Data-Driven Innovations in Supply Chain Management with Qlik Insights -Yaswanth Teja Yarlagadda

Define Problem / Problem Understanding

1. Specify The Business Problem-

In the rapidly evolving landscape of global commerce, effective supply chain management is critical for maintaining competitiveness, efficiency, and customer satisfaction. Businesses face numerous challenges in their supply chains, including demand forecasting inaccuracies, inventory management inefficiencies, logistical bottlenecks, and suboptimal supplier performance. These issues can lead to increased operational costs, delayed deliveries, stockouts, and ultimately, a decline in customer trust and loyalty.

Despite the abundance of data generated across various stages of the supply chain, many organizations struggle to harness this data effectively to drive informed decision- making. Traditional supply chain management systems often lack the advanced analytical capabilities needed to process and analyze large volumes of data from disparate sources in real time. Consequently, decision-makers are unable to gain the actionable insights required to optimize their supply chain operations.

To address these challenges, there is a pressing need for innovative solutions that leverage advanced data analytics and visualization tools. Qlik, a leading provider of business intelligence and data visualization software, offers powerful tools for extracting meaningful insights from complex datasets. By integrating Qlik's insights intosupply chain management, businesses can transform raw data into actionable intelligence, enabling them to identify inefficiencies, predict future trends, and make data-driven decisions that enhance overall supply chain performance.

2. Business Requirements-

To address the specified business problem and enhance supply chain management through data-driven innovations with Qlik, the following business requirements must be met:
Data Integration and Management:
Integrate data from various sources within the supply chain, including ERP systems,

warehouse management systems, transportation management systems, and supplier databases.Ensure data accuracy, consistency, and timeliness by implementing robust data cleansing and validation processes.Establish a centralized data repository to store and manage all supply chain data securely.

Advanced Analytics and Visualization:

Utilize Qlik's advanced analytics capabilities to analyze large volumes of supply chain data in real time.Develop interactive and intuitive dashboards that provide a comprehensive view of key supply chain metrics, such as inventory levels, order fulfillment rates, lead times, and supplier performance.Implement predictive analytics to forecast demand, identify potential disruptions, and optimize inventory levels.

Performance Monitoring and Reporting:

Create automated reporting mechanisms to generate regular and ad-hoc reports on supply chain performance.Provide customizable alerts and notifications to inform stakeholders of critical issues, such as low inventory levels, delayed shipments, and supplier non-compliance.Enable drill-down capabilities in reports and dashboards to allow users to explore data at granular levels and identify root causes of issues.

User Accessibility and Training:

Ensure that the Qlik platform and associated dashboards are accessible to all relevant stakeholders, including supply chain managers, procurement officers, logistics coordinators, and senior executives.Develop user-friendly interfaces that require minimal technical expertise to navigate and interpret data.Provide comprehensive training and support to users to maximize the adoption and effective use of Qlik tools in their daily operations.

Scalability and Flexibility:

Design the solution to be scalable, accommodating future growth in data volume and complexity.Ensure the flexibility to adapt to changing business requirements and incorporate new data sources and analytical models as needed.Implement modular components that can be easily updated or replaced without disrupting the overall system.

Security and Compliance:

Implement robust security measures to protect sensitive supply chain data from unauthorized access and breaches.Ensure compliance with relevant data protection regulations and industry standards, such as GDPR and ISO 27001.Provide audit trails and access controls to monitor and manage user activities within the system.

Continuous Improvement:

Establish a feedback loop to continuously gather input from users on the effectiveness and usability of the Qlik-based solutions.Regularly update and refine analytics models,

dashboards, and reports based on user feedback and evolving business needs.Monitor advancements in data analytics technologies and integrate relevant innovations to maintain a competitive edge in supply chain management.

