

3.Enhancing Financial Inclusion through Supply Chain Innovations:

- Investigation of the role of data-driven innovations in enhancing financial inclusion opportunities within supply chains.
- Analyzing correlations between improved supply chain efficiencies and increased access to financial services for underserved communities.

4.Exploring Correlations Between Usage and Social Impact Improvements:

- Examining the statistical relationships between the adoption of data-driven technologies in supply chain management and measurable improvements in social welfare metrics.
- Identification of key indicators such as employment rates, income levels, and access to essential services to substantiate these correlations.

2.5.Business Impact Analysis:

Enhanced Sales Forecasting:

- Data-driven supply chain innovations enable more accurate demand forecasting in banking, telecommunications, and e-commerce.
- This accuracy reduces stockouts and excess inventory, optimizing sales potential and real-time data insights allow businesses to adjust strategies promptly, improving overall sales performance.

Improved Customer Onboarding:

- Utilizing data analytics in supply chain management facilitates faster customer onboarding processes and attracts more new customers.
- Enhanced visibility into inventory and logistics ensures timely product availability.
- Personalized recommendations based on purchase histories and preferences enhance customer experience, increasing retention rates.

Operational Efficiency Gains:

- Automation of supply chain processes through data-driven technologies reduces manual errors and delays.
- Predictive analytics minimize disruptions and streamline logistics, improving overall operational efficiency.
- Enables cost savings through optimized inventory management and logistics leading to better profit margins.

Agility in Response to Market Changes:

- Supply chain operations driven by data insights enable quick adaptation to market fluctuations.
- Businesses can identify emerging trends and consumer preferences early, launching new products and services promptly. This agility enhances provides a competitive advantage to the business in rapidly evolving sectors.

Optimized Resource Allocation:

- Data analytics optimize resource allocation across various stages of the supply chain.
- Businesses in banking, telecommunications, and e-commerce sectors can allocate resources more efficiently based on demand patterns and operational requirements. This leads to reduced wastage and improved cost management.

3.Data Collection:

3.1.Downloading the dataset

The dataset used in this project is obtained from Kaggle using the following link
<https://www.kaggle.com/datasets/shashwatwork/dataco-smart-supply-chain-for-big-data-analysis/data>

The data is used from the above link and then analysed for better understanding of the supply chain management.

3.2.Understanding the Data

- 1.Customer information-Customer details, purchases history
- 2.Product details-ID's, categories, pricing
- 3.Order Summary-ID's, placed and delivery locations, Order total
- 4.Sales data- Sales revenue and figures information
- 5.Logistics- Shipment and delivery information

3.3.Connecting with QlikSense

- 1.After creation of the QlikSense account,the following steps are followed
- 2.Click the Add New button to start creating a New Analytics App
- 3.Download the required dataset from SkillWallet using the above link
- 4.Load this dataset into the QlikSense and now the data is ready to generate meaningful insights.

4.Data Preparation

Preparing data for visualization is like refining raw material into a masterpiece. It involves meticulously cleaning the data to remove any imperfections or gaps, ensuring only the most relevant and accurate information remains. This meticulous process transforms raw data into a refined format that is primed for visualization—like sculpting a rough stone into a polished sculpture.

Once cleaned, the data undergoes exploration—a journey into its depths to uncover hidden patterns and trends. Like an explorer mapping uncharted territory, this phase reveals insights that guide strategic decisions and unveil opportunities previously obscured.

Filtering the data sharpens focus, honing in on specific subsets that hold pivotal significance. It's akin to adjusting a camera lens to capture the essence of a scene—highlighting key elements that tell a compelling story. Preparing this refined data for visualization software is akin to assembling ingredients for a culinary masterpiece. Each component must be meticulously arranged and presented, ensuring clarity and coherence. This meticulous preparation ensures that the data is not only accurate and complete but also structured in a way that effortlessly translates into compelling visual narratives.

Ultimately, this process transforms complex data into a visual feast—an intuitive representation that unlocks insights into performance and efficiency. It's the art of turning data into clarity, empowering decision-makers with a clear view of the landscape ahead.

1.Data collection

- **Objective Definition:** Clearly define the goals and objectives of data collection to guide the process effectively.
- **Method Selection:** Choose appropriate methods (e.g., surveys, interviews, observations) based on research objectives and data requirements.
- **Source Identification:** Determine primary (e.g., surveys, experiments) and secondary sources (e.g., databases, literature) for acquiring data.

2.Data Cleaning

- **Handling Missing Data:** Identify missing values in the dataset, Decide on appropriate methods for handling missing data (e.g., imputation, deletion), Ensure consistency in the approach across the dataset to maintain integrity.
- **Removing Duplicates:** Identify and remove duplicate entries or observations. Verify uniqueness criteria (e.g., based on specific variables) to retain relevant data only.
- **Correcting Inconsistencies:** Standardize formats (e.g., dates, currencies) to ensure uniformity. Resolve discrepancies or errors in data entry (e.g., typos, incorrect values).

3.Data Transformation

- **Normalization:** Adjusts numeric data to a standard scale, typically between 0 and 1 or -1 and 1. Ensures variables with different scales do not disproportionately influence analysis.
- **Standardization:** Rescales data to have a mean of 0 and a standard deviation of 1. Useful for algorithms that assume normally distributed data.
- **Encoding Categorical Variables:** Converts categorical data into numerical format suitable for analysis. Techniques include one-hot encoding, label encoding, and binary encoding.

