Recommendation Engine for E-Commerce Platform

Title: - RecSys360

By: -Team 1

TEAM MEMBERS (Team 1)

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1. MODELING TEAM

The aim of this part is to accurately model the data using specific domains based on different users' shopping habits, preferences, and behaviors while browsing e-commerce platforms. This will help build a recommendation system that enhances user engagement by suggesting products based on their interests and demographic location, ultimately improving the shopping experience and increasing sales.

Product Recommendation System Using Collaborative Filtering with MLP

Overview

This project focuses on creating a personalized product recommendation system for e-commerce. The goal is to suggest products to users based on their past interactions and preferences, enhancing their shopping experience.

Model Description

We used a collaborative filtering approach with a Multi-Layer Perceptron (MLP) model. This model helps predict the ratings that users might give to various products, allowing us to recommend items they are likely to enjoy.

You can explore the project in detail using this [Google Colab link]
https://colab.research.google.com/drive/1v4G6u-vofXc2CQZmJ-CJ0al14dyYXBKg

Key Features of the Model

Collaborative Filtering: Uses user-product interactions to find similarities and make predictions.
MLP Model: A neural network that processes user and product data to predict ratings.
Embeddings: Reduces the dimensionality of user and product data for efficient computation.

Tools & Technologies

Python: Programming language used for developing the model.
Pandas: For data manipulation and analysis.
Scikit-learn: For preprocessing and evaluating the model.
Keras (TensorFlow): For building and training the neural network.
NumPy: For numerical operations.

Google Colaboratory: Development environment, utilizing TPU-V4 for enhanced performance.

MLP Model Architecture

Input Layers: One for user IDs and one for product IDs.
Embedding Layers: Convert user and product IDs into lower-dimensional vectors.
Hidden Layers: Two dense layers with ReLU activation to learn complex patterns.
Output Layer: Produces the predicted rating for a user-product pair.

Data Preprocessing

Data Extraction: Selected relevant columns from the dataset: CustomerID, Product, Rating.
Encoding: Transformed CustomerID and Product into numerical values.
Data Splitting: Divided the data into 80% training and 20% testing sets.
Continuous Ratings: Ensured that ratings were treated as continuous values for better model training.

Model Training

Training Data: Used 80% of the dataset.
Testing Data: Used 20% of the dataset.
Training Parameters:
- Batch size: 64
- Epochs: 10
- Validation split: 20%
- Optimizer: ADAM
- Loss Function: Mean Squared Error (MSE)

Model Performance

Evaluation Metric: Mean Squared Error (MSE) was used to evaluate the model.
Results:
- MSE: 1.93
- Root Mean Squared Error (RMSE): 1.39
- Accuracy (RMSE): 65.31% on the testing set.

```python
import numpy as np
predictions = model.predict([user_ids_test, product_ids_test])
mse = mean_squared_error(ratings_test, predictions)
rmse = np.sqrt(mse)

# The range of ratings
min_rating = np.min(ratings_test)
max_rating = np.max(ratings_test)
rating_range = max_rating - min_rating

#The percentage of error reduction compared to the range of ratings
accuracy_percentage = (1 - (rmse / rating_range)) * 100
print("Accuracy Score (RMSE) on Testing Set:", accuracy_percentage, "%" + " and RMSE is :",rmse)
```

```
707/707 [==============================] - 1s 2ms/step
Accuracy Score (RMSE) on Testing Set: 65.30821912825193 % and RMSE is : 1.3876712348699225
```

Sample Recommendation

To see how the recommendation system works, consider a user who enters a Product ID (e.g., 2) and requests two suggestions. The system predicts and suggests products based on the ratings of similar users.

For example:
Input: Product ID 2 ("6030 3.1 Bluetooth Home Theatre With Remote Control - Black + Free Smartwatch")
Suggestions:
- Product ID: 26, "M4 Smart Bracelet Sports Pedometer Watch"
- Product ID: 5, "Amazon Fire HD 8 Kids Tablet 32GB HDD - 2GB RAM - 8" Blue"

Conclusion & Future Work

```
Enter the Product ID: 2
Enter the number of suggestions you want: 2
2/2 [==============================] - 0s 12ms/step
Based on the Ratings :
Suggested products for product ID 2 (Product: 6030 3.1 Bluetooth Home Theatre With Remote Control - Black + Free Smartwatch):
Product ID: 26, Product Name: M4 Smart Bracelet Sports Pedometer Watch
Product ID: 5, Product Name: Amazon Fire HD 8 Kids Tablet 32GB HDD - 2GB RAM - 8" Blue
```

Conclusion:
- Successfully built a product recommendation system using collaborative filtering with MLP.
- Demonstrated the ability to suggest relevant products based on user input.

Future Work:

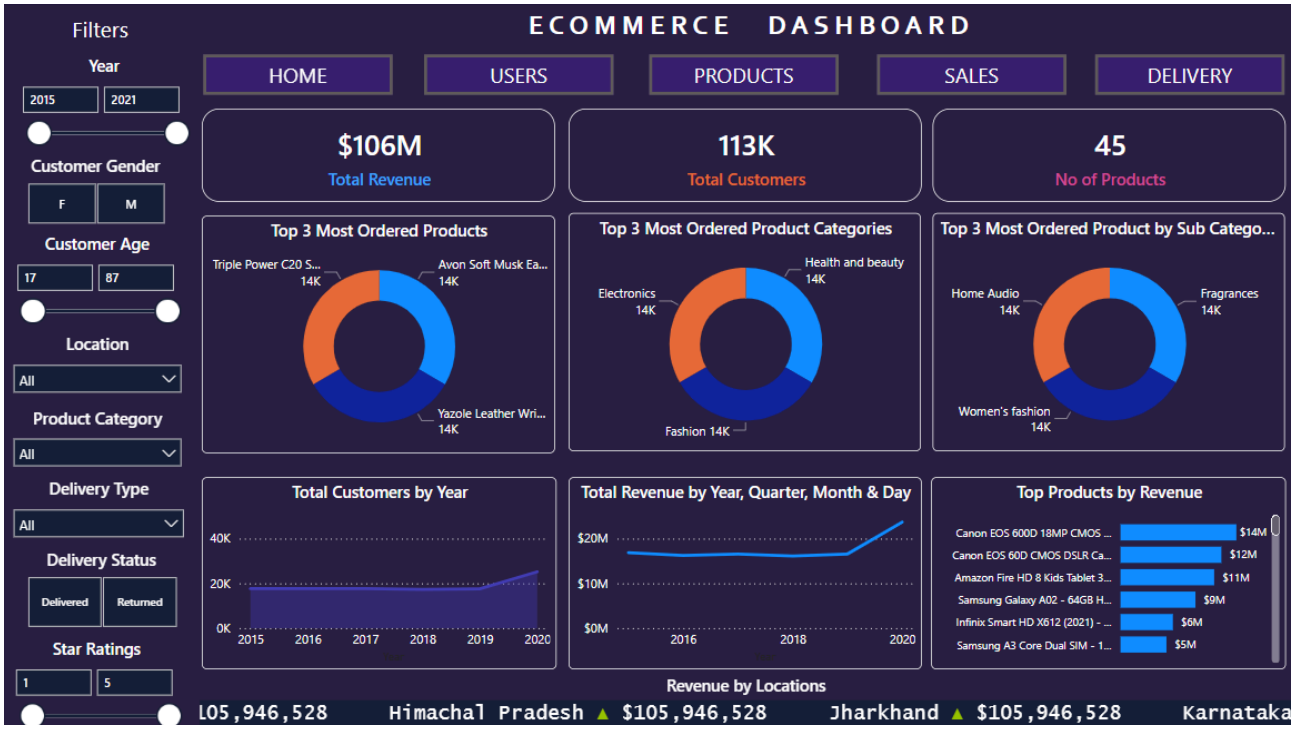
- Additional Features: Incorporate more user information like demographics and product categories.
- Model Experimentation: Try different neural network architectures to improve performance.
- Real-Time Updates: Implement real-time recommendations that update based on user interactions.

This project shows the potential of machine learning in creating effective recommendation systems, enhancing user satisfaction by providing personalized shopping experiences.

DATA VISUALIZATION REPORT

The aim of this part is to correctly visualize certain domains based on different users' shopping habits, preferences, and behaviors while browsing through e-commerce platforms. This will help in building the recommendation system on e-commerce platforms to engage customers by suggesting products based on their preferences. For this, we created a dashboard with multiple pages. Each page has its own importance. Let us see about each page in detail.

