Data-Driven Innovations In Supply Chain Management With Qlik Insights

Problem Understanding

In today's highly competitive and rapidly changing market environment, supply chain management has become increasingly complex. Companies face challenges in managing their supply chains efficiently due to the vast amount of data generated from various sources, including suppliers, manufacturers, distributors, and customers. Traditional methods of supply chain management often fall short in providing real-time insights,actionable intelligence, leading to inefficiencies, higher costs, and missed opportunities. This problem statement aims to address the gap between the potential of Qlik Insights and its actual implementation in supply chain management.

Business Requirements

Develop a comprehensive data integration strategy to consolidate relevant data from various supply chain sources into a centralized system. Harness Qlik's sophisticated visualization tools to design dynamic and user-friendly dashboards, offering stakeholders detailed insights across the entire supply chain. Employ Qlik's advanced analytics capabilities to examine historical logistics data, uncover trends, and enhance transportation route efficiency. Establish real-time tracking and monitoring systems to improve the visibility of goods movement, thereby cutting down lead times and transportation expenses. Utilize real-time analytics for rapid decision-making in response to unexpected events or shifts in demand, ensuring a responsive and agile supply chain.

Literature Survey

S.NO	Title of the paper and year	Description	Advantages	Disadvantges
1.	Machine learning for Supply Chain Management: Review and Aplications" by Nguyen et al.(2022)	Comprehensive review of machine learning is applied to various supply chain problems including demand forecasting	Highlights the importance of Machine Learning for improved efficiency	Lacks specific algorithm detail
2.	Big Data Analytics in Supply Chain Management: A Systematic Review and Opportunities for Future Research Nguyen et al.(2022)	Comprehensive Review of Big Data Analytics applications in Supply Chain	Highhlights the benefits of leveraging large scale data sources for decision making in supply chain	Limited discussion on challenges of integrating and processing heterogeneous data sources in supply chain
3.	Predictive Analytics in Supply Chain Management:A ssytematic Review and Future Research Directions by Srinivasan and Dey (2021)	Focuses on applications of predictive analysis techniques,such as machine learning and time series forecasting	Highlights the benefits of predictive analytics for supply chain mangement	Limited coverage of recent developments in deep learning and advanced neural network

Business Impact

1. **Improved Efficiency and Cost Reduction:**
   - Centralizing data and using advanced analytics leads to more efficient operations, reducing waste and operational costs.

- Optimized transportation routes and better inventory management lower logistics and storage expenses.
2. **Enhanced Decision-Making:**
   - Real-time analytics and dynamic dashboards enable quicker, data-driven decisions, enhancing responsiveness to market changes and unforeseen events.
   - Predictive analytics provide accurate demand forecasting, minimizing stockouts and overstock situations.
3. **Increased Supply Chain Visibility:**
   - Comprehensive visibility into the supply chain allows for better monitoring and management, reducing the risk of disruptions.
   - Improved transparency with suppliers and customers fosters stronger partnerships and collaboration.
4. **Risk Mitigation:**
   - Proactive risk assessment and management strategies reduce the impact of supply chain disruptions, ensuring business continuity and resilience.
   - Real-time monitoring systems help identify and address potential issues before they escalate.
5. **Competitive Advantage:**
   - Leveraging Qlik Insights provides a technological edge, allowing companies to stay ahead of competitors through superior supply chain management.
   - Enhanced customer satisfaction from reliable and timely deliveries strengthens brand reputation and loyalty.

Social Impacts:

1. **Sustainability and Environmental Benefits:**
   - Optimized transportation routes and efficient resource management contribute to reduced carbon emissions and a smaller environmental footprint.
   - Better inventory management minimizes waste, promoting sustainability .
2. **Economic Growth:**
   - Efficient supply chain operations can lower product costs, making goods more affordable for consumers.
   - Improved supply chain management supports job creation and economic stability within communities.
3. **Community Well-being:**
   - Reliable supply chains ensure the timely delivery of essential goods, contributing to community well-being and stability.
   - Enhanced transparency and ethical sourcing practices promote fair labor conditions and social responsibility.

4. **Innovation and Skill Development:**
   - The adoption of advanced technologies like Qlik Insights encourages innovation and continuous improvement within organizations.
   - Comprehensive training programs enhance employees' data literacy and analytical skills, fostering a culture of continuous learning and development.
5. **Global Impact:**
   - Efficient and resilient supply chains can better respond to global crises, such as natural disasters or pandemics, ensuring the availability of critical supplies.
   - Collaborative and transparent supply chains promote international trade and economic cooperation, contributing to global economic stability.