4.Data Integration

- **Connectivity to Multiple Data Sources:** Qlik Sense supports connectivity to a wide range of data sources including databases (SQL Server, Oracle, MySQL), cloud platforms (AWS, Azure), spreadsheets (Excel), and web services (REST APIs). Integration with enterprise applications such as Salesforce, SAP, and others is also supported through connectors.
- **Data Loading and In-Memory Processing:** Qlik Sense uses an in-memory data model to load and process data for analysis. Data is loaded into Qlik's associative engine, allowing for rapid data exploration and visualization.
- **Source Identification:** Identify and select relevant data sources based on the objectives of integration. Sources can include databases, spreadsheets, APIs, cloud services, and more.

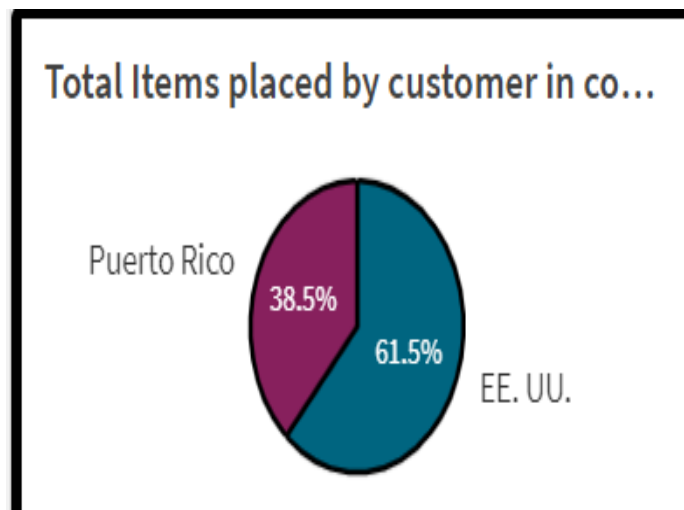
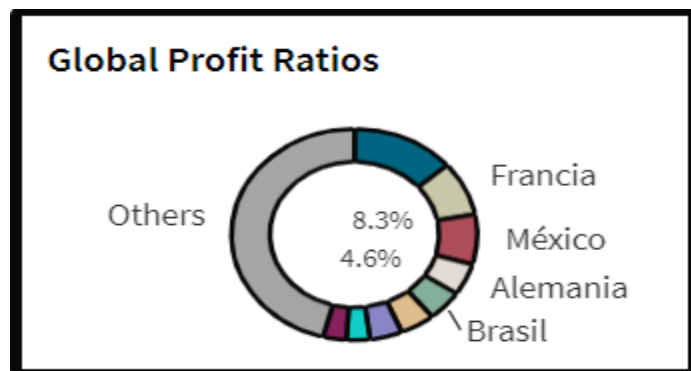
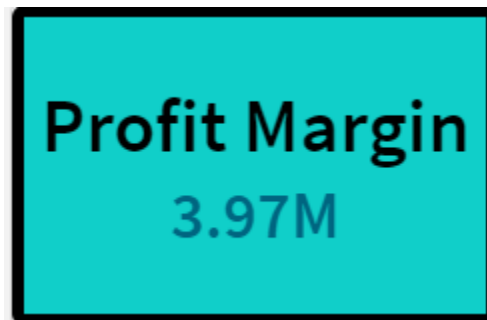
5.Data Modelling