1. OVERVIEW



Why this page is needed:

- The Overview page is an essential part of the e-commerce recommendation engine dashboard, offering a concise summary of key metrics and insights from the dataset. It features clear visualizations of top-rated products, user engagement, and detailed trends.
- Users can filter data by year, gender, age, location, product category, delivery type, status, and star ratings to customize their view. The page prominently displays total revenue, total customers, and product count for a quick snapshot of overall performance.
- It highlights the most ordered products, categories, and subcategories, providing insights into popular items and trends. Graphs show customer and revenue trends over time, while a bar chart lists the highest-earning products.
- This comprehensive view of key performance indicators aids in strategic

decision-making and enhances understanding of the e-commerce platform's dynamics.

Cards:

- **Why Cards Are Needed:**

Card visualizations are a crucial element in data dashboards and reports, providing a clear and concise way to present key metrics and highlights at a glance. They offer a quick, clear, and user-friendly way to convey essential data, enabling users to quickly grasp important information without extensive analysis.

1. Total Revenue:

This card displays the total revenue generated by the e-commerce platform. Showing $106M, this metric is vital for understanding the financial performance and overall growth of the platform. It provides a clear snapshot of the total monetary value generated, helping stakeholders gauge the platform's success and profitability.

2. Total Customers:

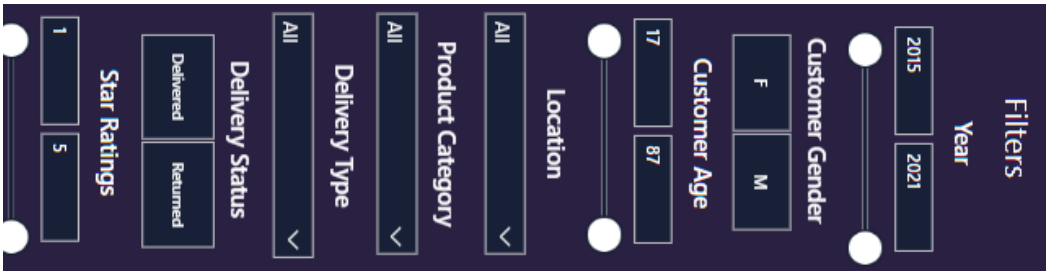
This card shows the total number of customers who have interacted with the platform. With 113K customers, this metric is essential for understanding the size and scope of the user base. It reflects user engagement and reach, indicating how many unique customers have purchased, rated, or interacted with products. This information is crucial for assessing market penetration and customer loyalty.

3. Number of Products:

This card indicates the total number of products available on the platform. Displaying 45 products, this metric provides insights into the diversity and scope of the product catalog. It helps in understanding the range of offerings and inventory size, which is important for inventory management and product strategy.

Filters Panel:

The Filters panel is an essential component of the e-commerce recommendation engine dashboard, providing users with the ability to customize and refine the data displayed according to their specific needs. This panel includes various filtering options that allow users to narrow down the dataset and gain insights from different perspectives.



1. Year: Users can select a range of years to view data for a specific timeframe, aiding trend analysis.

2. Customer Gender: This filter enables gender-specific data segregation for analyzing trends and preferences.

3. Customer Age: Users can specify an age range to focus on age-related trends and target specific demographics.

4. Location: The drop down allows selection of specific locations for regional analysis.

5. Product Category: Users can choose a product category or view all categories for focused analysis.

6. Delivery Type: This filter provides options to select different delivery methods, analyzing their impact on satisfaction and sales.

7. Delivery Status: Users can filter data by delivery status to understand performance and distribution.

8. Star Ratings: This slider allows filtering products based on star ratings, assessing satisfaction and quality.

Top 3 most ordered products :

Why This Chart is Needed:

The Top 3 Most Ordered Products chart is essential for understanding customer preferences and identifying the most popular items. It helps businesses focus on high-demand products for better inventory and promotional strategies.

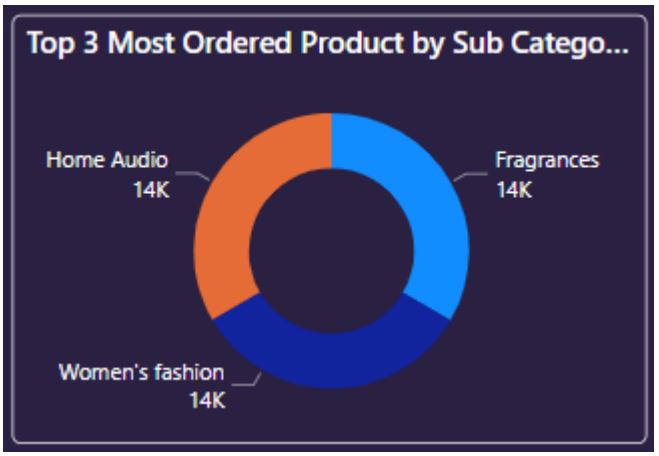
Details:

- Type of Chart: Donut Chart
- Segments: Each segment represents one of the top three most ordered products.
- Labels: Product names with order quantities.
- Values: Orders for each product (14K each).

Result:

The chart shows that "Triple Power C20 S...," "Avon Soft Musk Ea...," and "Yazole Leather Wri..." each received 14K orders, indicating balanced demand and the importance of maintaining stock for these items.

Top 3 most ordered product by sub categories:



Why This Chart is Needed:

This chart identifies the most popular product subcategories, aiding businesses in targeting inventory and marketing strategies effectively.

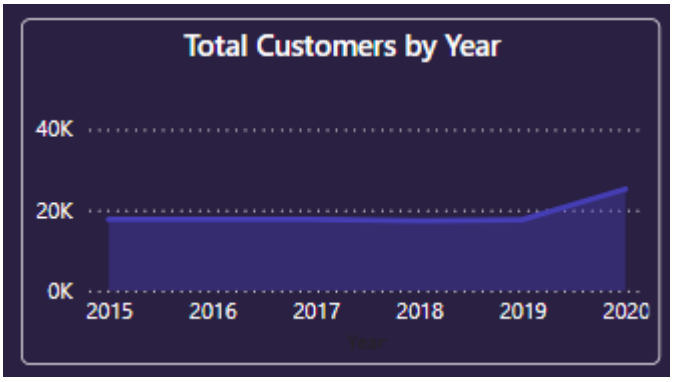
Details:

- Type of Chart: Donut Chart
- Segments: Each segment represents a top-ordered subcategory.
- Labels: Subcategory names with order quantities.
- Values:14K orders for each subcategory.

Result:

"Home Audio," "Fragrances," and "Women's fashion" each received 14K orders, indicating balanced demand and the need for adequate stock levels.

Total customers by year



Why This Chart is Needed:

This area chart helps users understand trends in customer growth over time. It highlights significant changes in the number of customers and can assist in identifying periods of significant growth or stagnation.

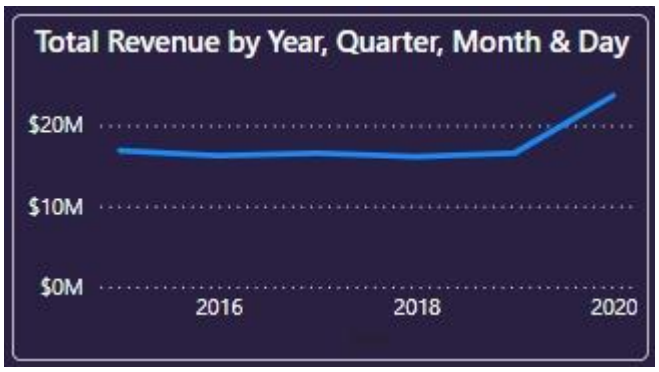
Details:

- X-axis: Year (2015 - 2020)
- Y-axis: Total number of customers (0K to 40K)

Result:

For example, the chart shows that the number of customers remained relatively stable from 2015 to 2019, hovering around 20K. In 2020, there was a noticeable increase in the number of customers, suggesting a positive growth trend during that year.

Total Revenue by Year



Why This Chart is Needed:

• The line chart helps users understand trends in total revenue over time. It highlights periods of revenue growth or decline and can assist in identifying key years of significant financial changes.

Details:

• X-axis: Year

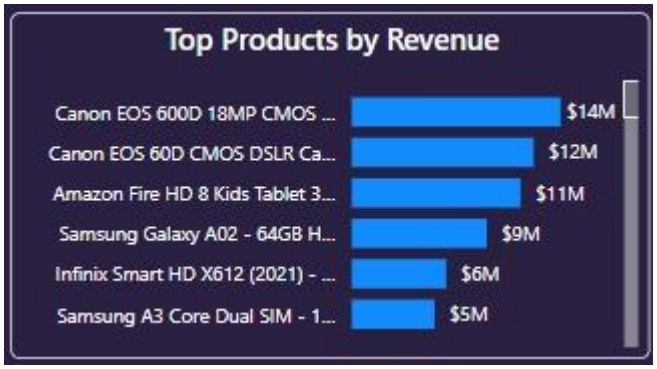
• Y-axis: Total Revenue (in millions of dollars)

• Legend: Not applicable (single data series)

• Insights: The visualization provides a comprehensive view of the total revenue each year. It helps users track the financial performance of the company and identify trends over time.