Data Collection & Extraction From Database

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.

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.

Understand the data

Data contains all the meta information regarding the columns described in the CSV files Column Description of the Dataset:

- 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 Preparation

Data preparation is a crucial step in ensuring that your data is ready for analysis and visualization in Qlik Insights. Here's a comprehensive guide to preparing your data:

1. **Data Collection:**
   - Identify Data Sources: Determine all relevant data sources, such as ERP systems, CRM systems, supplier databases, logistics platforms, and external datasets (e.g., Kaggle).
   - Data Extraction: Use appropriate tools and connectors to extract data from these sources. Ensure the data is in a compatible format (CSV, JSON, Excel, etc.).
2. **Data Cleaning:**
   - Remove Duplicates: Identify and remove duplicate records to avoid skewed analysis.
   - Handle Missing Values: Address missing data through methods such as imputation, deletion, or using default values.
   - Standardize Formats: Ensure consistency in data formats (e.g., date formats, measurement units).
3. **Data Transformation:**
   - Normalize Data: Standardize data to a common scale without distorting differences in the ranges of values.
   - Aggregate Data: Summarize detailed data into higher-level summaries for easier analysis (e.g., daily sales aggregated into monthly sales).
   - Create Calculated Fields: Derive new metrics from existing data, such as calculating the average delivery time or inventory turnover rates.
4. **Data Integration:**
   - Merge Datasets: Combine data from multiple sources to create a unified dataset. Ensure that key fields (e.g., product ID, customer ID) are correctly aligned.
   - Resolve Inconsistencies: Harmonize conflicting data from different sources to ensure a coherent dataset.
5. **Data Validation:**
   - Verify Data Quality: Check for data accuracy, completeness, and reliability. Validate against known benchmarks or standards.

- Consistency Checks: Ensure that data across different sources and periods is consistent.

6. **Data Enrichment:**
   - Add External Data: Enhance your dataset with additional external data (e.g., market trends, economic indicators) that can provide deeper insights.
   - Geocode Data: For logistics and transportation analysis, add geographical data (latitude, longitude) to addresses.

7. **Data Structuring:**
   - Organize Data: Structure your data in a way that supports efficient querying and analysis. Use star schemas or snowflake schemas as appropriate.
   - Metadata Management: Ensure that all data fields are well-documented with clear definitions and descriptions.

8. **Loading Data into Qlik:**
   - Import Data: Load the cleaned, transformed, and integrated data into Qlik.
   - Data Modeling: Use Qlik's data modeling capabilities to define relationships between different data tables and create a logical data model.

9. **Continuous Monitoring:**
   - Automate Data Updates: Set up automated data extraction and loading processes to keep your data current.

   - Monitor Data Quality: Implement continuous data quality monitoring to catch and address issues promptly.

Prepare The Data For Visualization

Preparing data for visualization involves several key steps: initially, cleaning the dataset to eliminate irrelevant or missing data ensures accuracy and relevance. Transforming the data into a format suitable for visualization software enables clear and insightful presentations of trends and patterns. Exploring the dataset allows for the identification of significant insights that can inform decision-making. Subsequently, filtering the data focuses the analysis on specific aspects, enhancing the clarity and relevance of visualizations. Finally, validating the accuracy and completeness of the data ensures reliable and actionable insights are derived. This systematic approach ensures that data