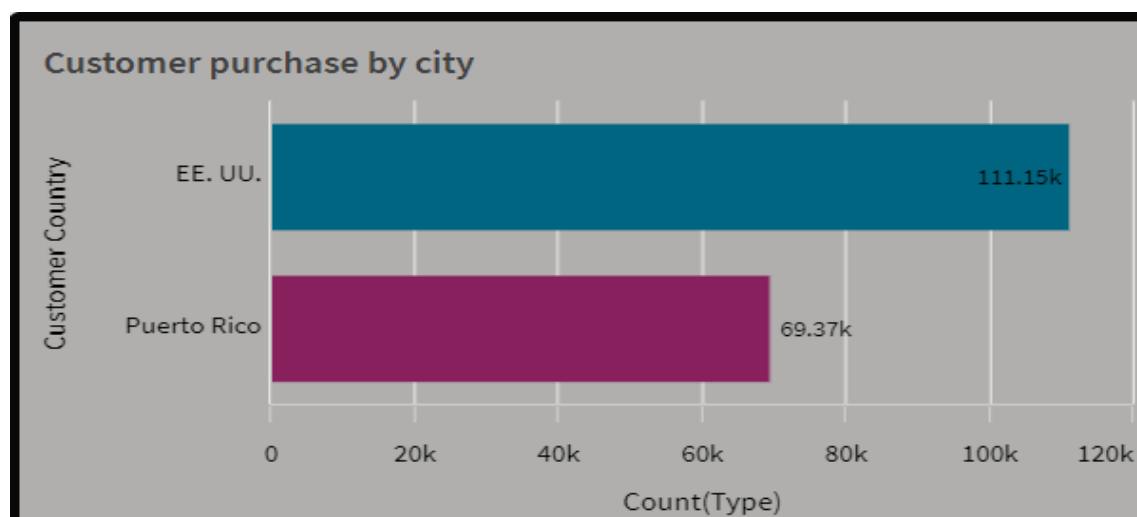
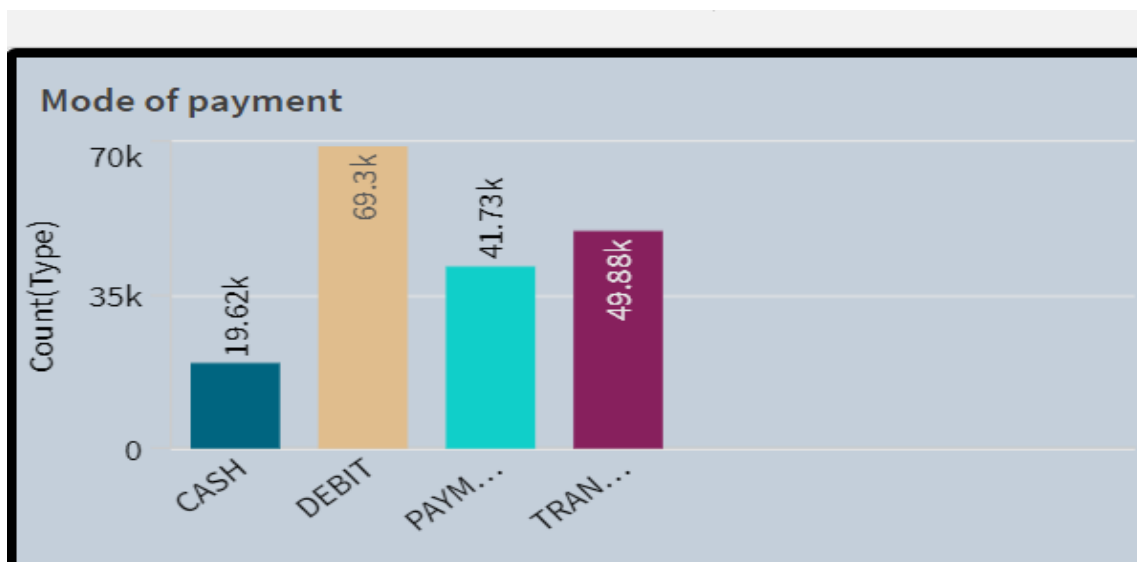
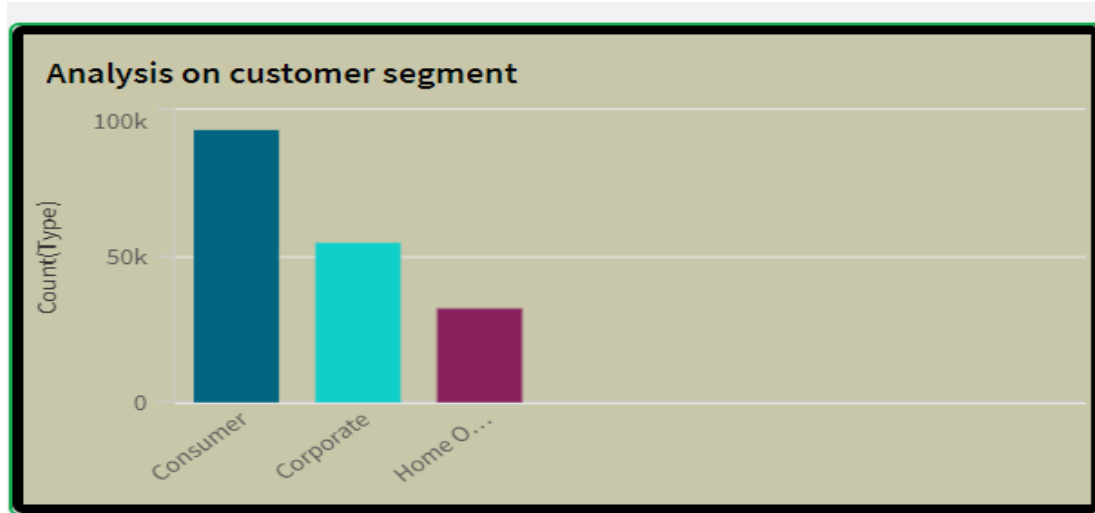
- **Data Loading and Transformation:** Qlik Sense's data load editor (Qlik Scripting) enables users to extract, transform, and load data from multiple sources into Qlik's in-memory data model. Transformations include cleaning data, handling missing values, performing calculations, and creating new fields or aggregations.
- **Data Modeling Techniques:**
