NorthWind Traders Sales Analytics

Capstone Project by *Shrey Tandel*

NorthWind Traders

Executive Summary

Overview

Data-driven analysis of Northwind Traders' sales, customers, employees, and inventory to optimize business operations using Excel, MySQL, and Power BI.

Key Findings

Sales peak in Q4, top customers drive revenue, 30% are high-value buyers, employee turnover affects sales, stockouts impact fulfillment, and 85% of orders ship on time.

Recommendatio

Optimize sales, customer rete
efficiency, inventory manage
performance to drive growt

NORTHWIND SALES ANALYTICS

Customer Analysis

Segmented customers using RFM analysis to identify high-value buyers and improve retention strategies.

Order Analysis

Examined order trends, volume fluctuations, and value distribution to optimize sales performance.

Employee Analysis

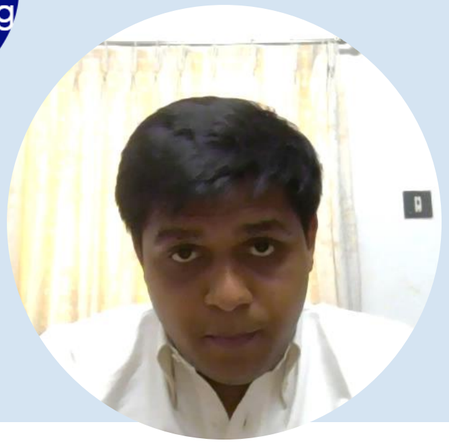
Assessed productivity, tenure, demographics, and performance metrics to enhance workforce efficiency.

Product Analysis

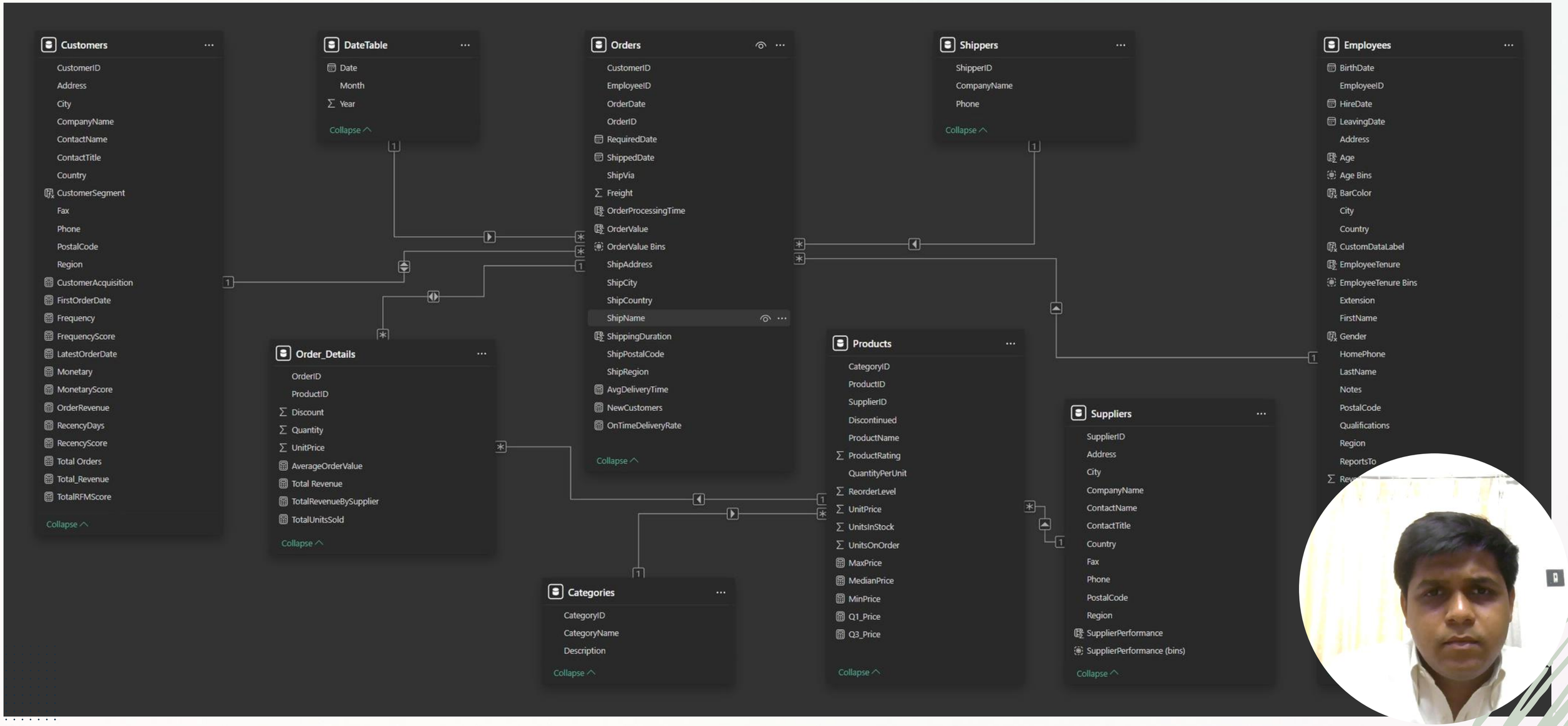
Evaluated sales volume, pricing, and customer ratings to identify top-performing categories and areas for improvement.

Supplier Analysis

Analyzed supplier pricing structures, and global distribution to optimize procurement and supply chain efficiency.