is not only ready for visualization but also optimized for extracting meaningful performance and efficiency insights.
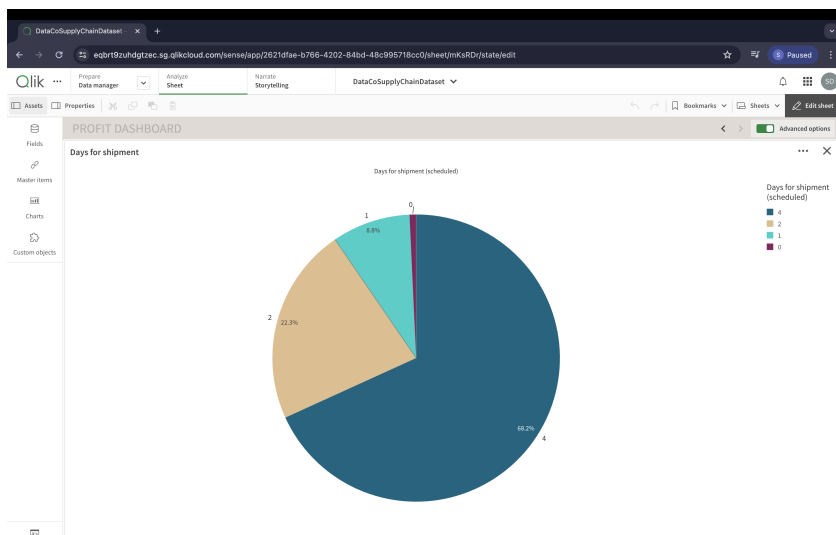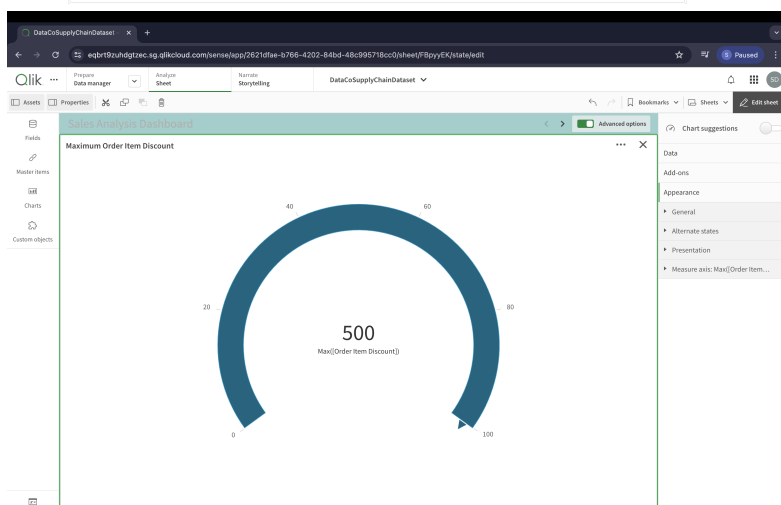