3. Literature Survey-

Data analytics is essential for enhancing supply chain efficiency and effectiveness. The ability to process and analyze large datasets leads to significant improvements in various aspects of supply chain management, including inventory management, demand forecasting, and supplier performance. Advanced analytics tools, such as Qlik, offer substantial benefits by enabling real-time data visualization, predictive analytics, and advanced reporting. These tools help organizations identify inefficiencies and optimize supply chain processes, resulting in cost reductions and improved service levels.The implementation of Qlik in various industries has demonstrated significant improvements in supply chain metrics. Case studies have shown that Qlik's capabilities in integrating disparate data sources and providing real-time insights are critical for proactive decision-making, leading to reduced inventory levels and increased on-time deliveries. However, organizations often face challenges in effectively utilizing their supply chain data. Common issues include data silos, poor data quality, and insufficient analytical skills among staff. These challenges highlight the need for robust data integration and user-friendly analytical tools to overcome barriers to effective data utilization.

4. Social Or Business Impact-

The implementation of data-driven innovations in supply chain management, particularly through the use of advanced analytics tools like Qlik, can have profound social and business impacts.

Business Impact

From a business perspective, leveraging data analytics in supply chain management can lead to significant improvements in operational efficiency and cost reduction. Real-time data visualization and predictive analytics enable organizations to identify inefficiencies, optimize inventory levels, and improve demand forecasting accuracy. This not only reduces excess inventory and associated holding costs but also minimizes stockouts and ensures better product availability, enhancing customer satisfaction. Additionally, by streamlining logistical operations and improving supplier performance, businesses can achieve faster delivery times and increased service levels, leading to a

competitive advantage in the market. The integration of advanced tools like Qlik facilitates proactive decision-making, allowing companies to respond swiftly to disruptions and market changes, thereby maintaining a resilient supply chain.

Social Impact

The social impact of these innovations is also significant. Improved supply chain efficiency can lead to more sustainable practices by reducing waste and optimizing resource usage. For instance, better demand forecasting and inventory management reduce the risk of overproduction and excess inventory, which can lead to waste. Enhanced logistical planning and routing can lower fuel consumption and emissions, contributing to environmental sustainability. Furthermore, the ability to quickly adapt to disruptions ensures the consistent availability of essential goods, which is particularly crucial in times of crisis, such as natural disasters or pandemics. This reliability can improve the quality of life by ensuring that critical supplies, such as food, medicine, and other necessities, are readily available to communities in need.

Data Collection & Extraction From Database-

Data Collection

Data collection involves gathering relevant supply chain data from various sources, such as ERP systems, warehouse management systems, transportation management systems, and supplier databases. This step ensures that all necessary information is captured to provide a comprehensive view of the supply chain.

Data Extraction

Data extraction entails retrieving and transforming the collected data into a usable format for analysis. This process involves cleaning and validating the data to ensure accuracy and consistency, enabling effective integration into analytics tools like Qlik.

Understand The Data

The dataset provided in CSV format encompasses comprehensive meta-information pertaining to diverse aspects of the supply chain process. Each column within the dataset delineates a specific attribute crucial for understanding and analyzing the supply chain dynamics. For instance, columns like "Days for shipping (real)" and "Days for shipment (scheduled)" furnish insights into the actual and planned durations, respectively, for product shipment preparation and delivery. "Benefit per item" denotes the profit accrued per product, while "Sales per customer" quantifies the number of products purchased by individual customers. Other columns include details on delivery dates, late delivery risk percentages, product categories and identifiers, customer information such as city, country, email, and name, along with their unique identifiers.

Additionally, the dataset encompasses market information, order locations, and customer segmentation. This comprehensive dataset serves as a valuable resource for delving into various facets of the supply chain, facilitating data-driven analysis and decision-making to optimize operational efficiency and enhance customer satisfaction.

Data Preparation

Skill Tags: Data Cleaning, Data Transformation, Data Exploration, Data Filtering, DataPreparation, Data Accuracy.

Data Cleaning in Qlik:

Use Qlik's data modeling capabilities to identify and remove duplicate records from the dataset.

Utilize Qlik's data profiling feature to identify missing values and outliers, and then decide on appropriate actions such as imputation or removal.

Implement data validation checks using Qlik expressions to ensure data integrity.

Data Transformation in Qlik:

Use Qlik's script editor to transform raw data into a format suitable for visualization.

Utilize Qlik's scripting language, QlikView Scripting or Qlik Sense Load Script, to perform various data transformation tasks such as renaming fields, aggregating data, or creating derived fields.