ER Diagram


Customers
CustomerID
Address
City
CompanyName
ContactName
ContactTitle
Country
CustomerSegment
Fax
Phone
PostalCode
Region
CustomerAcquisition
FirstOrderDate
Frequency
FrequencyScore
LatestOrderDate
Monetary
MonetaryScore
OrderRevenue
RecencyDays
RecencyScore
Total Orders
Total_Revenue
TotalRFMScore
Collapse
DateTable
Date
Month
Year
Collapse
Orders
CustomerID
EmployeeID
OrderDate
OrderID
RequiredDate
ShippedDate
ShipVia
Freight
OrderProcessingTime
OrderValue
OrderValue Bins
ShipAddress
ShipCity
ShipCountry
ShipName
ShippingDuration
ShipPostalCode
ShipRegion
AvgDeliveryTime
NewCustomers
OnTimeDeliveryRate
Collapse
Shippers
ShipperID
CompanyName
Phone
Collapse
Employees
BirthDate
EmployeeID
HireDate
LeavingDate
Address
Age
Age Bins
BarColor
City
Country
CustomDataLabel
EmployeeTenure
EmployeeTenure Bins
Extension
FirstName
Gender
HomePhone
LastName
Notes
PostalCode
Qualifications
Region
ReportsTo
Order_Details
OrderID
ProductID
Discount
Quantity
UnitPrice
AverageOrderValue
Total Revenue
TotalRevenueBySupplier
TotalUnitsSold
Collapse
Products
CategoryID
ProductID
SupplierID
Discontinued
ProductName
ProductRating
QuantityPerUnit
ReorderLevel
UnitPrice
UnitsInStock
UnitsOnOrder
MaxPrice
MedianPrice
MinPrice
Q1_Price
Q3_Price
Collapse
Suppliers
SupplierID
Address
City
CompanyName
ContactName
ContactTitle
Country
Fax
Phone
PostalCode
Region
SupplierPerformance
SupplierPerformance (bins)
Collapse
Categories
CategoryID
CategoryName
Description
Collapse

Tools Used for Data Analysis
NorthWind Traders Sales

Used SQL for data extraction, cleaning, transformation, and exploratory analysis.

Used Excel for data cleaning, EDA, pivoting, visuals building & trend analysis.

Used Power BI for data visualization, interactive dashbo and deriving bu insights

Exploratory Data Analysis

Problem Statements

Question1.What are the key factors influencing customer retention or loyalty based on the dataset?

Companies	TotalOrders	AvgDaysBetweenOrders
Save-a-lot Markets	116	19.4
Ernst Handel	102	22.7
QUICK-Stop	86	22.9
Rattlesnake Canyon Grocery	71	38.4
Hungry Owl All-Night Grocers	55	33.4
Berglunds snabbkÃ¶p	52	33.5
Frankenversand	48	44.2
Folk och fÃ¤ HB	45	35.7
HILARIÃ“N-Abastos	45	38.3
Bon app'	44	35.4
Queen Cozinha	40	43.0
White Clover Markets	40	49.2
SuprÃªmes dÃ©lices	39	59.2
KÃ¶niglich Essen	39	53.5
Lehmanns Marktstand	39	45.0
Wartian Herkku	37	44.9
Bottom-Dollar Markets	35	39.3
LINO-Delicateses	35	44.3
LILA-Supermercado	34	48.2
MÃ¨re Paillarde	32	31.5
Hanari Carnes	32	50.6
Vaffeljernet	31	49.0
La maison d'Asie	31	40.9
Around the Horn	30	42.6
Richter Supermarkt	30	73.7
Tortuga Restaurante	29	70.4
Ottilies KÃ¤seladen	29	70.4
Ricardo Adocicados	27	61.5
Blondel pÃ¨re et fils	26	53.6
Die Wandernde Kuh	26	65.7
Godos Cocina TÃ-pica	26	65.2
Seven Seas Imports	26	55.0
Victuailles en stock	25	62.7
Old World Delicatessen	24	64.9
Que DelÃ-cia	24	77.5
Piccolo und mehr	23	58.9
Island Trading	23	58.4
Reggiani Caseifici	22	55.9
B's Beverages	22	66.2
Great Lakes Food Market	22	38.6
Chop-suey Chinese	22	92.9
Eastern Connection	21	74.0
Magazzini Alimentari Riuniti	21	65.1
Split Rail Beer & Ale	20	75.1
Furia Bacalhau e Frutos do Mar	20	74.4
Familia Arquibaldo	19	59.8
Wellington Importadora	19	75.3
Gourmet Lanchonetes	19	57.0
Antonio Moreno TaquerÃ-a	17	71.2
Maison Dewey	17	55.8
Wilman Kala	17	41.8
SantÃ© Gourmet	16	95.6
Wolski Zajazd	16	84.0
Folies gourmandes	16	87.0
Simons bistro	15	92.3
Toms SpezialitÃ¤ten	14	125.2
Lonesome Pine Restaurant	14	81.9
Blauer See Delikatessen	14	64.2