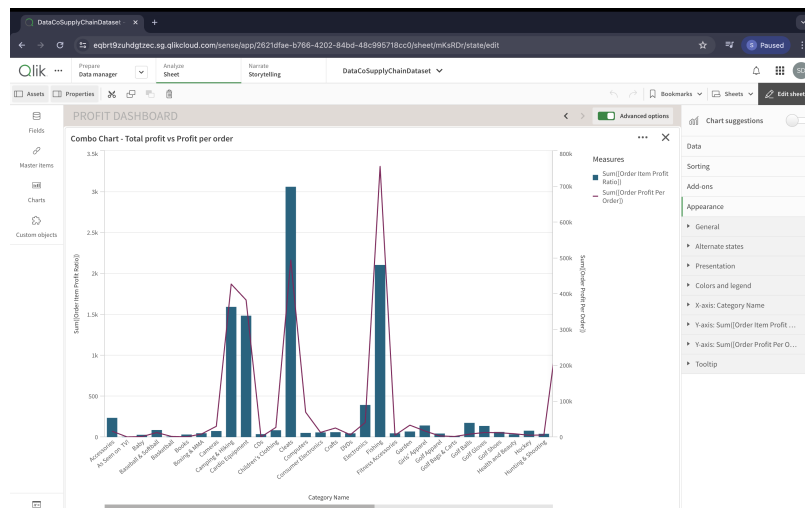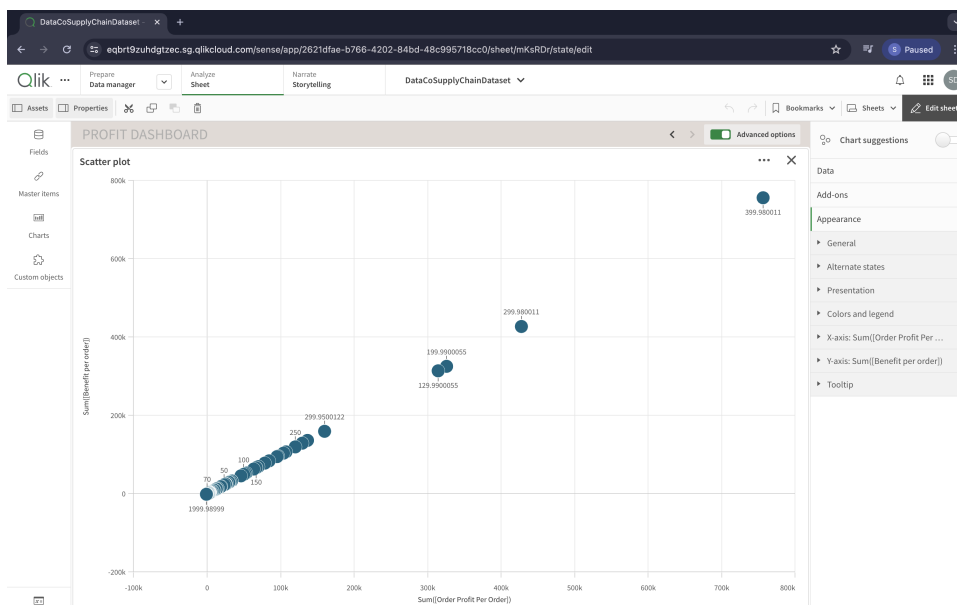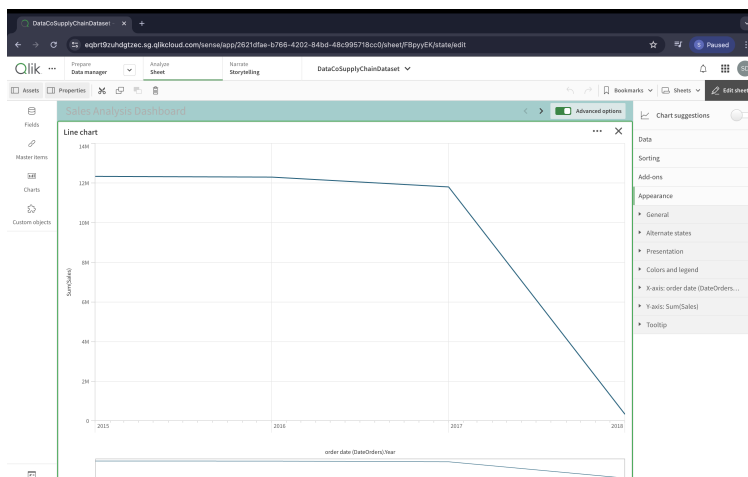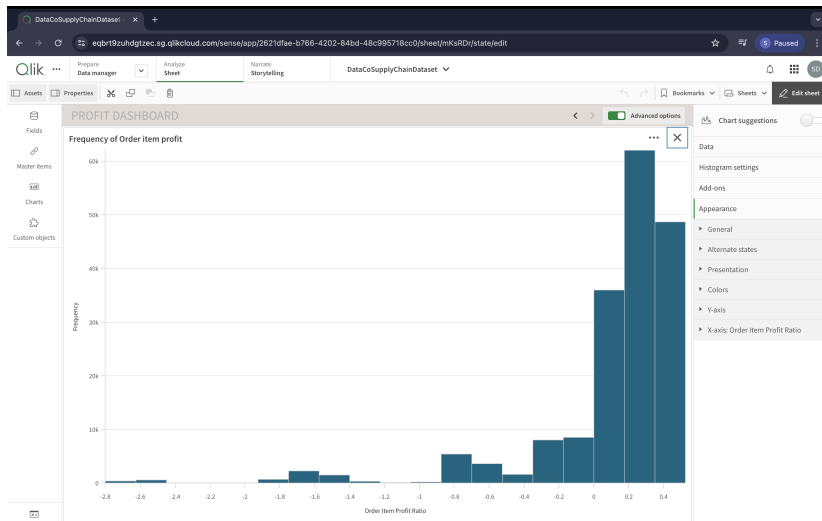
Data Visualization