Leverage Qlik's data modeling capabilities to create associations between different tables and optimize data structure for analysis.

Data Exploration in Qlik:

Create dynamic and interactive visualizations in Qlik Sense or QlikView to explore data trends and patterns.

Utilize Qlik's selection capabilities to drill down into specific subsets of data anduncover insights.

Use Qlik's built-in chart types such as bar charts, line charts, scatter plots, and heat maps to visualize different aspects of the data.

Data Filtering in Qlik:

Utilize Qlik's selection tool to filter data based on specific criteria such as time periods, geographical regions, or product categories.

Implement dynamic filters using Qlik expressions to enable users to interactively filter data within visualizations.

Use Qlik's set analysis syntax to create advanced filtering conditions based on complex logic.

Data Preparation in Qlik:

Use Qlik's data load editor to prepare data for visualization by loading and transforming data from various sources.

Leverage Qlik's data modeling capabilities to create optimized data models that facilitate efficient analysis and visualization.

Implement data governance practices within Qlik to ensure data accuracy, consistency, and completeness.

Data Accuracy in Qlik:

Implement data validation checks within Qlik scripts or expressions to ensure the accuracy of loaded data.

Utilize Qlik's data profiling capabilities to identify data quality issues and take corrective actions.

Implement data governance policies and procedures within Qlik to maintain data accuracy over time.

Data Visualization

Skill Tags: Data Visualization, Analytical Thinking, Creativity

The number of unique visualizations that can be created with a given dataset is vast, offering a myriad of possibilities for analysis and interpretation. Common types of visualizations that can be employed to analyze the performance and efficiency of banks include:

Bar Charts: Comparing performance metrics such as revenue, profit, or customer satisfaction across different banks or time periods.

Line Charts: Tracking changes over time in key performance indicators such as loan approvals, deposits, or branch expansion.

Heat Maps: Visualizing the geographical distribution of bank branches or customer demographics to identify areas of high activity or potential growth opportunities.

Scatter Plots: Exploring relationships between variables such as loan amount and default rate, or customer age and account balance.

Pie Charts: Illustrating the breakdown of revenue or market share by product line, service category, or customer segment.
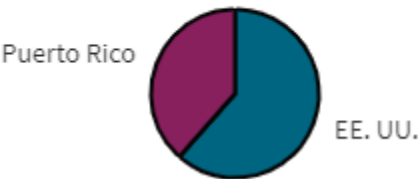
Maps: Geospatial visualizations depicting the location of bank branches relative to customer demographics, competitor locations, or market trends.

These visualizations serve various analytical purposes, including comparing performance, tracking changes over time, showing distribution and relationships between variables, analyzing revenue breakdowns and customer demographics, evaluating workload and resource allocation, and assessing the geographic location of
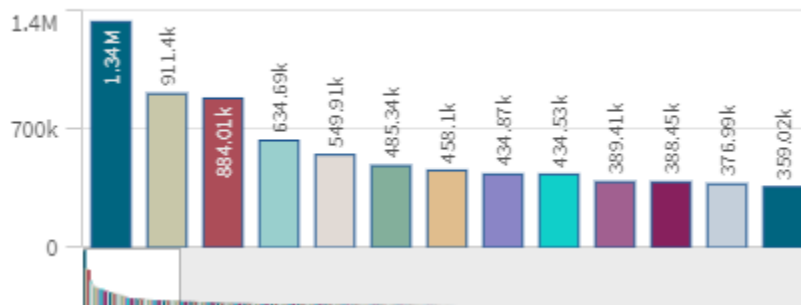
banks in relation to market dynamics. By leveraging these diverse visualization techniques, analysts can gain valuable insights into the performance and efficiency of banks, enabling informed decision-making and strategic planning.
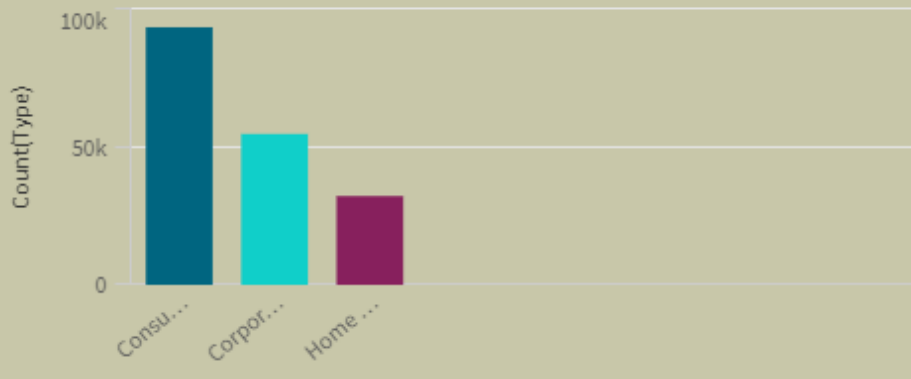
Visualisations-