 - **Data Concatenation:** Combining tables with similar structures to create a unified dataset.
 - **Link Tables:** Establishing associations between tables using common fields or keys.
 - **Data Reduction:** Optimizing data model size and performance by loading only relevant subsets of data.
 - **Data Compression:** Storing data efficiently in memory to maximize performance.

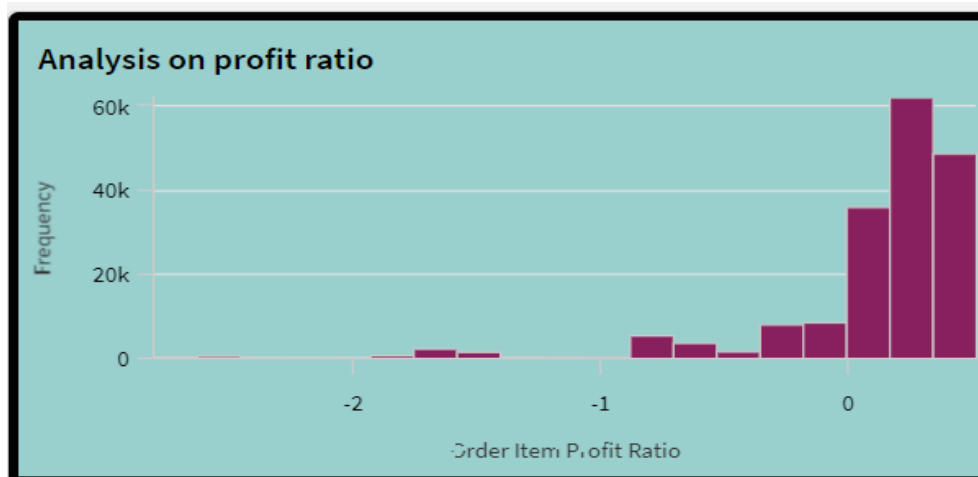
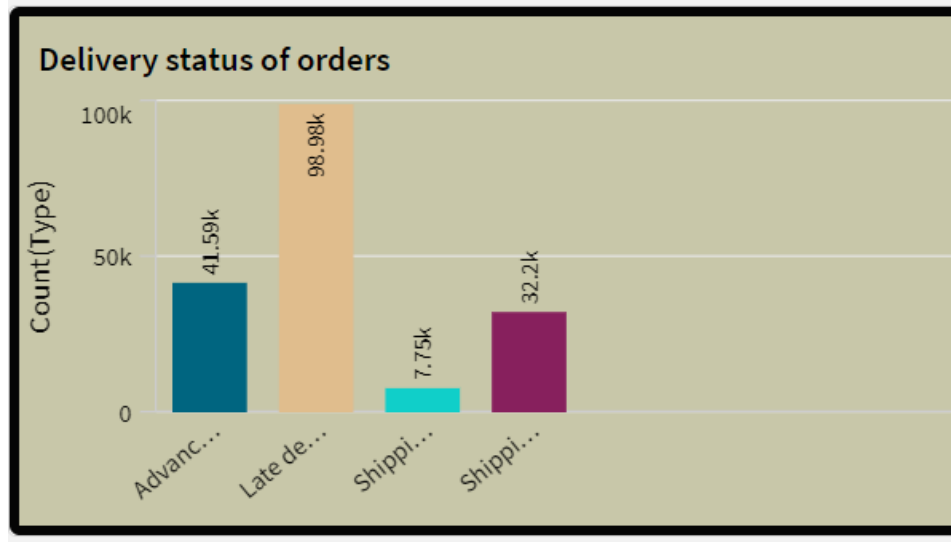
6.Data Visualization