Data visualization is the practice of translating information into a visual context, such as a map or graph, to make data easier for the human brain to understand and pull insights from. The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets.The term is often used interchangeably with information graphics, information visualization and statistical graphics.Data visualization is one of the steps of the data analysis process, which states that after data has been collected, processed and modeled, it must be visualized for conclusions to be made. Data visualization is also an element of the broader data presentation architecture discipline, which aims to identify, locate, manipulate, format and deliver data in the most efficient way possible.
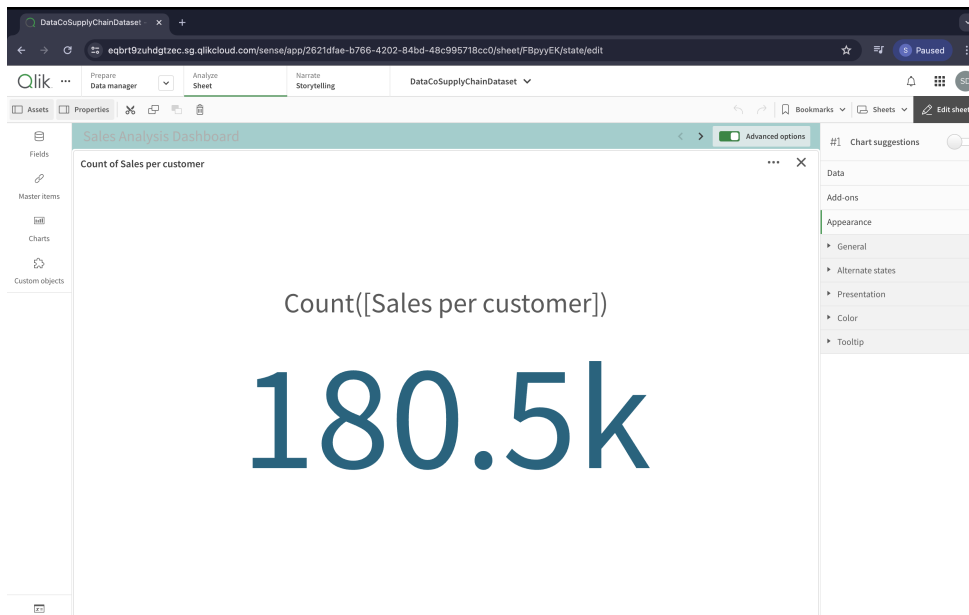
No Of Unique Visualisations