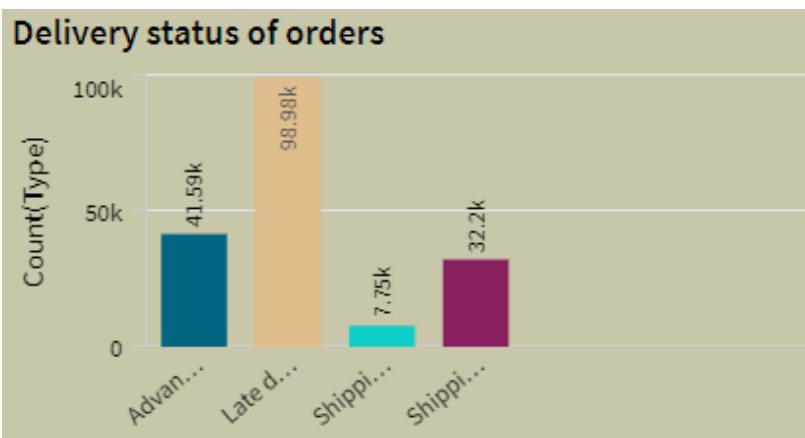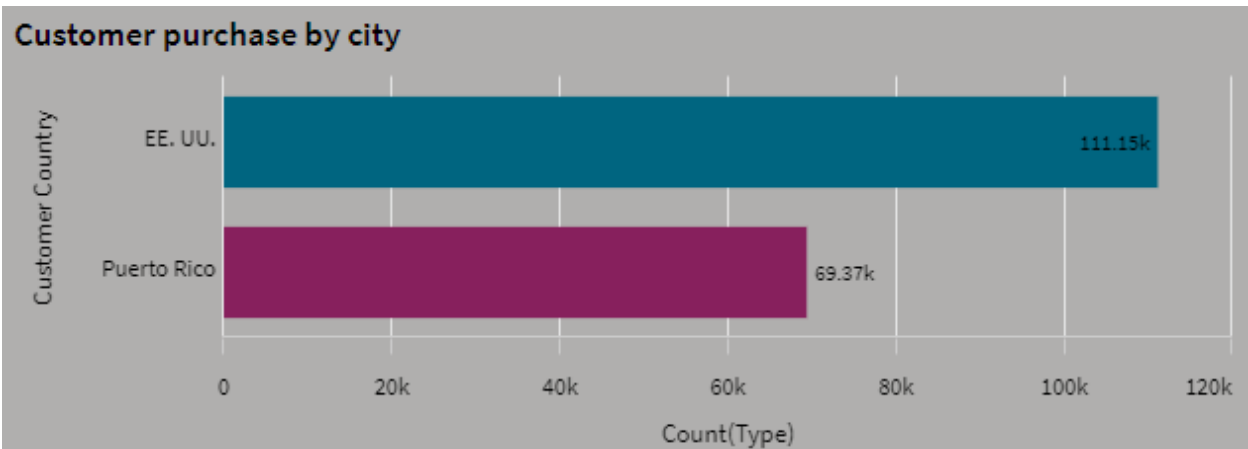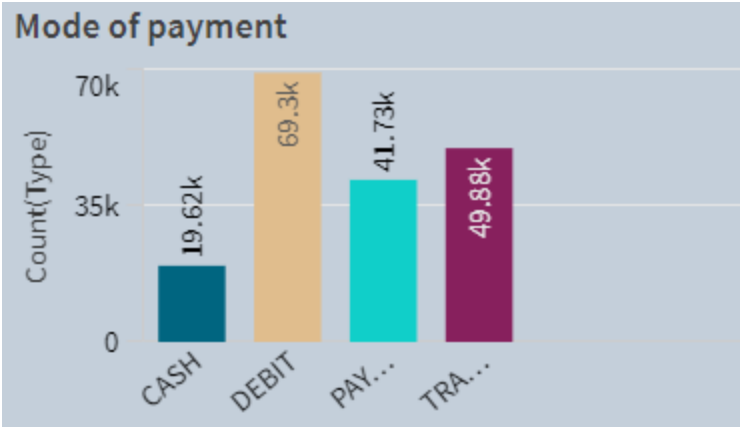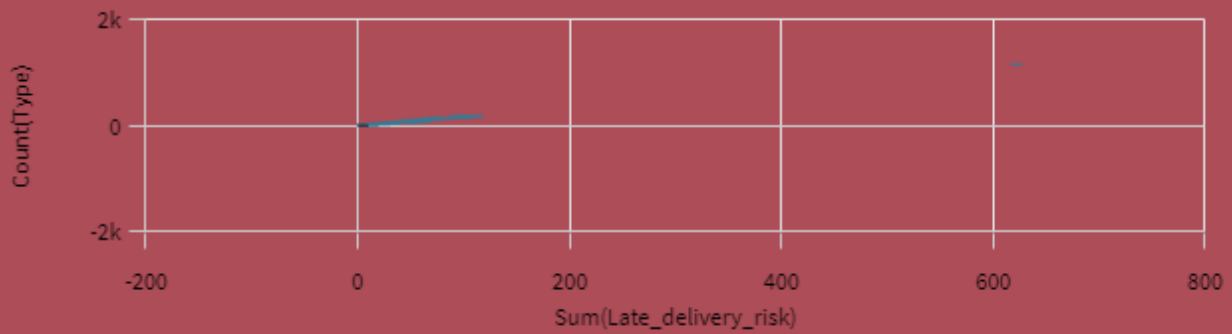## Total Items placed by customer in country