Result: For example, there was a noticeable increase in total revenue in 2020, reaching over $20 million, compared to the relatively stable revenue figures from 2015 to 2019, indicating significant financial growth in 2020.

Top Products by Revenue



Why This Chart is Needed:

• The bar chart helps users understand the revenue contribution of different products. It highlights the top-performing products and can assist in identifying which items generate the most revenue for the business.

Details:

• X-axis: Revenue (in millions of dollars)

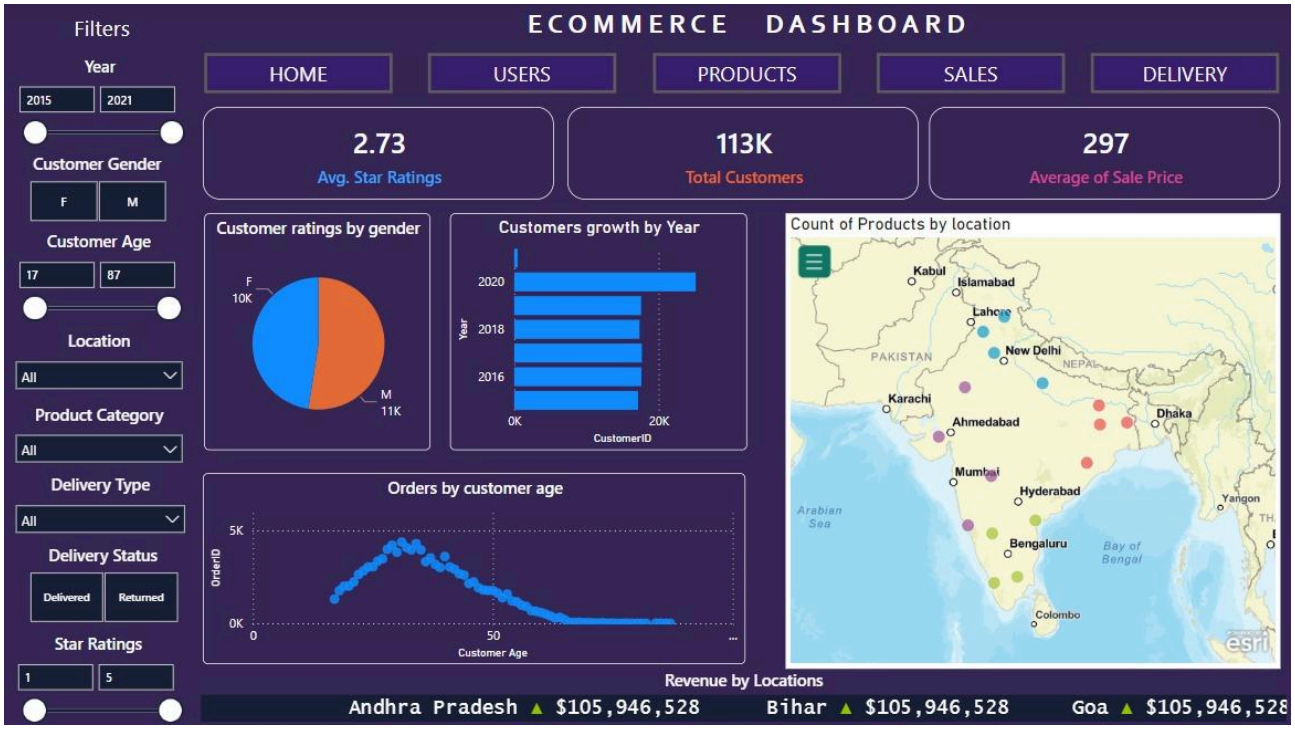
• Y-axis: Product Names

• Legend: Not applicable (single data series)

• Insights: The visualization provides a comprehensive view of the top products by revenue. It helps users identify the most profitable products and understand their impact on overall sales.

Result: For example, the Canon EOS 600D 18MP CMOS camera is the highest revenue-generating product with $14 million, followed by the Canon EOS 60D CMOS DSLR camera with $12 million, and the Amazon Fire HD 8 Kids Tablet with $11 million. This indicates that these products are key contributors to the company's revenue.

2. USER ANALYSIS



Why User Analysis Page is needed:

Users can filter data by multiple criteria, including year, gender, age, location, product category, delivery type, delivery status, and star ratings, allowing for a customized view. Key metrics such as average star ratings, total customers, and average sale price are prominently displayed, providing a quick snapshot of customer satisfaction and sales performance.

Cards:

Why Cards Are Needed:

Card visualizations are a crucial element in data dashboards and reports, providing a clear and concise way to present key metrics and highlights at a glance. They offer a quick, clear, and user-friendly way to convey essential data, enabling users to quickly grasp important information without extensive analysis.

1. Average Star Ratings:

Average star ratings: 2.73

This card displays the average star ratings given by customers. It is vital for understanding overall customer satisfaction and product quality. A clear snapshot of the average rating helps stakeholders quickly gauge how well products are being received by customers, which is crucial for maintaining product standards and improving customer experience.

2.Total Customers:

Total Customers: 113K

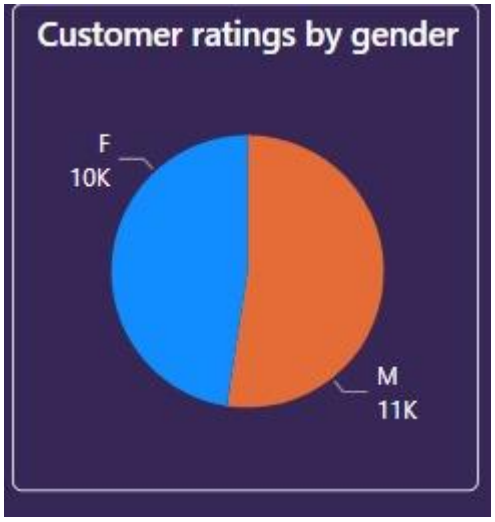
This card shows the total number of customers who have interacted with the platform. With 113,000 customers, this metric is essential for understanding the size and scope of the user base. It reflects user engagement and reach, indicating how many unique customers have purchased, rated, or interacted with products. This information is crucial for assessing market penetration and customer loyalty.

3. Average of Sale Price:

Average of sale price: 297

This card indicates the average sale price of products on the platform. Displaying an average sale price of 297, this metric provides insights into pricing strategy and revenue generation. It helps in understanding the pricing dynamics and the average expenditure of customers, which is important for financial planning and product positioning.

Customer Ratings By Gender



Why This Chart is Needed:

The pie chart helps users understand the distribution of customer ratings by gender. It provides insights into gender-specific satisfaction levels, highlighting differences in ratings between male and female customers.

Details:

- Segments: Male (M), Female (F)
- Values: Number of ratings (M: 11K, F: 10K)

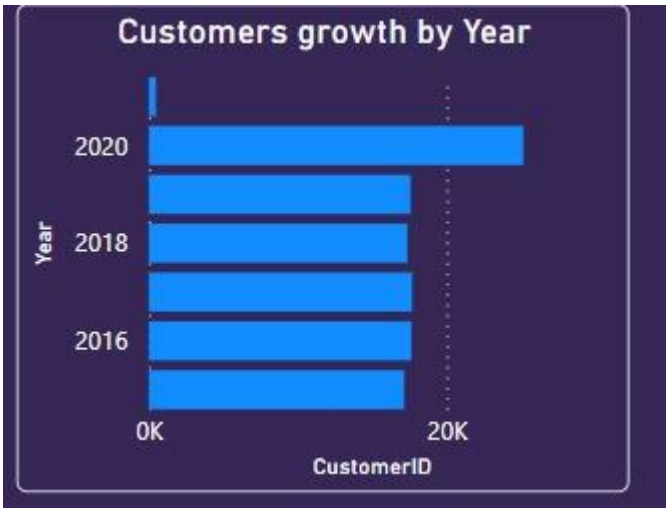
Insights:

The visualization offers a clear comparison of customer ratings by gender, showing that male customers provided slightly more ratings (11K) compared to female customers (10K). This can help businesses understand and address gender-specific feedback and preferences.

Result:

For example, the chart reveals that out of the total customer ratings, male customers accounted for 11,000 ratings, while female customers accounted for 10,000 ratings, indicating a near-equal distribution of feedback between genders.

Customers Growth By Year:



Why This Chart is Needed:

The bar chart helps users understand the growth of the customer base over time. It highlights periods of significant growth, allowing businesses to identify when they experienced increases in new customers.

Details:

X-axis: Customer ID count
Y-axis: Year
Values: Number of customers per year

Insights:

The visualization provides a clear view of the number of customers gained each year. It helps users track the evolution of the customer base and identify trends in customer acquisition over time.