SQL Query

```
with alpha as(

SELECT
  o.CustomerID,
  c.CompanyName,
  c.City,
  c.Country,
  p.ProductName,
  g.CategoryName,
  COUNT(o.OrderID) AS TotalOrders,
  DATEDIFF(MAX(o.OrderDate), MIN(o.OrderDate)) AS RetentionPeriod,
  SUM(od.UnitPrice * od.Quantity * (1 - od.Discount)) AS CLV, -- (CLV: Customer Lifetime Value) --
  AVG(od.UnitPrice * od.Quantity * (1 - od.Discount)) AS AOV, -- (Aov: Average Order Value) --
  SUM(od.Discount) / COUNT(od.OrderID) AS AvgDiscountPerOrder,
  AVG(DATEDIFF(o.ShippedDate, o.OrderDate)) AS AvgDeliveryTime,
  MIN(o.OrderDate) AS FirstOrderDate,
  MAX(o.OrderDate) AS LastOrderDate
FROM Orders o
JOIN Customers c ON o.CustomerID = c.CustomerID
JOIN Order_Details od ON o.OrderID = od.OrderID
JOIN products p ON od.ProductID = p.ProductID
JOIN categories g on p.CategoryID = g.CategoryID
GROUP BY c.CustomerID, c.CompanyName, p.ProductName, g.CategoryName
order by CLV desc),

sigma as(

SELECT
  CustomerID,
  COUNT(OrderID) AS TotalOrders,
  AVG(DATEDIFF(OrderDate,
    (SELECT OrderDate FROM Orders o2 WHERE o2.CustomerID = o1.CustomerID AND o2.OrderDate < o1.OrderDate ORDER BY OrderDate DESC LIMIT 1)
  )) AS AvgDaysBetweenOrders
FROM Orders o1
GROUP BY CustomerID
order by TotalOrders desc, AvgDaysBetweenOrders)

select a.CustomerID, a.CompanyName, a.City, a.Country, a.ProductName, a.CategoryName, a.RetentionPeriod, s.AvgDaysBetweenOrders,
a.TotalOrders, a.AvgDiscountPerOrder, a.CLV , a.AOV,
a.TotalOrders/a.RetentionPeriod as "Orders/Period", a.CLV/a.RetentionPeriod as "Revenue/Period",
a.CLV/a.TotalOrders as "Revenue/Order", a.AvgDeliveryTime
from alpha a join sigma s
on a.CustomerID = s.CustomerID
GROUP BY a.CustomerID, a.CompanyName, a.ProductName, a.CategoryName ;
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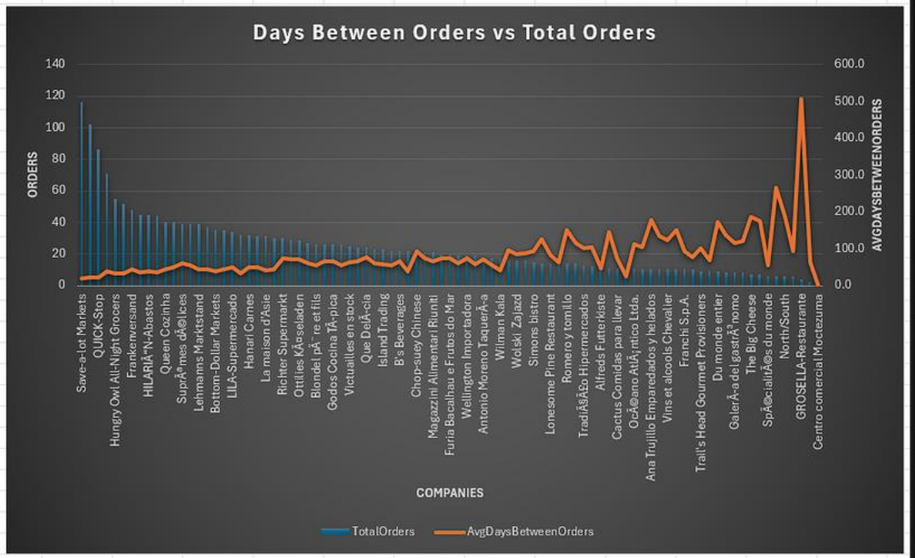
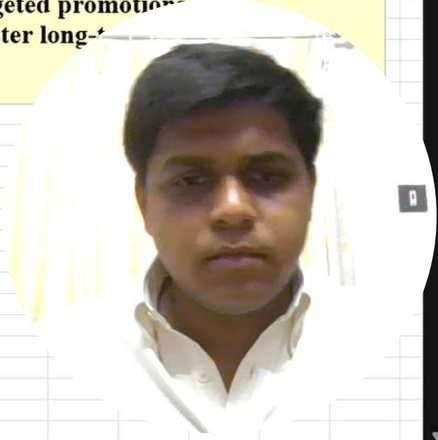


Conclusion: The chart reveals a strong correlation between customer order frequency and loyalty. Companies with higher total order volumes generally have lower average days between orders, indicating consistent purchasing behavior and higher customer engagement. Conversely, companies with lower total orders often exhibit longer intervals between orders, suggesting lower customer loyalty and potential for churn. This analysis highlights the importance of strategies that encourage repeat purchases, such as loyalty programs, targeted promotions, and personalized customer experiences, to foster long-term relationships and drive business growth.



Question 1.What are the key factors influencing customer retention or loyalty based on the dataset?

Companies	Discount	CLV
Alfreds Futterkiste	8.41%	₹ 4,273.00
Ana Trujillo Emparedados y helados	0.00%	₹ 1,402.95
Antonio Moreno TaquerÃ-a	5.83%	₹ 7,023.98
Around the Horn	2.26%	₹ 13,390.65
BÃ³lido Comidas preparadas	11.67%	₹ 4,232.85
Berglunds snabbkÃ¶p	5.86%	₹ 24,927.58
Blauer See Delikatessen	0.00%	₹ 3,239.80
Blondel pÃ¨re et fils	2.90%	₹ 18,534.08
Bon app'	7.99%	₹ 21,963.25
Bottom-Dollar Markets	8.18%	₹ 20,801.60
B's Beverages	0.00%	₹ 6,089.90
Cactus Comidas para llevar	0.00%	₹ 1,814.80
Centro comercial Moctezuma	0.00%	₹ 100.80
Chop-suey Chinese	6.18%	₹ 12,348.88
ComÃ©rcio Mineiro	0.00%	₹ 3,810.75
Consolidated Holdings	0.00%	₹ 1,719.10
Die Wandernde Kuh	8.86%	₹ 9,588.42
Drachenblut Delikatessen	0.00%	₹ 3,763.21
Du monde entier	0.00%	₹ 1,615.90
Eastern Connection	2.63%	₹ 14,761.04
Ernst Handel	6.82%	₹ 1,04,874.98
Familia Arquibaldo	5.59%	₹ 4,107.55
Folies gourmandes	0.00%	₹ 11,666.90
Folk och fÃ¤ HB	8.64%	₹ 29,567.56
France restauration	0.00%	₹ 3,172.16
Franchi S.p.A.	0.00%	₹ 1,545.70
Frankenversand	7.12%	₹ 26,656.56
Furia Bacalhau e Frutos do Mar	9.69%	₹ 6,427.42
GalerÃ-a del gastrÃ³nomo	0.00%	₹ 836.70
Godos Cocina TÃ-pica	3.93%	₹ 11,446.36
Gourmet Lanchonetes	6.32%	₹ 8,414.13
Great Lakes Food Market	7.25%	₹ 18,507.45
GROSELLA-Restaurante	0.00%	₹ 1,488.70
Hanari Carnes	7.25%	₹ 32,841.37
HILARIÃ“N-Abastos	3.18%	₹ 22,768.76
Hungry Coyote Import Store	0.00%	₹ 3,063.20
Hungry Owl All-Night Grocers	10.86%	₹ 49,979.90
Island Trading	0.00%	₹ 6,146.30
KÃ¶niglich Essen	3.79%	₹ 30,908.38
La corne d'abondance	0.00%	₹ 1,992.05
La maison d'Asie	12.37%	₹ 9,328.20
Laughing Bacchus Wine Cellars	0.00%	₹ 522.50
Lazy K Kountry Store	0.00%	₹ 357.00
Lehmanns Marktstand	9.22%	₹ 19,261.41
Let's Stop N Shop	11.00%	₹ 3,076.47
LILA-Supermercado	9.64%	₹ 16,076.60
LINO-Delicateses	8.94%	₹ 16,476.56
Lonesome Pine Restaurant	0.00%	₹ 4,258.60
MÃ¨re Paillarde	6.11%	₹ 28,872.19
Magazzini Alimentari Riuniti	5.13%	₹ 7,176.21
Maison Dewey	5.88%	₹ 9,736.07
Morgenstern Gesundkost	0.00%	₹ 5,042.20
North/South	0.00%	₹ 649.00
OcÃ©ano AtlÃ¡ntico Ltda.	0.00%	₹ 3,460.20
Old World Delicatessen	6.17%	₹ 15,177.46
Ottilies KÃ¤seladen	5.07%	₹ 12,496.20
Pericles Comidas clÃ¡sicas	0.00%	₹ 4,242.20
Piccolo und mehr	6.63%	₹ 23,128.86

SQL Query

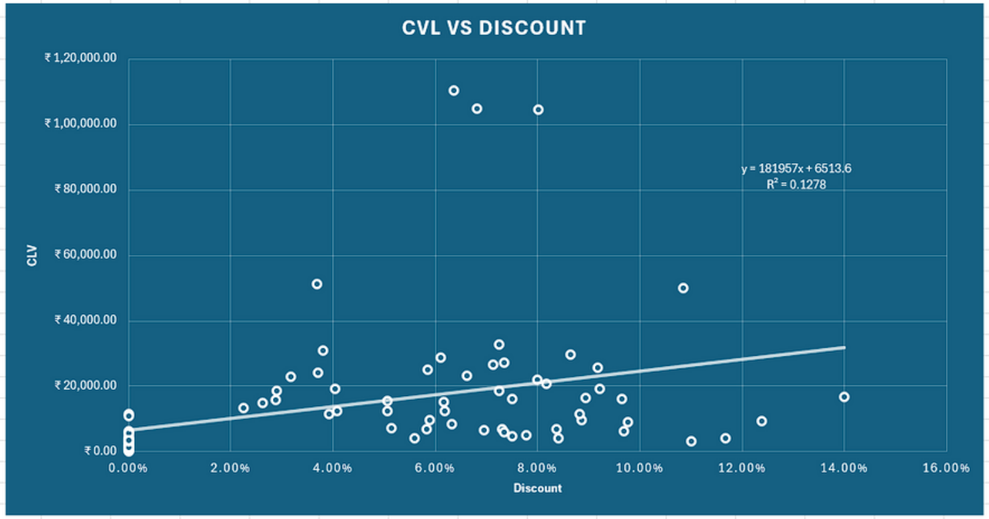
```
with alpha as(