Total items placed by a state

Mode of payment

Mode	Count(Type)
CASH	19.62k
DEBIT	69.3k
PAY...	41.73k
TRA...	49.88k

Customer purchase by city

Customer Country	Count(Type)
EE. UU.	111.15k
Puerto Rico	69.37k

Delivery status of orders

Status	Count(Type)
Advan...	41.59k
Late d...	98.98k
Shippi...	7.75k
Shippi...	32.2k

Analysis on benefit per order

Y-axis: Count(Type), range -2k to 2k
X-axis: Sum(Late_delivery_risk), range -200 to 800

Analysis on profit ratio

Y-axis: Frequency, range 0 to 60k
X-axis: Order Item Profit Ratio, range -2.5 to 0.5

Bar values: 414, 613, 54, 55, 54, 724, 2.29k, 1.54k, 361, 126, 234, 5.44k, 3.65k, 1.64k, 8.06k, 8.54k, 35.99k, 62.05k, 48.69k

Market Analysis

Y-axis: Market
X-axis: Count(Type), range 0 to 60k

| Market	Count(Type)
Africa	11.61k
Europe	50.25k
LATAM	51.59k
Pacific Asia	41.26k
USCA	25.8k
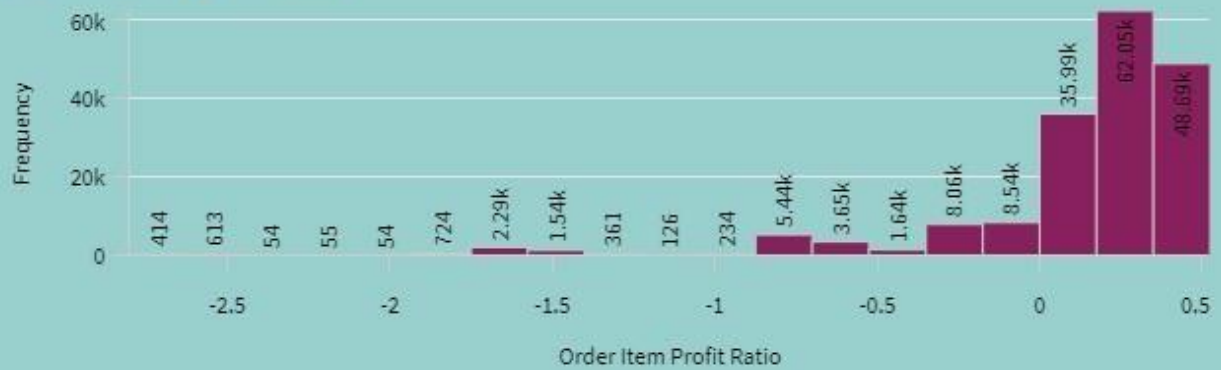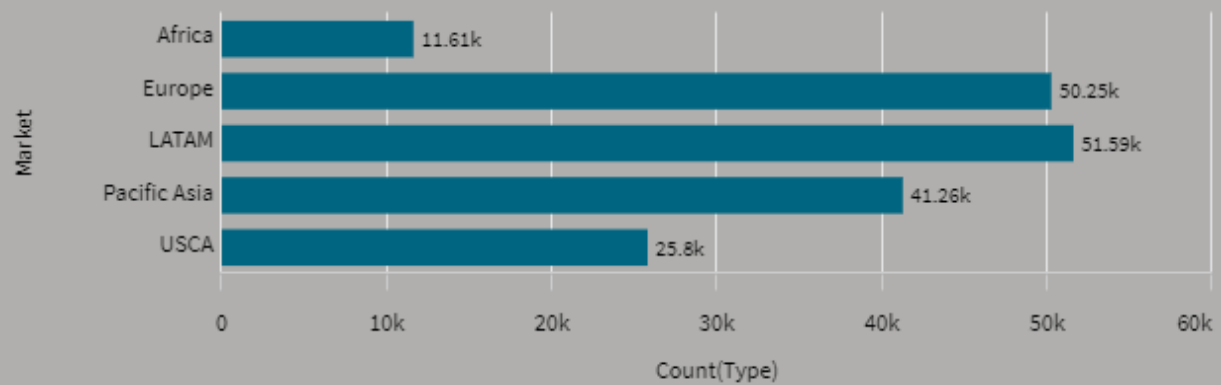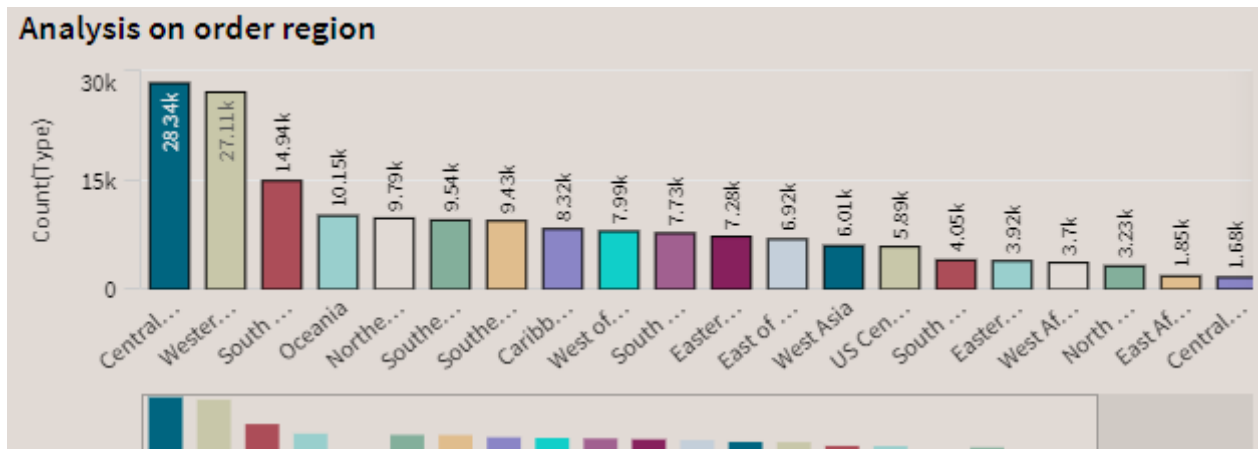
Dashboard