The number of unique visualizations that can be created with a given dataset. Some common types of visualizations that can be used to analyse the performance and efficiency of banks include bar charts, line charts, heat maps, scatter plots, pie charts, Maps etc. These visualizations can be used to compare performance, track changes over time, show distribution, and relationships between variables, breakdown of revenue and customer demographics, workload, resource allocation and location of banks.

These are the following unique visualisations that can be observed in this project for the chosen dataset.

Combo Chart - Total profit vs Profit per order

Maximum Order Item Discount

500
Max([Order Item Discount])

Days for shipment

Days for shipment (scheduled)

Dashboard

A dashboard is a graphical user interface (GUI) that displays information and data in an organized, easy-to-read format. Dashboards are often used to provide real-time monitoring and analysis of data and are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

Dashboards in Qlik Insights are customizable, allowing users to configure widgets such as charts, graphs, tables, and KPIs that visualize data from various sources and perspectives. This enables decision-makers to quickly assess trends, identify anomalies, and drill down into details as needed. By centralizing relevant information and enabling interactive exploration, dashboards facilitate informed decision-making, enhance operational efficiency, and support strategic planning across different

functions within an organization. They play a pivotal role in transforming complex datasets into actionable insights that drive business outcomes and improve overall performance.

The following dashboard looks like this:
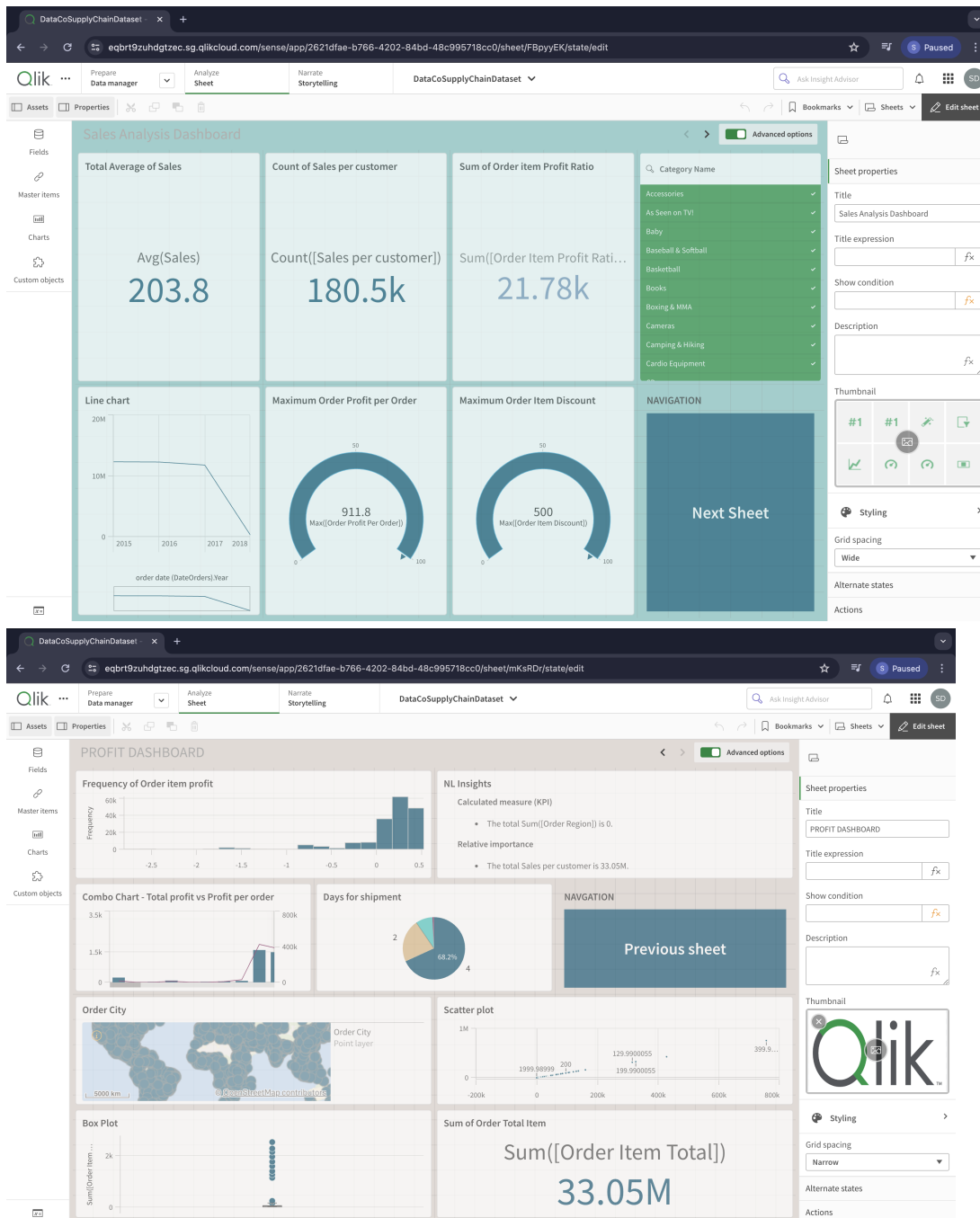
Story

A data story is a methodical approach to presenting data and analysis, structured to captivate and simplify comprehension. It begins with an introduction that contextualizes the data, providing background and relevance. The body of the story systematically unveils the data through logical progression and insightful analysis. It aims to engage the audience by visualizing complex information into clear, meaningful narratives. Concluding the story, key findings are summarized, emphasizing their implications and actionable insights. Data stories can be conveyed through diverse mediums such as reports, presentations, interactive visualizations, and videos, tailored to effectively communicate insights and foster informed decision-making.