SELECT
  o.CustomerID,
  c.CompanyName,
  c.City,
  c.Country,
  p.ProductName,
  g.CategoryName,
  COUNT(o.OrderID) AS TotalOrders,
  DATEDIFF(MAX(o.OrderDate), MIN(o.OrderDate)) AS RetentionPeriod,
  SUM(od.UnitPrice * od.Quantity * (1 - od.Discount)) AS CLV, -- (CLV: Customer Lifetime Value) --
  AVG(od.UnitPrice * od.Quantity * (1 - od.Discount)) AS AOV, -- (Aov: Average Order Value) --
  SUM(od.Discount) / COUNT(od.OrderID) AS AvgDiscountPerOrder,
  AVG(DATEDIFF(o.ShippedDate, o.OrderDate)) AS AvgDeliveryTime,
  MIN(o.OrderDate) AS FirstOrderDate,
  MAX(o.OrderDate) AS LastOrderDate
FROM Orders o
JOIN Customers c ON o.CustomerID = c.CustomerID
JOIN Order_Details od ON o.OrderID = od.OrderID
JOIN products p ON od.ProductID = p.ProductID
JOIN categories g on p.CategoryID = g.CategoryID
GROUP BY c.CustomerID, c.CompanyName, p.ProductName, g.CategoryName
order by CLV desc),

sigma as(

SELECT
  CustomerID,
  COUNT(OrderID) AS TotalOrders,
  AVG(DATEDIFF(OrderDate,
    (SELECT OrderDate FROM Orders o2 WHERE o2.CustomerID = o1.CustomerID AND o2.OrderDate < o1.OrderDate ORDER BY OrderDate DESC LIMIT 1)
  )) AS AvgDaysBetweenOrders
FROM Orders o1
GROUP BY CustomerID
order by TotalOrders desc, AvgDaysBetweenOrders)