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. They consolidate and visualize complex data sets into concise, user-friendly visuals, facilitating quick comprehension and decision-making.
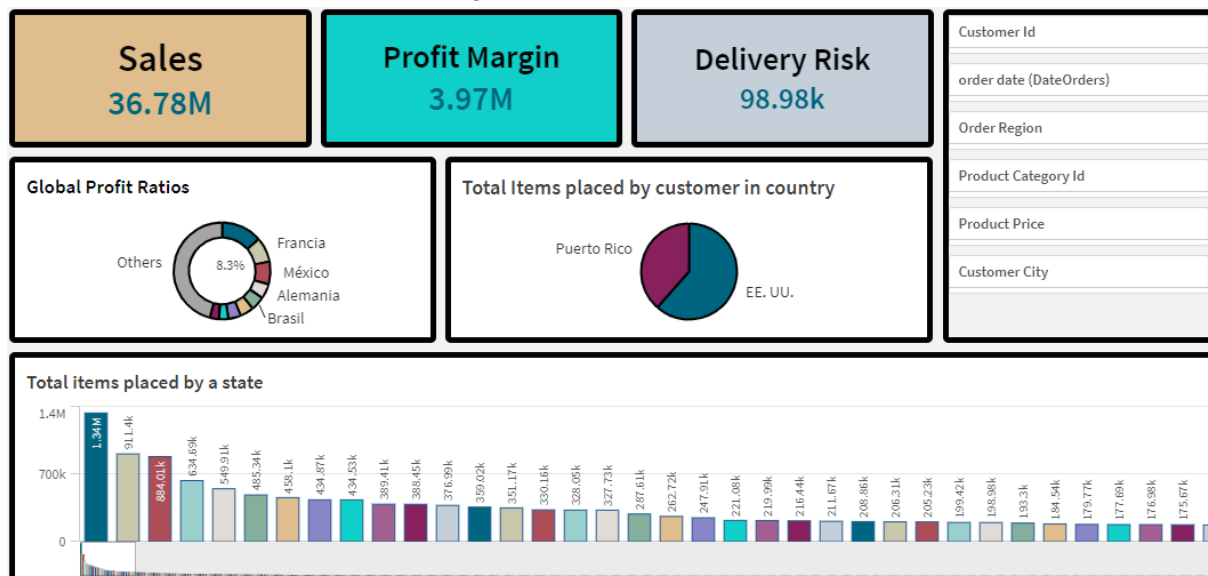
Story

Data Connection and Preparation

The first step in designing the report was to connect to multiple data sources. These included ERP systems, warehouse management systems, and logistics providers. Power BI's robust data connectivity options enabled seamless integration of these diverse data sets. Once the data was connected, it was essential to clean and transform it to ensure accuracy and consistency. This involved removing duplicates, handling missing values, and standardizing data formats. The cleaned and integrated data formed the foundation for all subsequent analysis and visualization efforts.

Visualization Creation

With the data prepared, the next step was to create visualizations that effectively communicate key insights. Various types of charts and graphs were used, including bar charts, line graphs, pie charts, and scatter plots. These visualizations were selected based on their ability to represent specific data points clearly and concisely. For example, bar charts were used to compare inventory levels across different warehouses, while line graphs illustrated trends in order fulfillment times over several months.

Customization and Interactivity

Customization was a critical aspect of the report design. Each visualization was customized to enhance clarity and engagement. This included adjusting color schemes, adding data labels, and ensuring that all elements were easy to read and interpret. Interactivity was also a key feature; filters and slicers were added to allow users to drill down into specific data points, providing a more detailed view of the information. This level of interactivity ensures that the report is not just static but a dynamic tool that users can manipulate to meet their specific needs.

Organizing the Canvas

The visualizations were organized logically on the Power BI canvas to guide the user through the

report intuitively. The layout was designed to follow a narrative flow, starting with a high-level overview and gradually delving into more detailed information. This structure helps usersquickly grasp the most critical insights before exploring more granular data. Sections were clearly defined, with appropriate headings and subheadings, making navigation straightforward.