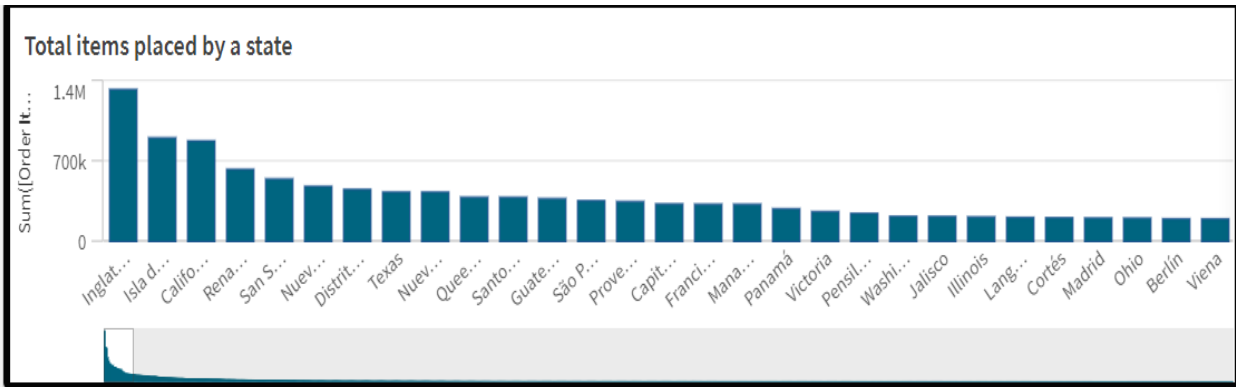
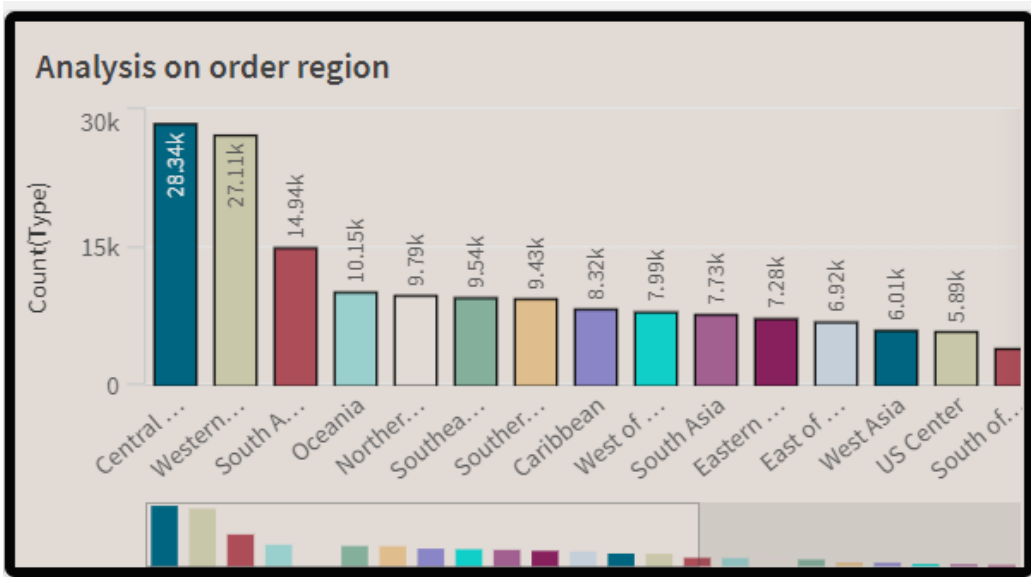
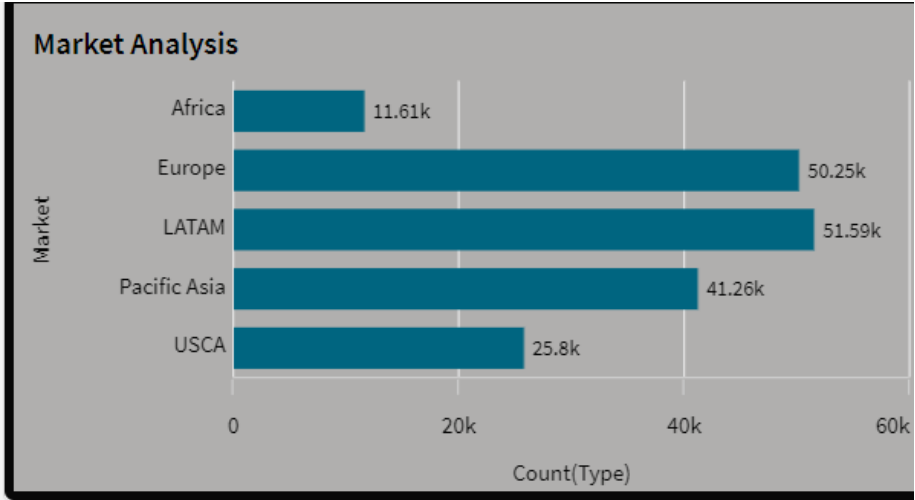
- **Drag-and-Drop Interface:**Qlik Sense provides an intuitive drag-and-drop interface for creating visualizations without requiring extensive programming knowledge.Users can select dimensions (categories) and measures (values) to instantly generate charts, graphs, and tables.
- **Interactive Dashboards:**Visualizations in Qlik Sense are interactive, allowing users to explore data dynamically by clicking, selecting, and filtering data points.Selections in one visualization can dynamically update other related visualizations on the same dashboard.
- **Wide Range of Visualizations:**Qlik Sense offers a variety of visualization types including bar charts, line charts, pie charts, scatter plots, heat maps, and more.Each visualization type can be customized with different colors, labels, and formatting options to convey information effectively.