select a.CustomerID, a.CompanyName, a.City, a.Country, a.ProductName, a.CategoryName, a.RetentionPeriod, s.AvgDaysBetweenOrders,
a.TotalOrders, a.AvgDiscountPerOrder, a.CLV , a.AOV,
a.TotalOrders/a.RetentionPeriod as "Orders/Period", a.CLV/a.RetentionPeriod as "Revenue/Period",
a.CLV/a.TotalOrders as "Revenue/Order", a.AvgDeliveryTime
from alpha a join sigma s
on a.CustomerID = s.CustomerID
GROUP BY a.CustomerID, a.CompanyName, a.ProductName, a.CategoryName ;
```



Conclusion: The scatter plot illustrates a weak positive correlation between customer lifetime value (CLV) and discount offered. This suggests that while discounts might influence initial purchases and attract new customers, their impact on long-term customer value is relatively limited. Other factors, such as product quality, customer service, and brand loyalty, likely play a more significant role in determining CLV.

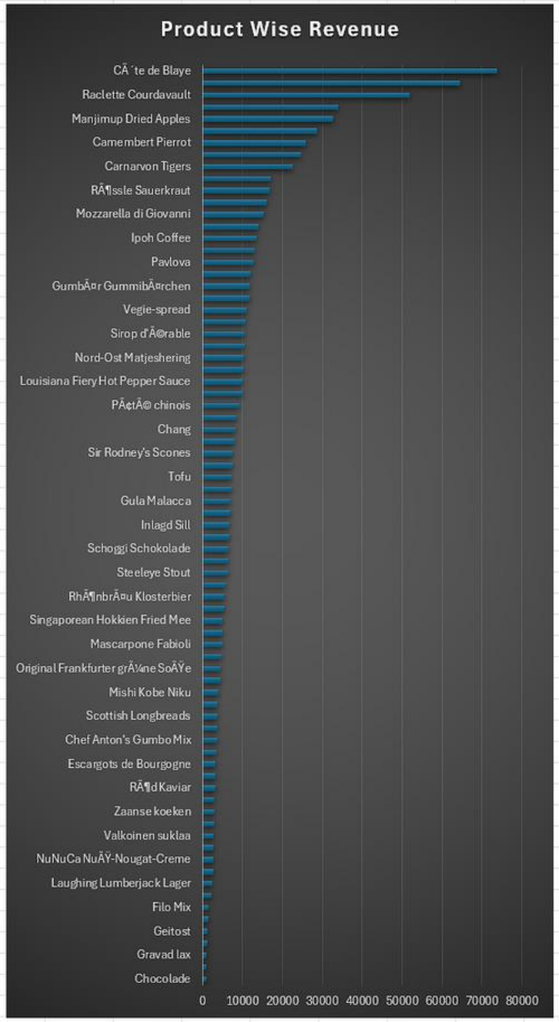
Question 2. How do customer preferences vary based on their location or demographics? Can we explore this through interactive visualizations?

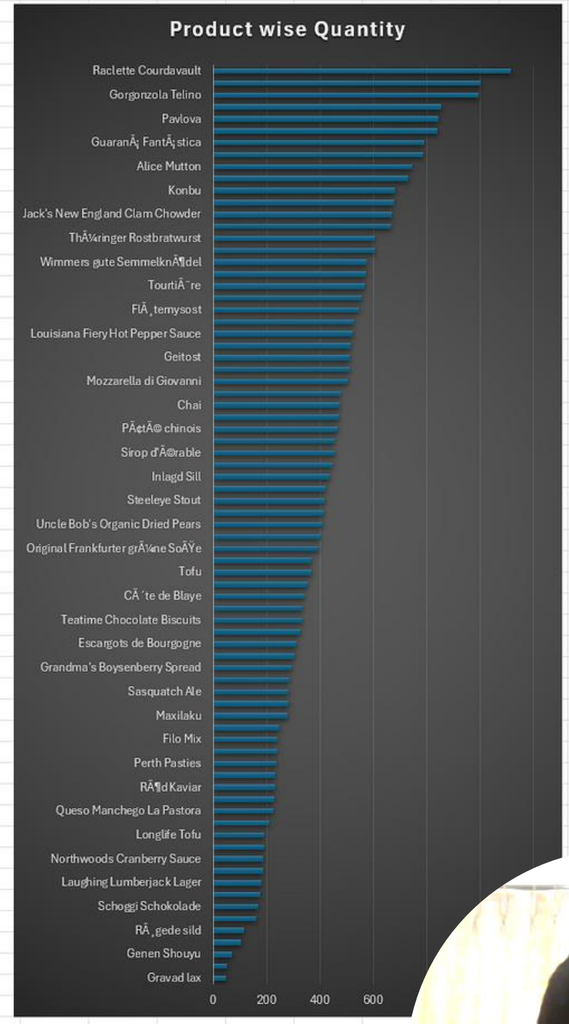
Country	Title	Product	Quantity	Revenue
Germany	Sales Representative	RÃ¶ssle Sauerkraut	24	₹ 886.60
Germany	Sales Representative	Chartreuse verte	26	₹ 373.50
Germany	Sales Representative	Spegesild	2	₹ 18.00
Germany	Sales Representative	Vegie-spread	20	₹ 878.00
Germany	Sales Representative	Aniseed Syrup	6	₹ 60.00
Germany	Sales Representative	LakkalikÃ¶Ã¶ri	48	₹ 795.60
Germany	Sales Representative	Raclette Courdavault	40	₹ 2,200.00
Germany	Sales Representative	Original Frankfurter grÃ¼ne SoÃŸe	27	₹ 280.80
Germany	Sales Representative	Grandma's Boysenberry Spread	36	₹ 880.00
Germany	Sales Representative	Escargots de Bourgogne	40	₹ 503.50
Germany	Sales Representative	FlÃ¸temysost	20	₹ 430.00
Mexico	Owner	Gudbrandsdalsost	1	₹ 28.80
Mexico	Owner	Outback Lager	17	₹ 240.00
Mexico	Owner	Tofu	3	₹ 69.75
Mexico	Owner	Singaporean Hokkien Fried Mee	25	₹ 350.00
Mexico	Owner	Camembert Pierrot	10	₹ 340.00
Mexico	Owner	Mascarpone Fabioli	10	₹ 320.00
Mexico	Owner	Queso Cabrales	91	₹ 1,705.20
Mexico	Owner	Konbu	20	₹ 108.00
Mexico	Owner	Teatime Chocolate Biscuits	14	₹ 128.80
Mexico	Owner	Mozzarella di Giovanni	10	₹ 348.00
Mexico	Owner	Ipoh Coffee	20	₹ 816.50
Mexico	Owner	Chocolade	15	₹ 162.56
Mexico	Owner	Boston Crab Meat	10	₹ 165.60
Mexico	Owner	Ravioli Angelo	5	₹ 87.75
Mexico	Owner	Raclette Courdavault	25	₹ 1,182.50
Mexico	Owner	Alice Mutton	36	₹ 1,341.60
Mexico	Owner	Sasquatch Ale	40	₹ 560.00
Mexico	Owner	Perth Pasties	25	₹ 820.00
Mexico	Owner	GumbÃ¤r GummibÃ¤rchen	30	₹ 796.36
Mexico	Owner	Geitost	68	₹ 167.00
Mexico	Owner	Louisiana Hot Spiced Okra	4	₹ 68.00
Mexico	Owner	RhÃ¶nbrÃ¤u Klosterbier	36	₹ 269.70
Mexico	Owner	Chang	20	₹ 380.00
UK	Sales Representative	GuaranÃ¡ FantÃ¡stica	25	₹ 90.00
UK	Sales Representative	Ravioli Angelo	71	₹ 1,287.00
UK	Sales Representative	Konbu	44	₹ 238.80
UK	Sales Representative	Valkoinen suklaa	39	₹ 585.00
UK	Sales Representative	Gnocchi di nonna Alice	40	₹ 1,216.00
UK	Sales Representative	Chocolade	15	₹ 137.70
UK	Sales Representative	Outback Lager	60	₹ 732.00
UK	Sales Representative	Zaanse koeken	25	₹ 237.50
UK	Sales Representative	Manjimup Dried Apples	23	₹ 1,187.20
UK	Sales Representative	Filo Mix	38	₹ 266.00
UK	Sales Representative	Perth Pasties	18	₹ 590.40
UK	Sales Representative	RÃ¶d Kaviar	3	₹ 45.00
UK	Sales Representative	PÃ¢tÃ© chinois	21	₹ 504.00
UK	Sales Representative	Chang	25	₹ 380.00
UK	Sales Representative	Spegesild	43	₹ 499.20
UK	Sales Representative	Gustaf's KnÃ¤ckebrÃ¶d	37	₹ 726.60
UK	Sales Representative	Gorgonzola Telino	115	₹ 1,406.25
UK	Sales Representative	Camembert Pierrot	15	₹ 510.00
UK	Sales Representative	FlÃ¸temysost	12	₹ 258.00
UK	Sales Representative	Jack's New England Clam Chowder	14	₹ 135.10
UK	Sales Representative	Steeleye Stout	24	₹ 432.00
UK	Sales Representative	Laughing Lumberjack Lager	15	₹ 210.00
UK	Sales Representative	Sir Rodney's Marmalade	50	₹ 3,847.50
UK	Sales Representative	Inlagd Sill	16	₹ 304.00
Sweden	Order Administrator	Gula Malacca	16	₹ 248.00
Sweden	Order Administrator	Raclette Courdavault	15	₹ 660.00

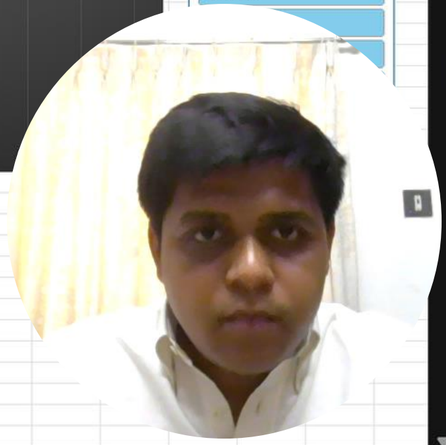
SQL Query