The following figures are used to explain the storytelling and narrative:
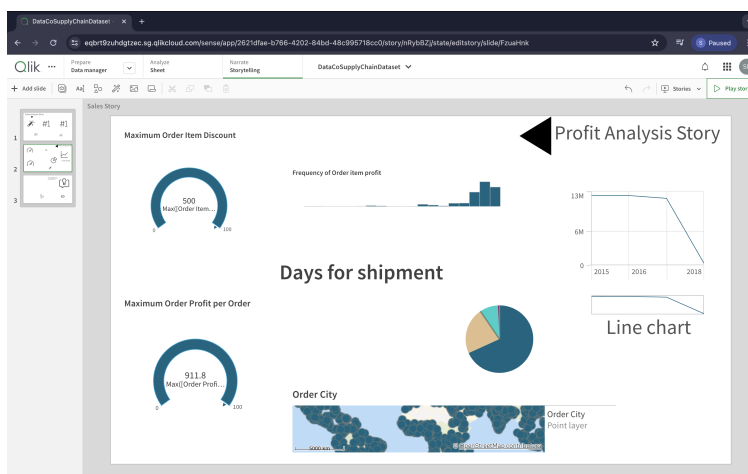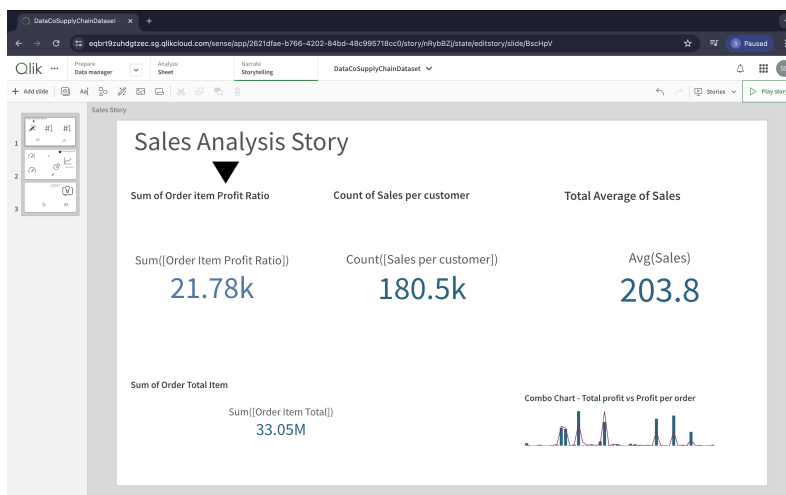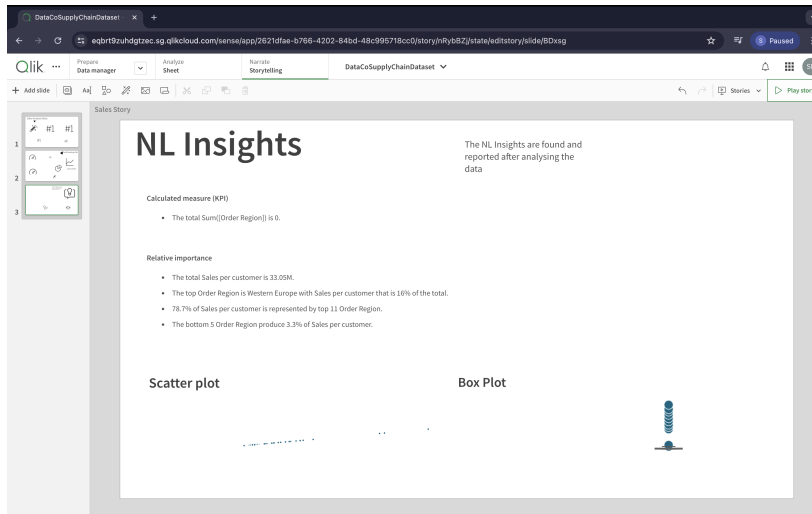
Performance Testing:

Amount Of Data Loaded

"Amount of Data Loaded" describes the total volume of data that has been transferred and stored in a particular system, application, or database. This term quantifies the data that has been successfully ingested and is now available for various operations, such as querying, reporting, and analysis. It reflects the capacity of the system to handle and manage the data influx, ensuring it is ready for users to interact with and derive insights. The measure is crucial for understanding the system's performance and readiness for data-driven tasks, indicating the scope of data available for operational or strategic purposes.

Left Panel

Search

Filter by table

All tables ▼

- Benefit per order
- Category Id
- Category Name
- 🌐 Customer City
- Customer Country
- Customer Email
- Customer Fname
- Customer Id
- Customer Lname
- Customer Password
- Customer Segment
- Customer State
- Customer Street