5.Data Visualization

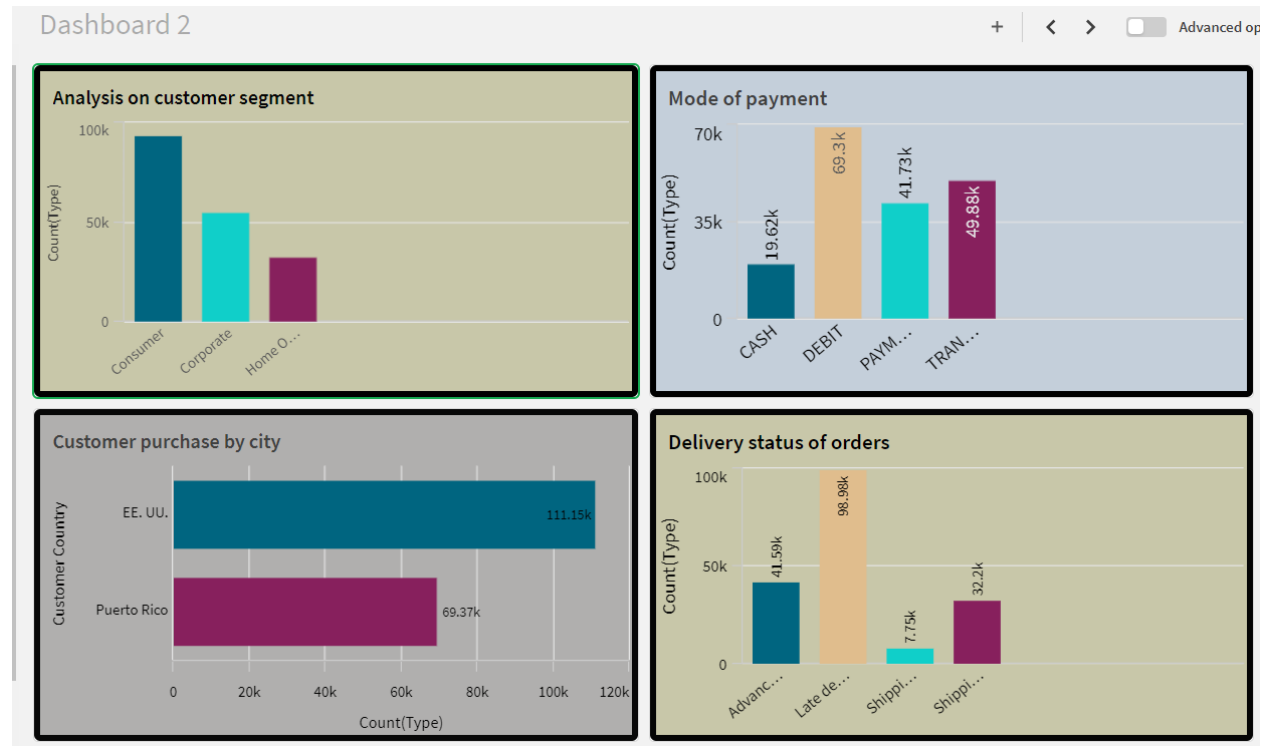
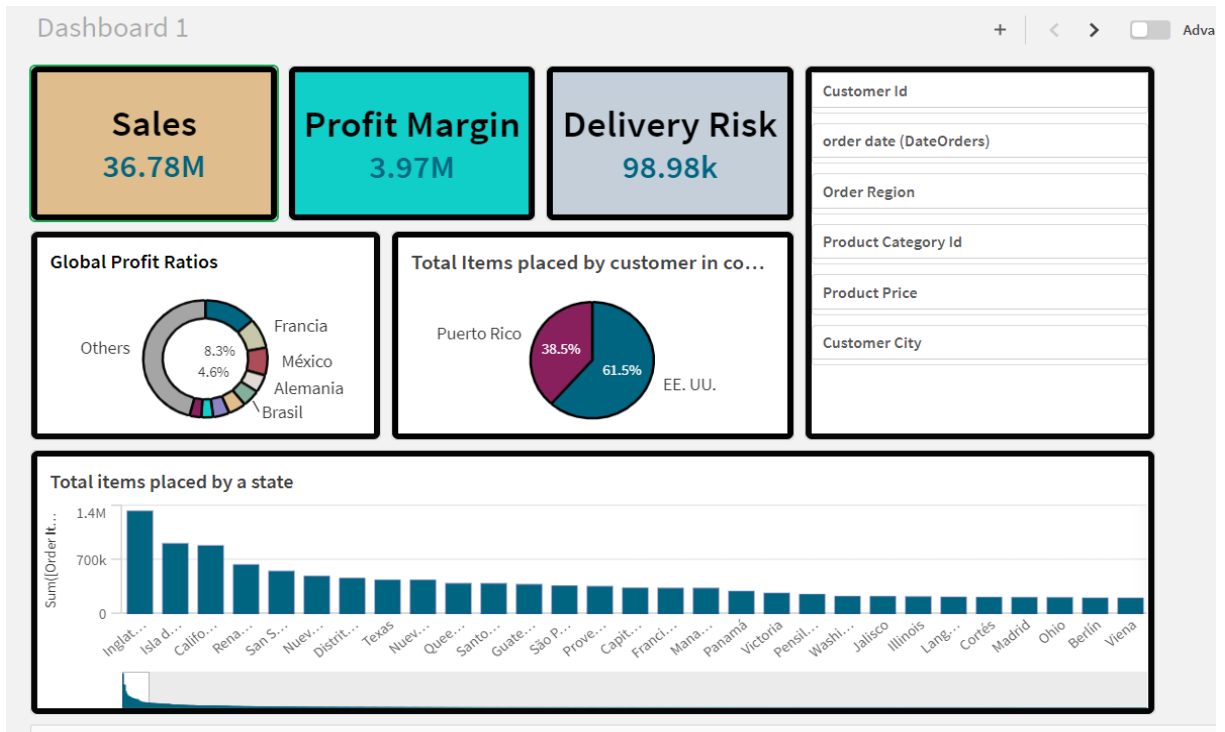