Result:

For example, the chart shows that the year 2020 saw the highest growth with nearly 20,000 new customers. In comparison, 2018 and 2016 had significantly fewer new customers, indicating that 2020 was a peak year for customer acquisition.

Orders By Customer Age

Why This Chart is Needed:

The scatter plot helps users understand the distribution of orders by customer age. It highlights which age groups are most active in placing orders, providing insights into customer demographics.

Details:

- X-axis: Customer Age
- Y-axis: Order ID count
- Values: Number of orders per age group

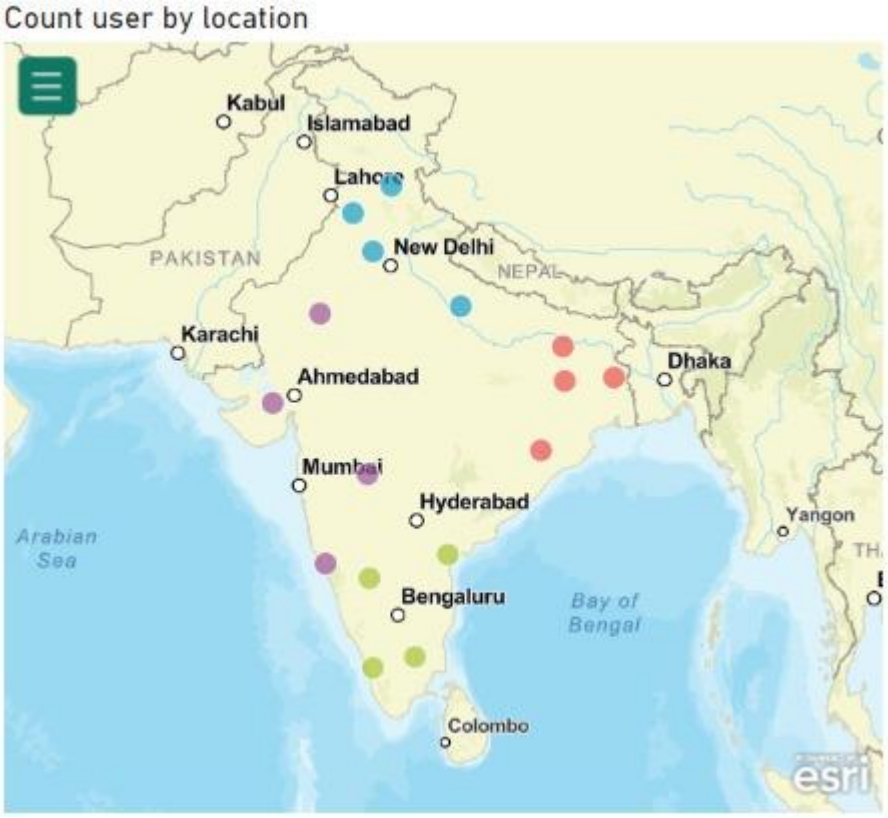
Insights:

The visualization provides a detailed view of the order frequency across different age groups. It helps users identify the most active age demographics and understand how order activity varies with age.

Result:

For example, the chart shows that order frequency peaks around the age range of 25-35, with over 5,000 orders, and then gradually declines with increasing age. This indicates that customers in their mid-20s to mid-30s are the most active in placing orders, while activity decreases significantly among older age groups.

Count of Users by Location



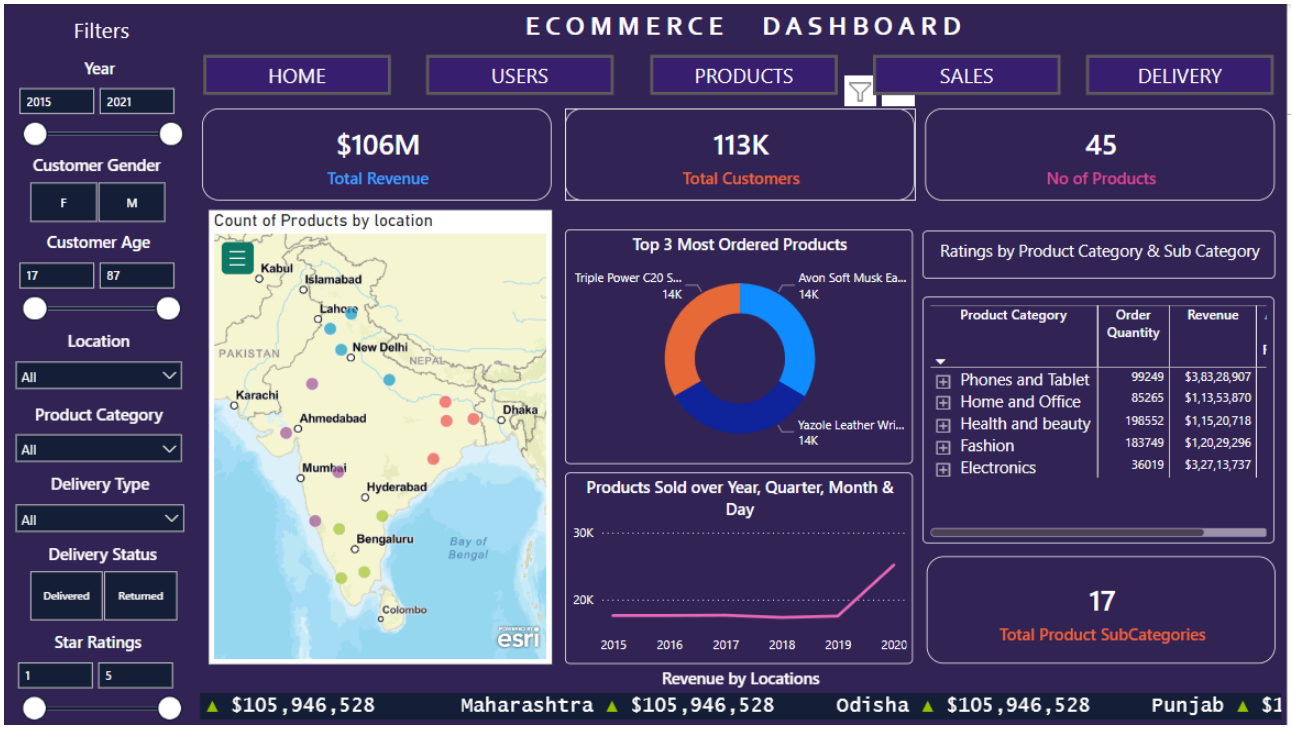
Importance of the Map:
The "Count User by Location" map is a crucial tool for visualizing the geographic distribution of users. It aids businesses in understanding regional user engagement, identifying areas with high user activity, and strategizing targeted marketing and service delivery efforts to enhance user experience and market reach.

Details:
Type of Visualization: Geographic map
Data Represented: Count of users in various locations
Geographic Scope: South Asia, highlighting major cities in India and neighboring countries.
Result:
The map displays the count of users by location, marked by colored dots indicating different quantities of users in various cities.

Analysis:
· Market Penetration: High user counts in cities like Mumbai, Bengaluru, and New Delhi suggest a strong market presence and high engagement in these metropolitan areas. This indicates successful user acquisition strategies, likely due to higher population density and greater internet penetration.
· Growth Opportunities: Areas with moderate to low user counts, such as cities in eastern India and neighboring countries, present opportunities for market expansion and increased user acquisition activities. These regions could benefit from targeted marketing campaigns and localized content.

· Logistics and Distribution: Understanding user distribution helps in optimizing service delivery logistics. For example, focusing on cities with higher user density ensures efficient resource allocation and better customer support services, enhancing overall user satisfaction.

3. PRODUCTS ANALYSIS -



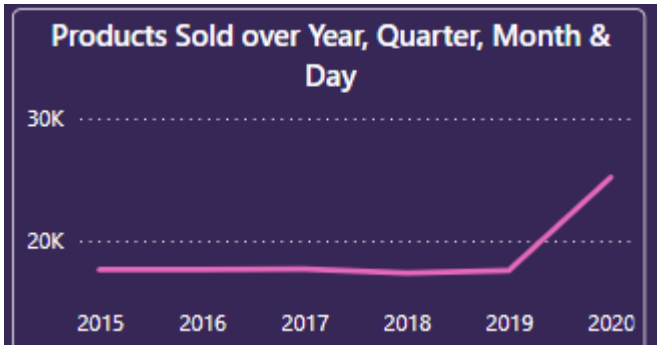
Why this page is needed:

- The Product page is an essential part of the e-commerce dashboard, offering a detailed summary of key metrics and insights specific to the product dataset. It features clear visualizations of product distribution, customer preferences, and sales trends.

- Users can filter data by year, gender, age, location, product category, delivery type, status, and star ratings to customize their view. The page prominently displays total revenue, total customers, and the number of products for a quick snapshot of overall product performance.