```
SELECT
  c.Country,
  c.ContactTitle,
  p.ProductName,
  SUM(od.Quantity) AS TotalOrderedQuantity,
  SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS
TotalRevenue
FROM Orders o
JOIN Order_Details od ON o.OrderID = od.OrderID
JOIN Products p ON od.ProductID = p.ProductID
JOIN Customers c ON o.CustomerID = c.CustomerID
GROUP BY c.Country, c.ContactTitle, p.ProductName;
```

Conclusion: 1st Bar chart shows Product Wise Revenue and the 2nd bar chart shows product wise quantity. Both the charts are connected with the Titale Slicer & the Country slicer. So as the we choose any buttons from both slicers customer's preferences like product's revenues & quntities chnages. Which indicates that as demographics changes, customer preference changes as well.





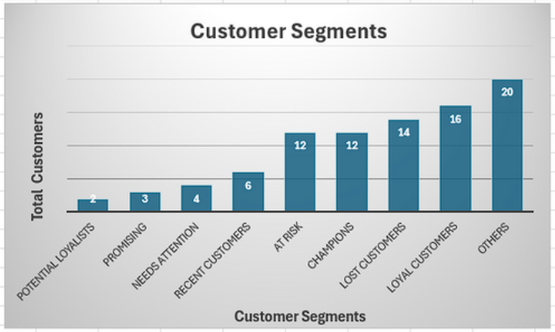


Question 3. Are there any interesting patterns or clusters in customer behavior that can be visualized to identify potential market segments?

CustomerID	RecentPurchaseDate	DaysSinceLastOrder	TotalOrders	TotalRevenue	RecencyScore	FrequencyScore	MonetaryScore	CustomerSegment
CENTC	18-08-1994	2327	2	₹ 100.80	0	0	0	Lost Customers
LAZYK	22-06-1995	2019	2	₹ 357.00	0	0	0	Lost Customers
LAUGB	01-02-1996	1795	8	₹ 522.50	0	1	0	Lost Customers
NORTS	29-05-1996	1677	6	₹ 649.00	7	0	0	Recent Customers
GALED	04-04-1996	1732	8	₹ 836.70	2	1	0	Lost Customers
ANATR	03-04-1996	1733	10	₹ 1,402.95	2	2	0	Lost Customers
ROMEY	09-05-1996	1697	14	₹ 1,467.29	4	3	0	Others
VINET	13-12-1995	1845	10	₹ 1,480.00	0	1	0	Lost Customers
GROSR	18-01-1996	1809	4	₹ 1,488.70	0	0	0	Lost Customers
FRANS	30-05-1996	1676	10	₹ 1,545.70	8	2	1	Recent Customers
TRAIH	08-02-1996	1788	9	₹ 1,571.20	1	1	1	Lost Customers
DUMON	18-03-1996	1749	9	₹ 1,615.90	1	1	1	Lost Customers
CONSH	23-02-1996	1773	7	₹ 1,719.10	1	0	1	Lost Customers
CACTU	28-05-1996	1678	11	₹ 1,814.80	7	2	1	Recent Customers
THECR	06-05-1996	1700	8	₹ 1,947.24	3	1	1	Others
LACOR	23-04-1996	1713	11	₹ 1,992.05	3	2	1	Others
SPECD	22-05-1996	1684	6	₹ 2,423.35	6	0	1	Others
RANCH	13-05-1996	1693	12	₹ 2,844.10	4	2	1	Others
HUNGC	09-10-1995	1910	9	₹ 3,063.20	0	1	2	Lost Customers
LETSS	14-03-1996	1753	10	₹ 3,076.47	1	1	2	Lost Customers
WILMK	07-05-1996	1699	17	₹ 3,161.35	4	4	2	Others
FRANR	23-04-1996	1713	6	₹ 3,172.16	3	0	2	Others
BLAUS	29-05-1996	1677	14	₹ 3,239.80	7	3	2	Recent Customers
THEBI	01-05-1996	1705	7	₹ 3,361.00	3	0	2	Others
OCEAN	29-04-1996	1707	11	₹ 3,460.20	3	2	2	Others
WOLZA	23-05-1996	1683	16	₹ 3,531.95	6	4	2	Others
DRACD	03-06-1996	1672	10	₹ 3,763.21	8	2	2	Recent Customers
COMMI	22-05-1996	1684	10	₹ 3,810.75	6	1	3	Others
FAMIA	01-12-1995	1857	19	₹ 4,107.55	0	4	3	Others
BOLID	23-04-1996	1713	6	₹ 4,232.85	3	0	3	Others
PERIC	04-06-1996	1671	14	₹ 4,242.20	9	3	3	Recent Customers
LONEP	13-05-1996	1693	14	₹ 4,258.60	5	3	3	Promising
ALFKI	09-05-1996	1697	12	₹ 4,273.00	4	3	3	Needs Attention
TOMSP	22-04-1996	1714	14	₹ 4,778.14	2	3	3	Lost Customers
MORGK	11-04-1996	1725	11	₹ 5,042.20	2	2	3	Lost Customers
PRINI	08-05-1996	1698	10	₹ 5,044.94	4	2	3	Others
SANTG	10-05-1996	1696	16	₹ 5,735.15	4	4	4	Needs Attention
WELLI	08-04-1996	1728	19	₹ 6,068.20	2	4	4	At Risk
BSBEV	14-05-1996	1692	22	₹ 6,089.90	5	5	4	Promising
ISLAT	05-04-1996	1731	23	₹ 6,146.30	2	5	4	At Risk
FURIB	18-04-1996	1718	20	₹ 6,427.42	2	4	4	At Risk
QUEDE	30-04-1996	1706	24	₹ 6,664.81	3	6	4	At Risk
TRADH	19-02-1996	1777	13	₹ 6,850.66	1	3	4	Others
ANTON	28-02-1996	1768	17	₹ 7,023.98	1	4	4	At Risk
REGGC	30-05-1996	1676	22	₹ 7,048.24	8	5	4	Potential Loyalists
MAGAA	15-04-1996	1721	21	₹ 7,176.21	2	5	5	At Risk
GOURL	24-05-1996	1682	19	₹ 8,414.13	6	4	5	Promising
VICTE	23-02-1996	1773	25	₹ 9,182.43	1	6	5	At Risk
LAMAI	27-05-1996	1679	31	₹ 9,328.20	7	7	5	Loyal Customers
WANDK	23-05-1996	1683	26	₹ 9,588.42	6	6	5	Loyal Customers
MAISD	07-05-1996	1699	17	₹ 9,736.07	4	4	5	Needs Attention
TORTU	03-06-1996	1672	29	₹ 10,812.15	8	7	5	Loyal Customers
SPLIR	24-04-1996	1712	20	₹ 11,441.63	3	5	5	Needs Attention
GODOS	21-05-1996	1685	26	₹ 11,446.36	6	6	5	Loyal Customers
FOLIG	22-01-1996	1805	16	₹ 11,666.90	0	3	6	Others
CHOPS	22-05-1996	1684	22	₹ 12,348.88	6	5	6	Others
RICAR	29-05-1996	1677	27	₹ 12,450.80	7	6	6	Loyal Customers
OTTIK	14-05-1996	1692	29	₹ 12,496.20	5	6	6	Loyal Customers
AROUT	10-05-1996	1696	30	₹ 13,390.65	4	7	6	Loyal Customers
EASTC	28-05-1996	1678	21	₹ 14,761.04	7	5	6	Potential Loyalists
OLDWO	20-05-1996	1686	24	₹ 15,177.46	5	6	6	Loyal Customers
WARTH	15-05-1996	1691	37	₹ 15,648.70	5	8	6	Loyal Customers
VAFFE	02-05-1996	1704	31	₹ 15,843.92	3	7	6	At Risk
LILAS	04-06-1996	1671	34	₹ 16,076.60	9	7	7	Champions
SEVES	06-03-1996	1761	26	₹ 16,215.32	1	6	7	At Risk
LINOD	21-05-1996	1685	35	₹ 16,476.56	5	7	7	Loyal Customers

SQL Query