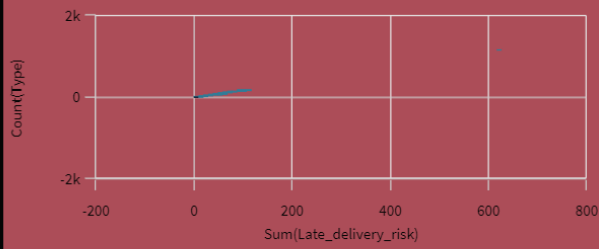




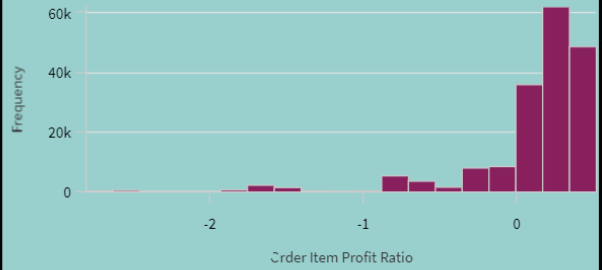
6. Dashboard



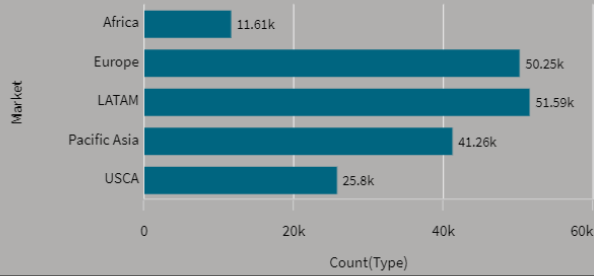
Analysis on benefit per order



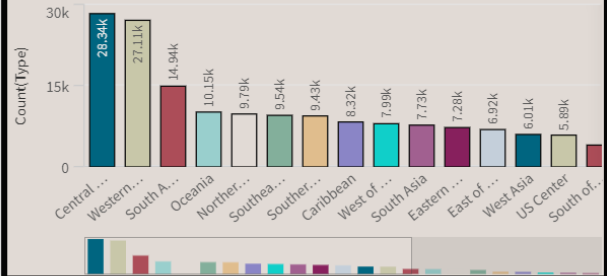
Analysis on profit ratio



Market Analysis

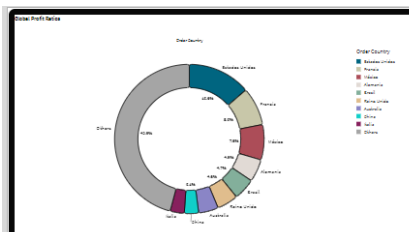
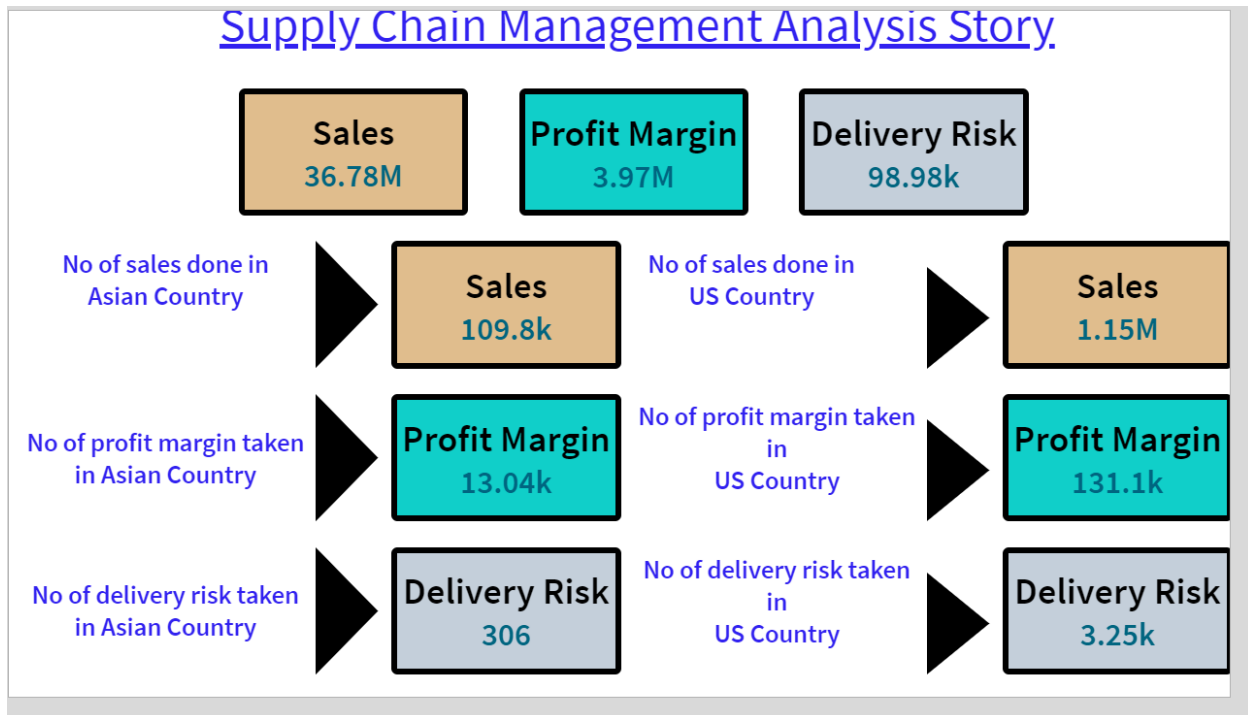


Analysis on order region



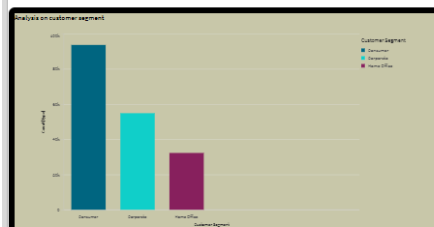
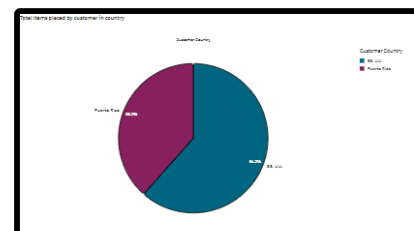
7.Report

Supply Chain Management Analysis Story



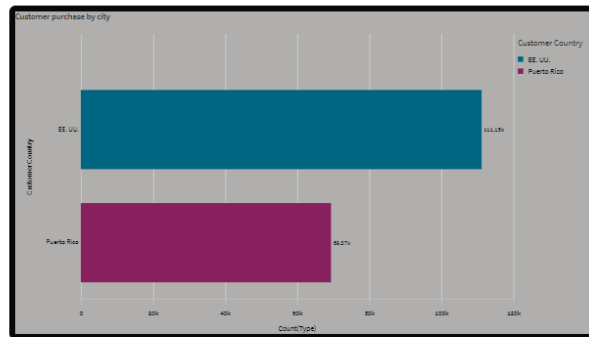
Top 10 countries with highest Profit ratios in supply chain management

Total items placed by customers in country's



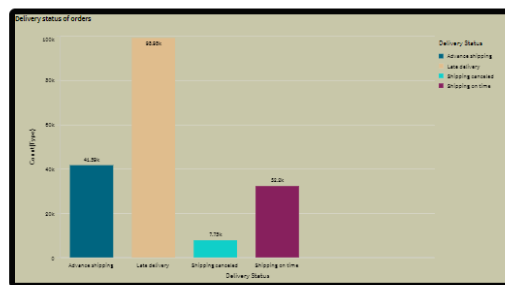
Analyzing customer segments, encompassing consumer, corporate, and home categories

Customer purchase item by city



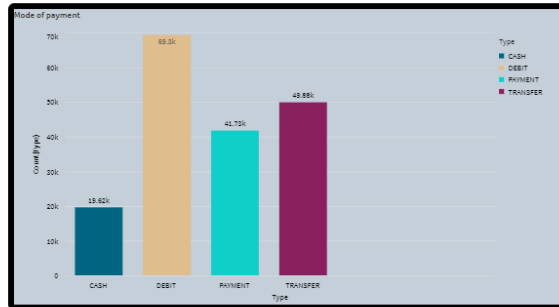
- ✓ Customer Purchase count in Puerto Rico reflects the transactional dynamics in this vibrant location, capturing the local consumer behaviour and market engagement.
- ✓ Customer Purchase count in the United States provides a comprehensive overview of buying patterns across diverse cities.

Delivery status of Orders



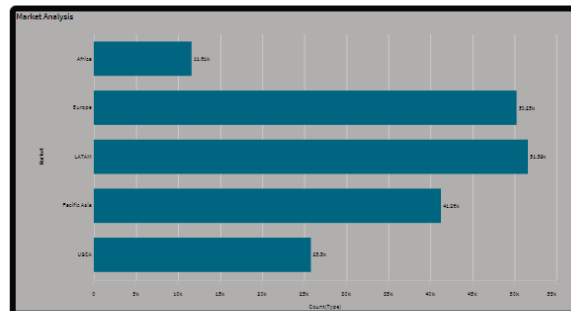
- ✓ Analyzing the delivery status of orders, including Advanced shipping, Late shipping, Shipping cancelled, and Shipping on Time.
- ✓ This allows businesses to evaluate the efficiency of their logistics operations, address potential delays, and enhance customer satisfaction.
- ✓ Ensuring timely and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

Mode of payment for purchase



- ✓ Cash transactions offer immediate liquidity, providing a straightforward 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.