- It highlights the most ordered products, categories, and subcategories, providing insights into popular items and trends. Graphs show customer and revenue trends over time, while charts list the highest-earning products and product ratings by category.
- This comprehensive view of key product performance indicators aids in strategic decision-making and enhances understanding of the e-commerce platform's product dynamics.

Products Sold over Year, Quarter, Month & Day:



Why This Chart is Needed:

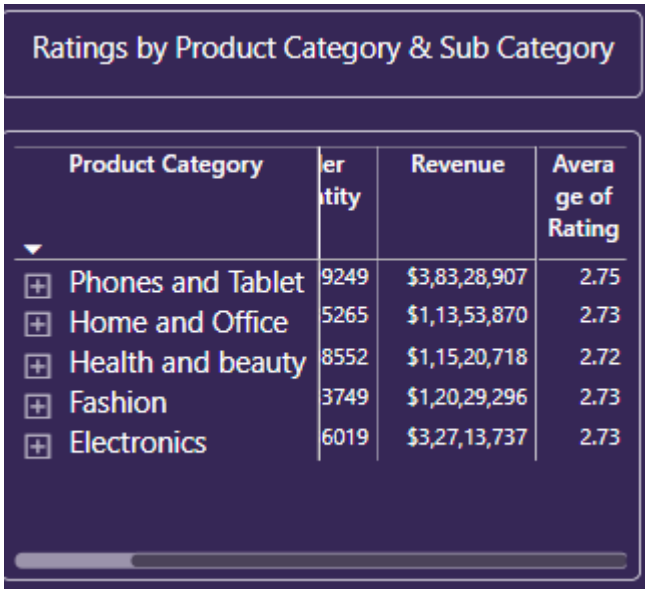
The "Products Sold over Year, Quarter, Month & Day" chart is essential for understanding sales trends over time. It provides valuable insights into how product sales have evolved, helping businesses identify patterns, seasonality, and growth opportunities.

- Type of Chart: Line Chart
- X-Axis: Time (Yearly intervals from 2015 to 2020)
- Y-Axis: Number of Products Sold (in thousands)
- Data Points: Number of products sold each year

Result:

The chart shows a consistent sales trend from 2015 to 2018, followed by a noticeable increase in 2019, and a significant spike in 2020. This indicates growing demand and suggests that the business experienced substantial growth in product sales during these years. The upward trend in 2020 highlights the importance of strategic planning to accommodate increased sales volume and capitalize on market opportunities.

Ratings by Product Category & Sub Category:



Why This Chart is Needed:

The "Ratings by Product Category & Sub Category" chart is crucial for analyzing customer satisfaction across different product categories. By examining average ratings alongside order quantity and revenue, businesses can identify areas for improvement, understand customer preferences, and make informed decisions to enhance product offerings and customer experience.

Details:

- **Type of Chart**: Table
- **Columns:**
  Product Category: The main categories of products sold.
  Order Quantity: The total number of orders for each product category.
  Revenue: The total revenue generated from each product category.
  Average of Rating: The average customer rating for each product category

Result:

The chart provides a comprehensive overview of key metrics for different product categories:

Phones and Tablets:

· Order Quantity: 9249

- Revenue: $3,83,28,907
- Average Rating: 2.75

Home and Office:

- Order Quantity: 5265
- Revenue: $1,13,53,870
- Average Rating: 2.73

Health and Beauty:

- Order Quantity: 8552
- Revenue: $1,15,20,718
- Average Rating: 2.72

Fashion:

- Order Quantity: 3749
- Revenue: $1,20,29,296
- Average Rating: 2.73

Electronics:

- Order Quantity: 6019
- Revenue: $3,27,13,737
- Average Rating: 2.73

Analysis:

The chart highlights that Phones and Tablets generate the highest revenue and order quantity but have a slightly higher average rating compared to other categories. Despite similar average ratings, variations in revenue and order quantity indicate different levels of customer engagement and satisfaction across categories. This information can guide businesses in prioritizing product improvements and marketing strategies to enhance customer satisfaction and drive revenue growth.

Total Product SubCategories:

Importance of the Metric:

The "Total Product Subcategories" metric is essential for understanding the diversity and breadth of the product offerings within each main category. It provides insight into how well the product range caters to different customer needs and preferences, and helps in assessing the complexity and scope of inventory management.

Details:

Metric Displayed: Total Product Subcategories
Value: 17

Result:

The chart shows that there are a total of 17 distinct subcategories under the main product categories. This number indicates a wide range of products available to customers, suggesting a comprehensive selection that can meet various customer needs and preferences.

Analysis:

Having 17 product subcategories indicates a diverse product portfolio, which can attract a broader customer base by offering more specialized and varied products. This diversity can enhance customer satisfaction by providing more options and can also drive higher sales by catering to niche markets. Additionally, it underscores the need for effective inventory management and marketing strategies to ensure each subcategory is well-represented and adequately stocked.

Count of Products by location:

Importance of the Map:

The "Count of Products by Location" map is a vital tool for visualizing the geographic distribution of product availability and sales. It helps businesses understand regional market penetration, identify high-demand areas, and strategize supply chain logistics and marketing efforts to maximize reach and efficiency.

Details:

- **Type of Visualization:** Geographic map
- **Data Represented:** Count of products available or sold in various locations
- **Geographic Scope:** South Asia, highlighting major cities in India.

Result:

The map displays the count of products by location, marked by coloured dots indicating different quantities of products in various cities.

Analysis:

- **Market Penetration:** High product counts in cities suggest strong market presence and demand in these metropolitan areas. This indicates a successful penetration in these markets, likely due to higher population density and

purchasing power.

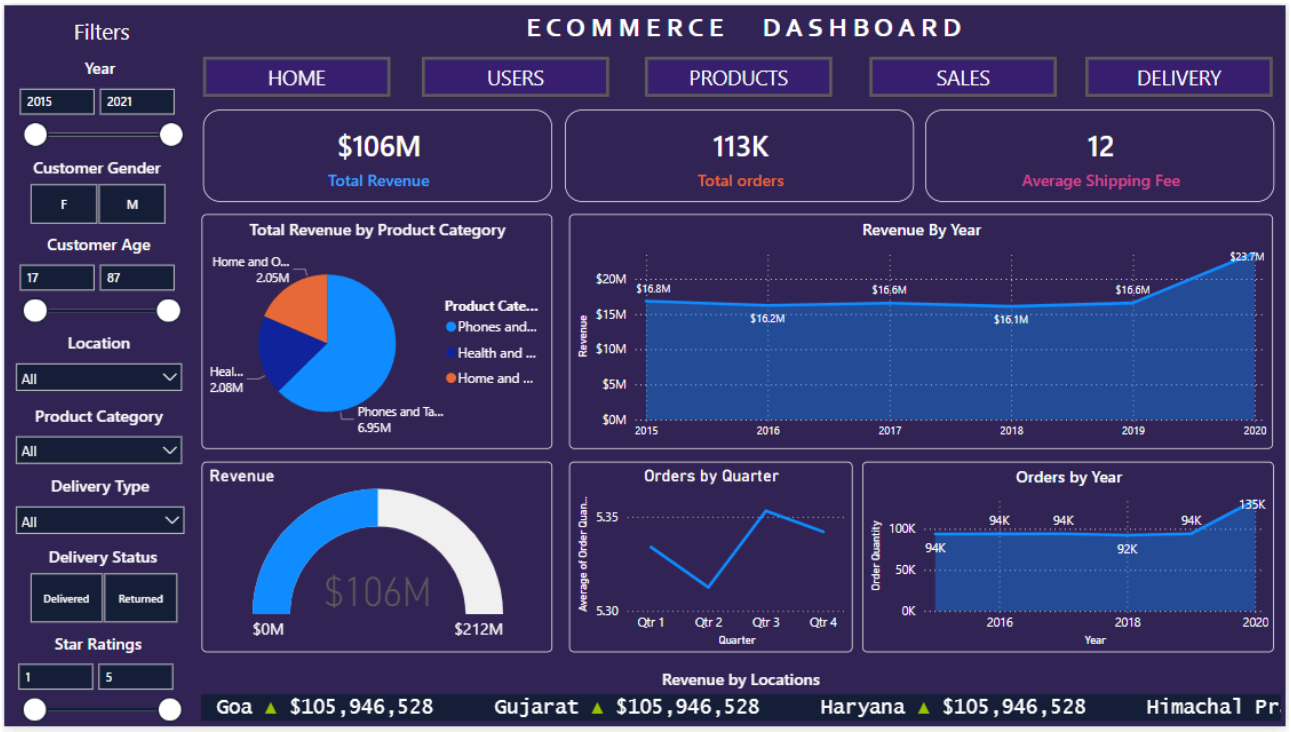
- **Growth Opportunities:** Areas with moderate to low product counts, present opportunities for market expansion and increased promotional activities to boost sales.

- **Logistics and Distribution:** Understanding product distribution helps in optimizing supply chain logistics. For example, focusing on cities with higher demand ensures efficient stock management and reduces the risk of stock outs or overstocking.