Formatting for Consistency and Clarity

Consistency in formatting was maintained throughout the report to enhance readability and professionalism. Uniform font styles, sizes, and colors were used across all visualizations and text elements. Consistent use of branding elements, such as company colors and logos, helped reinforce the report's visual identity. Care was taken to ensure that all elements were aligned correctly and that there was ample white space to avoid clutter.

Dashboard Creation

To provide a summarized view of the supply chain data, dashboards were created within Power BI. These dashboards aggregated key metrics and visualizations, offering a quick snapshot of overall performance. Dashboards included KPI indicators, trend analyses, and performance comparisons, making it easy for executives and managers to monitor the supply chain's healthat a glance.

User-Centric Design

Throughout the design process, the needs of the end-users were paramount. Feedback sessions were conducted with key stakeholders to gather input on the report's usability and effectiveness. This feedback was invaluable in iterating on the design, making adjustments to improve the report's functionality and relevance. The goal was to ensure that the report not only looked good but also provided actionable insights that users could leverage to make informed decisions.

Conclusion

The project successfully delivered a comprehensive, interactive Power BI report that significantly enhances supply chain management capabilities. By connecting to various data sources, creating insightful visualizations, and focusing on user needs, the report provides a powerful tool for data-driven decision-making. Continuous iteration based on user feedback will further refine and improve the report, ensuring it remains a vital asset for the organization.

Performance Testing

Skill Set for Data Processing and Visualization in Power BI

Data Collection and Integration: Proficiency in extracting data from various sources, such as ERP systems, warehouse management systems, and logistics providers, and integrating it into Power BI.

Data Cleaning and Transformation: Skills in cleaning data to remove duplicates, handle missing values, and ensure consistency, as well as transforming data into a structured format suitable for analysis.

Data Modeling: Ability to create relational data models in Power BI, defining relationships between tables and organizing data for efficient querying and analysis.

ETL Processes: Expertise in using ETL (Extract, Transform, Load) processes to efficiently load large volumes of data into Power BI, ensuring performance and accuracy.

Visualization Design: Competence in designing and customizing various visualizations such as bar charts, line graphs, pie charts, and dashboards to effectively communicate insights.

Interactivity and Customization: Skills in adding interactivity features like filters and slicers, and customizing visual elements to enhance user engagement and data exploration.

Performance Optimization: Knowledge of optimizing Power BI reports for performance, including techniques for managing large datasets and using data compression.

User-Centric Design: Understanding the needs of end-users, gathering feedback, and iteratingon report designs to improve usability and relevance.

Data Security and Governance: Ensuring data security and compliance with relevant data governance policies while handling sensitive supply chain data.

Collaboration and Communication: Ability to collaborate with stakeholders, gather requirements, and communicate complex data insights in a clear and actionable manner.

Effective data processing and visualization in Power BI require a diverse skill set to handle the complexities of modern supply chain management. Proficiency in data collection and integration is essential, enabling seamless extraction of data from various systems like ERP and warehouse management platforms. Once collected, the data must be meticulously cleaned andtransformed, ensuring it is accurate and consistent. Creating robust data models within Power BI facilitates efficient querying and comprehensive analysis. Expertise in ETL processes is crucial for managing large data volumes, optimizing performance, and ensuring the integrity of the data. Visualization skills are vital for designing interactive and insightful reports that effectively communicate key metrics and trends. Customization and interactivity features enhance user engagement, allowing for dynamic data exploration. Performance optimization techniques ensure the reports remain responsive even with substantial data loads. A user- centric approach, incorporating feedback from stakeholders, ensures the reports meet their needs and drive informed decision-making. Additionally, maintaining data security and adhering to governance policies protect sensitive information. Collaboration and clear communication of insights ensure the project's success, empowering stakeholders to make data-driven decisions that enhance supply chain efficiency and performance.

Filter by table

All tables ▼

Benefit per order   ⠿

Category   ⠿

Category Id   ⠿

Category Name   ⠿

🌐 Customer City   ⠿

Customer Country   ⠿

Customer Email   ⠿

Customer Fname   ⠿

Customer Id   ⠿

Total items placed by a state