```
WITH RFM_Calculations AS (
  SELECT
    c.CustomerID,
    MAX(o.OrderDate) AS RecentPurchaseDate,
    DATEDIFF("2000/12/31", MAX(o.OrderDate)) AS DaysSinceLastOrder,
    COUNT(o.OrderID) AS TotalOrders,
    SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS TotalRevenue
  FROM Customers c
  JOIN Orders o ON c.CustomerID = o.CustomerID
  JOIN Order_Details od ON o.OrderID = od.OrderID
  GROUP BY c.CustomerID
),
RFM_Scored AS (
  SELECT
    CustomerID,
    RecentPurchaseDate,
    DaysSinceLastOrder,
    TotalOrders,
    TotalRevenue,
    NTILE(10) OVER (ORDER BY DaysSinceLastOrder DESC) - 1 AS RecencyScore,  -- Lower days is better, so DESC
    NTILE(10) OVER (ORDER BY TotalOrders ASC) - 1 AS FrequencyScore,  -- Higher orders are better
    NTILE(10) OVER (ORDER BY TotalRevenue ASC) - 1 AS MonetaryScore  -- Higher revenue is better
  FROM RFM_Calculations
)
SELECT
  CustomerID,
  RecentPurchaseDate,
  DaysSinceLastOrder,
  TotalOrders,
  TotalRevenue,
  RecencyScore,
  FrequencyScore,
  MonetaryScore,
  CASE
    WHEN RecencyScore >= 7 AND FrequencyScore >= 7 AND MonetaryScore >= 7 THEN 'Champions'
    WHEN RecencyScore >= 4 AND FrequencyScore >= 6 AND MonetaryScore >= 5 THEN 'Loyal Customers'
    WHEN RecencyScore >= 7 AND FrequencyScore BETWEEN 3 AND 6 AND MonetaryScore BETWEEN 4 AND 6 THEN 'Potential Loyalists'
    WHEN RecencyScore >= 7 AND FrequencyScore <= 3 AND MonetaryScore <= 3 THEN 'Recent Customers'
    WHEN RecencyScore BETWEEN 5 AND 6 AND FrequencyScore BETWEEN 2 AND 5 AND MonetaryScore BETWEEN 3 AND 5 THEN 'Promising'
    WHEN RecencyScore BETWEEN 3 AND 4 AND FrequencyScore BETWEEN 3 AND 5 AND MonetaryScore BETWEEN 3 AND 5 THEN 'Needs Attention'
    WHEN RecencyScore BETWEEN 0 AND 3 AND FrequencyScore >= 4 AND MonetaryScore >= 4 THEN 'At Risk'
    WHEN RecencyScore BETWEEN 0 AND 2 AND FrequencyScore <= 3 AND MonetaryScore <= 3 THEN 'Lost Customers'
    ELSE 'Others' -- Catch-all category
  END AS CustomerSegment
FROM RFM_Scored;
```



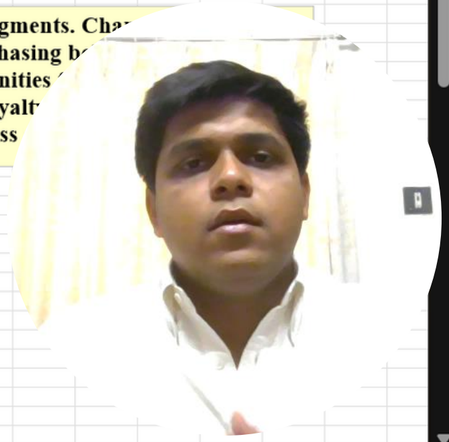
Segments Dictionary

1 **Identifying High-Value Segments**
- **Champions** (R ≥ 7, F ≥ 7, M ≥ 7) → These customers bring the most revenue.
  - ✅ **Strategy:** Reward loyalty, exclusive discounts.
- **Loyal Customers** (R ≥ 4, F ≥ 6, M ≥ 5) → Regular buyers with potential for upselling.
  - ✅ **Strategy:** Cross-sell and introduce premium products.

2 **Finding Potential Growth Areas**
- **Potential Loyalists** (R ≥ 7, F 3-6, M 4-6) → New customers with early signs of loyalty.
  - ✅ **Strategy:** Offer first-time buyer discounts.
- **Promising** (R 5-6, F 2-5, M 3-5) → Growing segment, need more engagement.
  - ✅ **Strategy:** Personalized email marketing, seasonal offers.

3 **Preventing Customer Churn**
- **At Risk** (R 0-3, F ≥ 4, M ≥ 4) → Used to buy a lot but stopped recently.
  - ✅ **Strategy:** Re-engagement campaigns, special offers.
- **Lost Customers** (R 0-2, F ≤ 3, M ≤ 3) → Haven't bought in a long time.
  - ✅ **Strategy:** Win-back campaigns, surveys to understand why they left.

Conclusion: The chart reveals a significant disparity in the number of customers across different segments. Cha… Loyal Customers form the largest segments, indicating a strong customer base with consistent purchasing b… segments like Lost Customers and Potential Loyalists represent smaller groups, suggesting opportunities … and retention strategies. This analysis highlights the potential for targeted marketing campaigns, loyalt… personalized outreach initiatives to nurture high-value segments and encourage engagement with less…



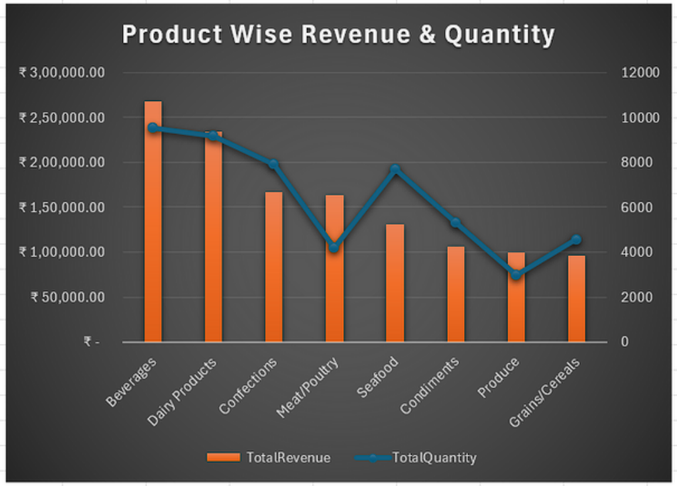
Question 4. Are there any specific product categories or SKUs that contribute significantly to order revenue? Can we identify them through visualizations?

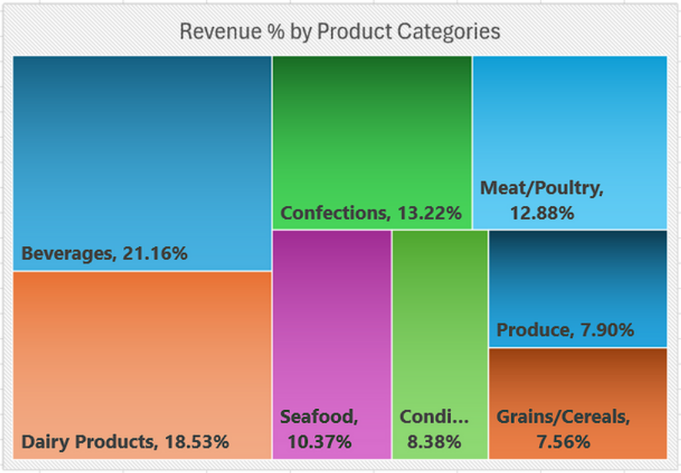
SQL Query