Conclusion:

The "Count of Products by Location" map provides a clear visual representation of product distribution across different geographic regions. By analyzing this data, businesses can enhance their market strategies, optimize distribution channels, and identify new opportunities for growth. This geographic insight is crucial for making informed decisions about regional marketing, inventory allocation, and customer service enhancements.

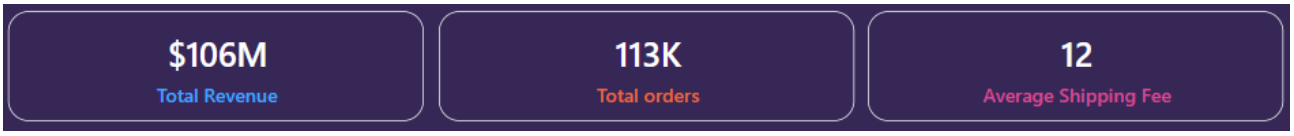
4. SALES ANALYSIS



Why this page is needed:

A sales page in an ecommerce dashboard serves as a digital storefront for your products or services. It showcases what you're selling, convinces visitors to make a purchase, and tracks the performance of your offerings.

Cards:



Why cards are needed:

Card visualizations are a crucial element in data dashboards and reports, providing a clear and concise way to present key metrics and highlights at a glance. Card visualizations are an essential component of data dashboards, providing a quick, clear, and user-friendly way to present key metrics.

Individual Cards Description:

1. **Total Revenue of the sales : Card Visualization**
    - Title: Total Revenue.
    - Rating: Total revenue received by overall products.
    - Type: Revenue.
    - Description: Total revenue received after selling the products.
2. **Total Orders of the products : Card Visualization**
    - Title: Total Orders.
    - Rating: Total orders by customers.
    - Type: Orders.
    - Description: Number of orders by customers.
3. **Average shipping Fee of the products : Card Visualization**
    - Title: Average Shipping Fee.
    - Rating: Average shipping fee for a product.
    - Type: Shipping Fee.
    - Description: Average shipping fee paid by a customer for a product.

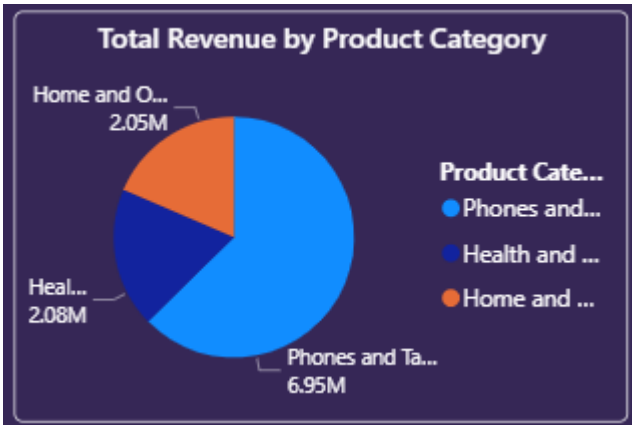
Selection Criteria:

We can perform in-depth sales analysis using the filter panel options on the left side of the page. This panel includes filters for year, gender, age, location, product category, delivery type, and star ratings.

Total Revenue of every product : Pie chart Visualization

• The pie chart titled "Total Revenue by Product Category" displays the revenue distribution across three product categories. The chart segments and their corresponding revenues are as follows:

1. **Phones and Tablets**: 6.95M (blue segment)
2. **Health and Personal Care**: 2.05M (orange segment)
3. **Home and Office**: 2.08M (deep blue segment)



Why this visual is needed :

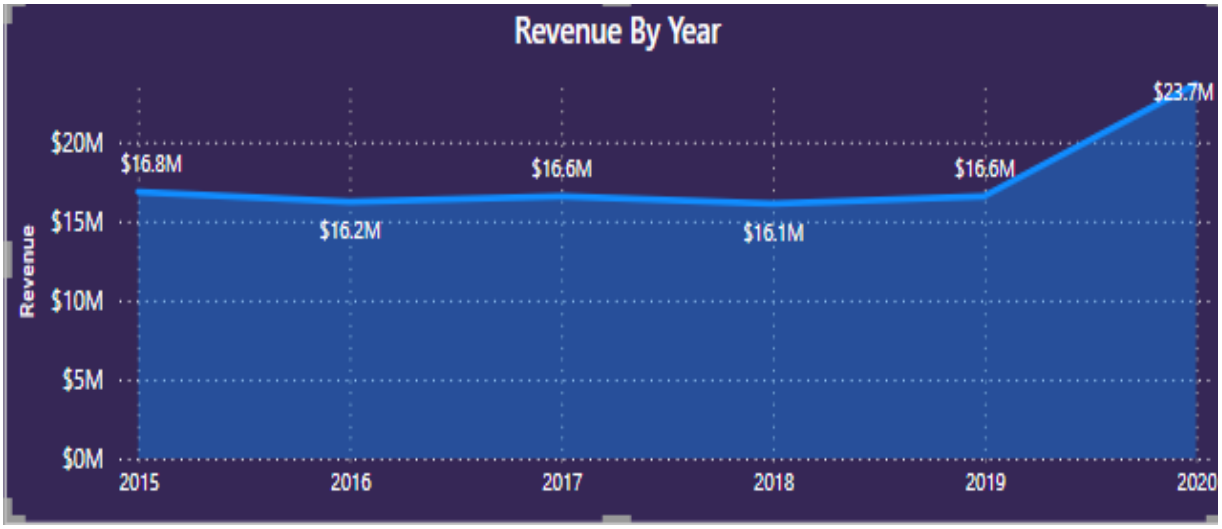
This chart is needed to visually represent revenue distribution across product categories, helping stakeholders quickly identify top-performing segments and make informed strategic decisions. It simplifies complex data for efficient analysis and communication.

Details: This chart displays revenue generated by each product category, using unit price as the basis for comparison.

- **Title**: Total Revenue by Product Category
- **Legend**:
  - Phones and Tablets (Blue)
  - Health and Personal Care (orange)
  - Home and Office (Deep Blue)
- **Values**:
  - Phones and Tablets: 6.95M
  - Health and Personal Care: 2.08M
  - Home and Office: 2.08M

Revenue from year 2015 - 2020: Area Chart Visualization

- The area chart titled "Revenue By Year" displays the annual revenue figures from 2015 to 2020.The chart illustrates a relatively stable revenue trend from 2015 to 2019, with a noticeable increase in 2020, where the revenue sharply rises to $23.7M. This indicates significant growth in the most recent year, following several years of steady performance.



Why this graph is needed :

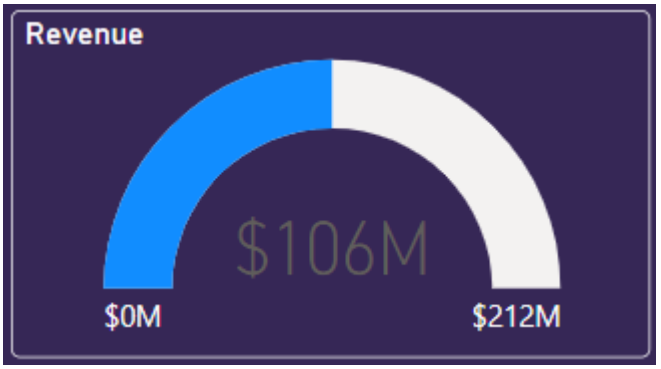
- This chart is needed to visually display annual revenue trends from 2015 to 2020, highlighting periods of stability and significant growth, particularly in 2020. It aids in trend analysis, strategic planning, and effective communication of financial performance to stakeholders.

  Details: This bar graph offers a clear view of annual revenue trends.

  - **X-axis:** Years (2015-2020)
  - **Y-axis:** Revenue in Millions.
  - **Insights:**The chart provides a visual representation of revenue from 2015 to 2020. It helps businesses track their revenue trends over time and identify any areas of growth or decline.
  - **Result:** This chart shows stable revenue from 2015 to 2019, followed by a significant increase to $23.7M in 2020. It highlights a notable growth trend in the most recent year.

Initial Revenue Vs Target Revenue: Gauge Visualization

- The gauge is divided into two segments, with the blue segment representing the current revenue of $106 million, which is exactly halfway between $0 million and the maximum target of $212 million. The numbers are displayed prominently in the center.



Why this visual is needed :

This chart is needed to provide a quick visual representation of the company's revenue performance against its target. It allows stakeholders to easily see at a glance how much revenue has been generated relative to the goal, highlighting progress and areas needing improvement. This aids in efficient decision-making and performance tracking.