Global Market Analysis



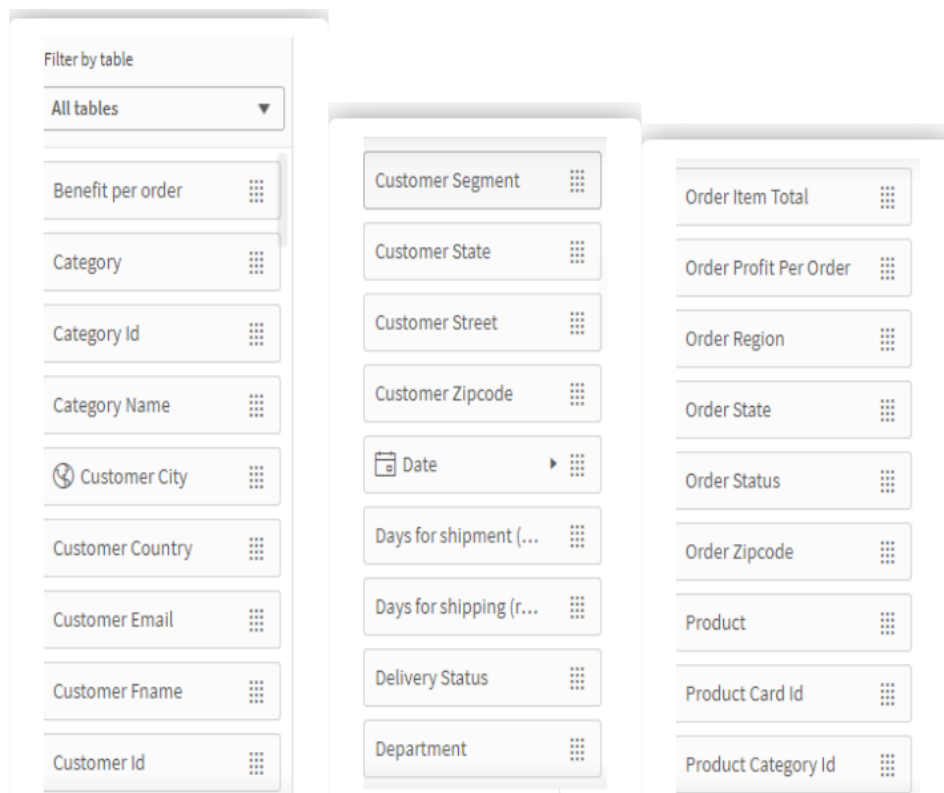
- ✓ Conducting a market analysis across Africa, Europe, LATAM(Latin America), Pacific Asia, and USCA(United States and Canada) enables businesses to gain strategic insights.
- ✓ Regional economic landscapes, consumer behaviors, and market dynamics.
- ✓ This comprehensive assessment supports transformed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

8. Performance Testing

8.1 Amount of Data Loaded

"Amount of data loaded" can be likened to the filling of a reservoir in a vast landscape of information. It represents the culmination of efforts to gather, refine, and channel streams of data into a cohesive body ready for exploration and utilization. In this analogy, each dataset is akin to a tributary, contributing its unique flow of information. The process of loading data is akin to constructing dams and channels, carefully managing the influx to ensure the reservoir's capacity is optimally utilized without overflow or underutilization.

Just as a well-managed reservoir serves multiple purposes—from providing water for agriculture and industry to generating hydroelectric power—so too does the amount of data loaded serve diverse needs. It fuels analytical engines, feeds machine learning algorithms, and supports decision-making across various domains. Ultimately, the amount of data loaded symbolizes readiness—a reservoir brimming with potential insights and innovations, awaiting skilled interpretation and strategic deployment to drive progress and success in the digital age.



8.2 Utilization of Filters

In the realm of Qlik Sense, filters act as adept navigators through the vast seas of data, serving as specialized lenses that focus on extracting the most pertinent insights from the digital ocean. They function as gateways, precisely honing in on specific data subsets that align with predefined criteria, enabling users to unearth patterns, anomalies, and actionable intelligence. In practical terms, within Qlik Sense, filters empower users to manipulate and interact with data dynamically. They enable selective viewing based on dimensions, measures, or custom-defined criteria, facilitating a tailored approach to data discovery and interpretation. This capability not only enhances the efficiency of data exploration but also ensures that insights derived are precise, actionable, and aligned with strategic objectives.

Moreover, the utilization of filters in Qlik Sense is akin to orchestrating a symphony where each instrument plays its part harmoniously. They orchestrate the flow of data, enriching analytical processes and enabling users to navigate complexities with clarity and confidence. Thus, filters in Qlik Sense embody the essence of precision and effectiveness in leveraging data to drive informed decisions and achieve transformative outcomes.

9.Conclusion

In the dynamic orchestra of supply chain management, Qlik Sense emerges as the conductor, orchestrating harmony amidst complexity. It transforms raw data into actionable insights, providing clarity and foresight across the entire supply chain ecosystem. Like a seasoned navigator, Qlik Sense navigates through vast streams of information, uncovering inefficiencies, optimizing logistics, and enhancing decision-making with precision.

By harnessing Qlik Sense's intuitive visualizations and robust analytics, supply chain stakeholders gain a panoramic view of operations—from procurement and production to distribution and customer delivery. This empowered perspective enables proactive adjustments, mitigates risks, and cultivates resilience in response to market fluctuations and operational challenges.

In essence, Qlik Sense revolutionizes supply chain management by transforming data into a strategic asset, fostering agility, efficiency, and competitive advantage. It empowers organizations to synchronize resources, streamline processes, and deliver value seamlessly, ensuring a symphony of efficiency and responsiveness in today's interconnected global marketplace.