Right Panel

Search

Filter by table

All tables ▼

- Customer Zipcode
- Days for shipment (...
- Days for shipping (r...
- Delivery Status
- Department Id
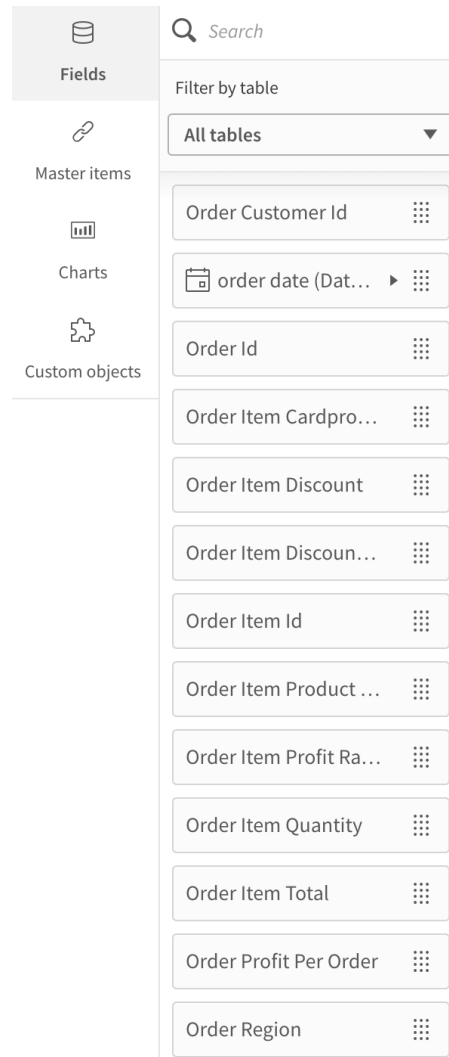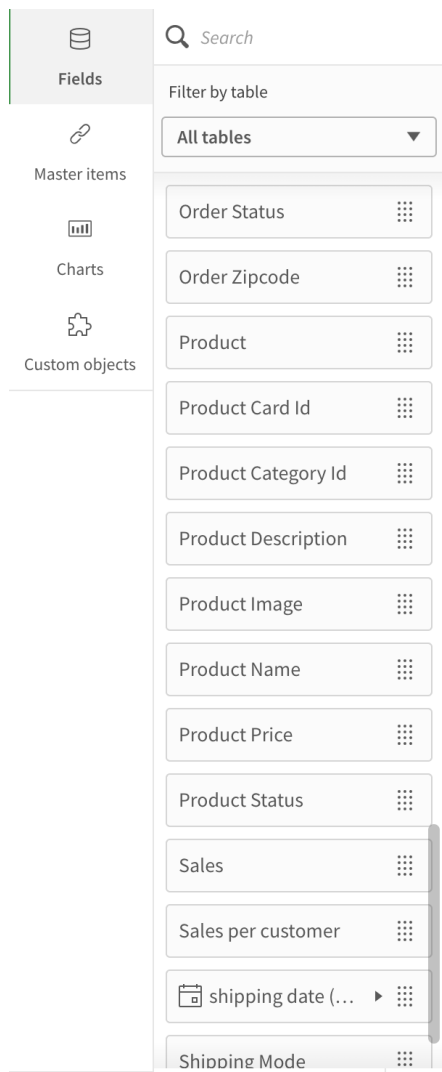- Department Name
- Late_delivery_risk
- Latitude
- Longitude
- Longitude_Latitude
- Market
- 🌐 Order City
- 🌐 Order Country

Fields

Search

Filter by table

All tables ▼

Order Status	⣿
Order Zipcode	⣿
Product	⣿
Product Card Id	⣿
Product Category Id	⣿
Product Description	⣿
Product Image	⣿
Product Name	⣿
Product Price	⣿
Product Status	⣿
Sales	⣿
Sales per customer	⣿
📅 shipping date (… ▶	⣿
Shipping Mode	⣿

Master items

Charts

Custom objects

Fields

Search

Filter by table

All tables ▼

Order Customer Id	⣿
📅 order date (Dat… ▶	⣿
Order Id	⣿
Order Item Cardpro…	⣿
Order Item Discount	⣿
Order Item Discoun…	⣿
Order Item Id	⣿
Order Item Product …	⣿
Order Item Profit Ra…	⣿
Order Item Quantity	⣿
Order Item Total	⣿
Order Profit Per Order	⣿
Order Region	⣿

Master items

Charts

Custom objects

No Of Visualizations/ Graphs

- Global Profit Ratios
- Total Items placed by customer in country
- Total Items placed by a state

- Analysis on customer segment
- Mode of payment
- Customer purchase by city
- Delivery status of orders
- Analysis on benefit per order
- Analysis on profit ratio
- Market Analysis
- Analysis on order region

Conclusion

In conclusion, data-driven innovations in supply chain management, powered by Qlik Insights, represent a transformative approach to enhancing efficiency, transparency, and decision-making within the supply chain. By leveraging advanced data integration, real-time analytics, and dynamic visualizations, Qlik Insights enables organizations to gain comprehensive visibility into their supply chain operations. This facilitates proactive management of inventory, optimization of transportation routes, and effective risk mitigation. The use of predictive analytics and real-time monitoring empowers businesses to anticipate and respond to market demands and disruptions swiftly. Ultimately, the integration of Qlik Insights into supply chain management leads to reduced operational costs, improved customer satisfaction, and a more resilient and agile supply chain, positioning organizations to thrive in a competitive and rapidly changing market environment.