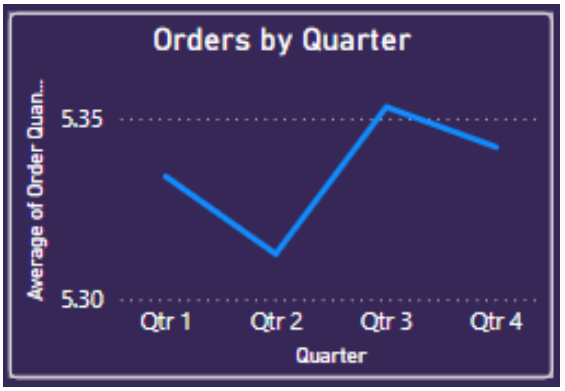
Details: It displays our total revenue in comparison to the estimated revenue.

- **Type**: Gauge chart
- **Legend**: This gauge chart uses color coding to represent different segments. In this chart, the blue segment indicates the achieved revenue, and the white segment shows the remaining portion to reach the target.
- **Insights**:
  - **Current Revenue**: The current revenue is $106 million, indicated by the blue segment of the gauge.
  - **Target Revenue**: The target revenue is $212 million, marked at the far end of the gauge.
  - **Progress**: The chart shows that the company has achieved 50% of its revenue target.
  - **Visual Impact**: The halfway point visually demonstrates that the organization is exactly at the midpoint of its goal.

- **Result:** This visual representation provides a quick and clear understanding of financial performance, highlighting both accomplishments and the remaining effort needed to reach the goal.

Orders by Quarter : Line Chart Visualization

- The line chart is titled "Average of Orders by Quarter." It displays the average order quantity over four quarters (Qtr 1, Qtr 2, Qtr 3, and Qtr 4). The Y-axis, labeled "Average of Order Quan.," ranges from 5.30 to 5.35. The data points indicate a decrease in average orders in Qtr 2, followed by an increase peaking in Qtr 3, and a slight decline in Qtr 4.This chart is needed to track and visualize the average order quantity per quarter, helping to identify trends and seasonal patterns in customer behavior. It aids in understanding fluctuations in order volume, enabling better inventory management, sales forecasting, and strategic planning. The chart provides a clear, at-a-glance summary of order performance across different time periods.



Why this graph is needed:

- This chart is needed to track and visualize the average order quantity per quarter, helping to identify trends and seasonal patterns in customer behavior. It aids in understanding fluctuations in order volume, enabling better inventory management, sales forecasting, and strategic planning. The chart provides a clear, at-a-glance summary of order performance across different time periods.

Details:

- X-axis: Quarters of the year
- Y-axis: Average order quantity
- **Insights**:
  - **Qtr 1 to Qtr 2:** There is a noticeable decrease in the average order quantity.

- **Qtr 2 to Qtr 3:** The average order quantity increases significantly, reaching the highest point in Qtr 3.
- **Qtr 3 to Qtr 4**: There is a slight decline in the average order quantity.

- **Result:**The line chart effectively communicates changes in the average order quantity over the four quarters. It highlights a drop in Qtr 2, a peak in Qtr 3, and a slight decrease in Qtr 4. This information can be used for identifying seasonal trends, making informed business decisions, and optimizing sales strategies and inventory management throughout the year.

Orders by Year : Area Chart Visualization

- The chart displays the average orders per year from 2016 to 2020. The number of orders remained relatively stable at around 94,000 from 2016 to 2017, dipped slightly to 92,000 in 2018, then returned to 94,000 in 2019, and saw a significant increase to 135,000 in 2020.

Why this graph is needed:

- This chart is needed to illustrate the trend in average orders over a five-year period from 2016 to 2020. It highlights the stability in orders from 2016 to 2019, with a minor dip in 2018, and a notable spike in 2020. Such data is useful for identifying patterns and making informed business decisions based on order volume trends.

Details:

- **X-axis**: Represents the years from 2016 to 2020.
- **Y-axis:** Represents the number of average orders, ranging from 0K to 135K.

- .**Insights:**
  - The average orders were stable at 94K from 2016 to 2017.

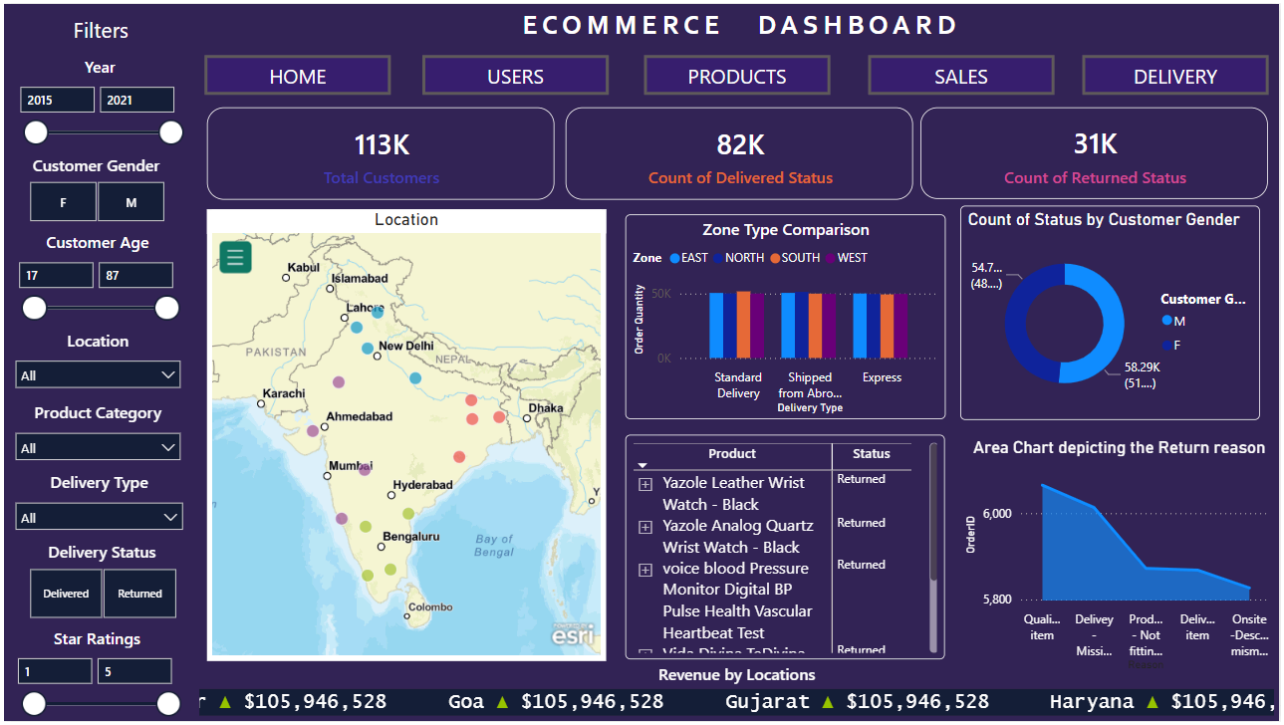
- There was a slight decline to 92K in 2018.
- Orders returned to 94K in 2019.
- A significant increase to 135K occurred in 2020.

- **Result:** The chart shows a notable increase in average orders in 2020 compared to the previous years, indicating a substantial growth in order volume.

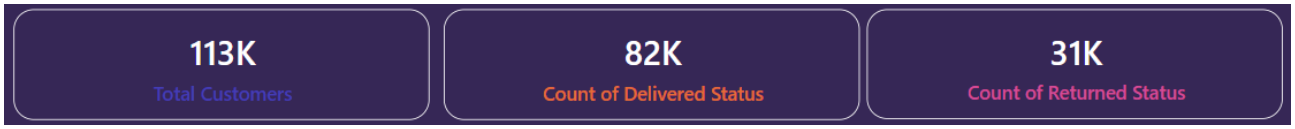
5. DELIVERY ANALYSIS :

Why this page is needed:

- The delivery page in ECommerce visualization tracks order status from placement to delivery, identifying delays and inefficiencies. It provides real-time updates to enhance customer transparency and satisfaction. By analyzing delivery data, businesses can optimize logistics and reduce operational costs. This page is essential for improving overall service efficiency and supporting better decision-making.



Cards:



Why cards are needed:

- Card visualizations are a crucial element in data dashboards and reports, providing a clear and concise way to present key metrics and highlights at a glance. Card visualizations are an essential component of data dashboards, providing a quick, clear, and user-friendly way to present key metrics.

Individual Cards Description:

1. **Total No of Customers : Card Visualization**
    - Title: Total Customers.
    - Rating: Total no of customers.
    - Type: Customers.
    - Description: Total no of customers present in our dataset.
2. **Delivered Status : Card Visualization**
    - Title: Count of Delivered Status.
    - Rating: No.of products delivered to customers.
    - Type: Delivered.
    - Description: Total No of products delivered.
3. **Returned Status : Card Visualization**
    - Title: Count of returned status.
    - Rating: No.of products returned by customers.
    - Type: Returned.
    - Description: Total No of products returned.

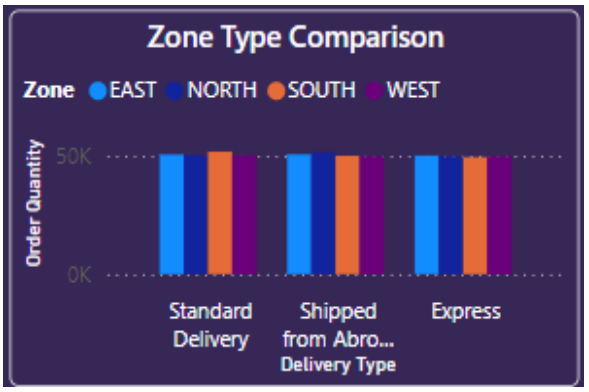
Selection Criteria:

The left-hand filter panel unlocks a deep dive into delivery performance. Filter by year, gender, age, location, product category, delivery type, and even customer satisfaction (star ratings) to

pinpoint trends and areas for improvement.

Zone Type Comparison : Clustered Column Chart Visualization

The chart compares order quantities across four zones (East, North, South, West) for three delivery types: Standard Delivery, Shipped from Abroad, and Express. Each delivery type shows similar order quantities across the zones, with order quantities close to 50K for all categories. This suggests uniform demand across different zones and delivery types.



Why this chart is needed:

This chart is needed to compare the order quantities across different zones (East, North, South, West) for various delivery types (Standard Delivery, Shipped from Abroad, Express). It helps identify if there are any significant differences or similarities in demand for each delivery type across the zones, aiding in logistical planning and resource allocation.

Details:

- **X-axis:** Delivery Type
- **Y-axis:** Order Quantity
- **Legend:** Zone (East, West, North, South)
- **Insights:**
    - All four zones (East, North, South, West) have similar order quantities for each delivery type.
    - The order quantities are approximately 50K for Standard Delivery, Shipped from Abroad, and Express, indicating consistent demand across zones and delivery methods.
- **Result:**The chart reveals that demand for different delivery types is uniform across all zones, suggesting balanced and stable distribution needs without significant regional variation.

Location - Geographical Map :

Why geographical maps are needed:

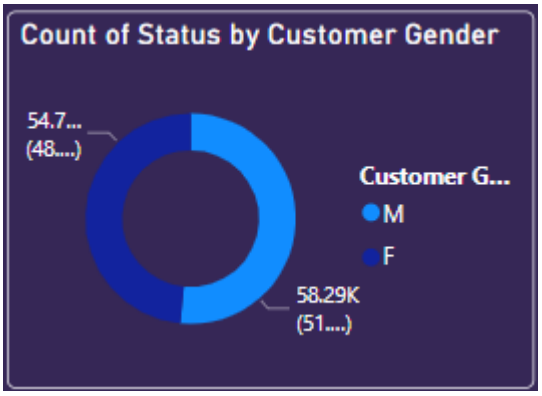
Geographical maps are vital for ecommerce visualization as they offer insights into sales trends and customer distribution across different regions. By visually representing sales data on maps, businesses can identify patterns and emerging markets that might not be evident in traditional reports. By overlaying sales data with demographic information or competitor locations, companies can gain valuable insights into consumer behavior and preferences in various regions. Ultimately, geographical maps serve as a powerful tool for ecommerce visualization, helping businesses stay competitive and responsive to changing market dynamics.

Details: Shows the customers across the different zones

- **Legend :**
    - **East Zone :** Represented by blue points
    - **West Zone :** Represented by purple points
    - **North Zone :** Represented by deep blue points
    - **South Zone :**Represented by orange points

Count of status by customer gender : Donut Chart

The title of the donut chart is "Count of Status by Customer Gender." It reveals the breakdown of customer support inquiries by gender. Light blue represents inquiries from male customers, and dark blue represents inquiries from female customers. The size of each slice indicates the volume of inquiries from each gender.



Why this chart is needed :

This pie chart shows how many customer support inquiries come from each gender. It helps businesses spot trends. A big difference between genders might indicate issues faced more by one side. This allows businesses to tailor their customer support approach to better serve both men and women.This chart displays the delivery and returned status based on customer gender.

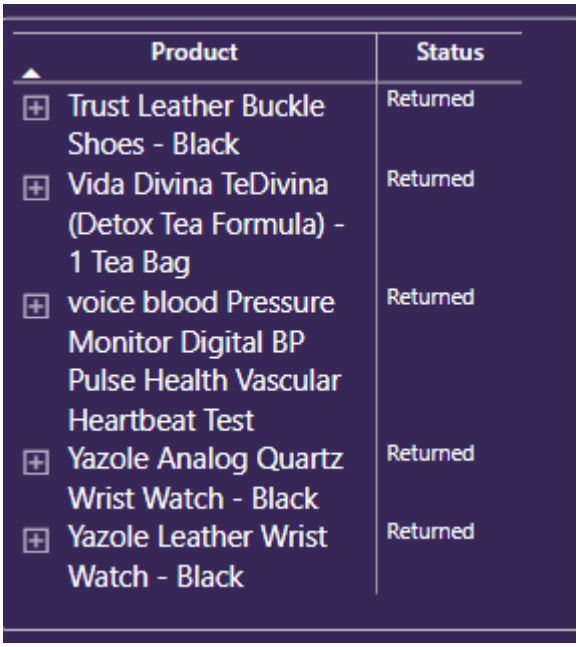
Details:

This chart displays the delivery and returned status based on gender.

- **Title**: Count of status by customer gender.
- **Legend**:
  - Customer Gender (Male, Female)
- **Values**:
  - Count of status (Delivered, Returned)
- **Result**: The donut chart represents the delivery status of 54.71k (48.42%) female customers and 58.29k (51.58%) male customers, totaling 113k customers.

Returned Products : Matrix Visualization

The table lists products that have been returned, including Trust Leather Buckle Shoes, Vida Divina TeDivina Detox Tea, a voice blood pressure monitor, and two types of Yazole wristwatches. Each product's status is marked as "Returned," indicating these items were sent back by customers.



Product	Status
Trust Leather Buckle Shoes - Black	Returned
Vida Divina TeDivina (Detox Tea Formula) - 1 Tea Bag	Returned
voice blood Pressure Monitor Digital BP Pulse Health Vascular Heartbeat Test	Returned
Yazole Analog Quartz Wrist Watch - Black	Returned
Yazole Leather Wrist Watch - Black	Returned

why this matrix is needed :

This matrix is needed to track and analyze returned products. By listing the specific items that have been returned, it helps identify patterns or common issues with particular products, informing decisions on quality control, inventory management, and customer satisfaction strategies.

Details:

- **Type:** The matrix is a tabular representation of returned products and their statuses.
- **Legend:**
  - Product: Lists the names and descriptions of the returned items.
  - Status: Indicates the return status of each product (all marked as "Returned").
- **Insights:**
  - Multiple types of products have been returned, including shoes, tea, a blood pressure monitor, and wristwatches.
  - The consistent return status suggests issues with these specific items, possibly related to quality or customer dissatisfaction.
- **Result:** The matrix highlights the need for further investigation into the reasons behind these returns, allowing the company to address potential product defects, improve quality control, and enhance customer satisfaction.

Return Reasons : Area Chart Visualization

The area chart illustrates various reasons for product returns, with the y-axis representing the number of Order IDs ranging from 5800 to 6000. The x-axis shows categories like "Quality Defect," "Delivery Issue," "Product Issue," and "Onsite Damage." The chart highlights that "Quality Defect" has the highest number of returns, while "Onsite Damage" has the lowest.

Why this chart is needed :

The chart is needed to analyze and visualize the reasons behind product returns, helping businesses identify and address the most common issues. By displaying the frequency of different return reasons, stakeholders can pinpoint areas for improvement, such as enhancing product quality, optimizing delivery processes, or improving packaging to reduce onsite damage. This information is crucial for making informed decisions to reduce return rates and improve customer satisfaction.

Details :

- **X-axis :** Reasons for return
- **Y-axis :** No.of Orders
- **Insights:**
    - **Quality - Defective Item**: Highest return rate, indicating a significant need for improved quality control.
    - **Delivery - Missing Item/Part**: Second highest return reason, suggesting issues in order fulfillment accuracy.
    - **Product - Not Fitting Expectation**: Returns due to unmet expectations highlight the need for clearer product descriptions.

    - **Delivery - Wrong Item**: Notable number of returns due to incorrect items being delivered, requiring better shipping accuracy.
    - **Onsite - Description Mismatch**: Least common return reason, but still an area for improvement in product listings accuracy.
- **Result :** The chart highlights that quality defects are the primary reason for product returns, followed by delivery issues, product issues, and onsite damage. This suggests that the company should prioritize improving product quality and addressing delivery problems to reduce the overall return rate and enhance customer satisfaction.