```
SELECT
   p.ProductName,
   c.CategoryName,
   SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS TotalRevenue,
   COUNT(o.OrderID) AS TotalOrders
FROM Order_Details od
JOIN Orders o ON od.OrderID = o.OrderID
JOIN Products p ON od.ProductID = p.ProductID
JOIN Categories c ON p.CategoryID = c.CategoryID
GROUP BY p.ProductName, c.CategoryName
ORDER BY TotalRevenue DESC
LIMIT 10;

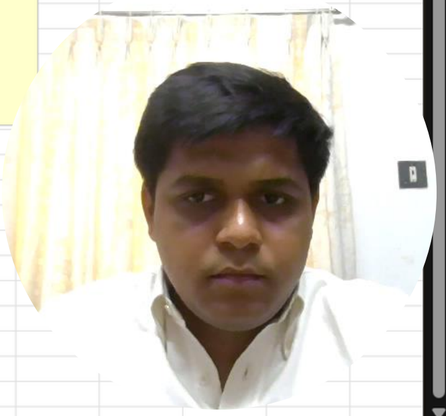
SELECT
   c.CategoryName,
   sum(od.Quantity) as TotalQuantity,
   SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS TotalRevenue,
   ROUND((SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) /
      (SELECT SUM(Quantity * UnitPrice * (1 - Discount)) FROM Order_Details)) * 100, 2) AS RevenuePercentage
FROM Order_Details od
JOIN Products p ON od.ProductID = p.ProductID
JOIN Categories c ON p.CategoryID = c.CategoryID
GROUP BY c.CategoryName
ORDER BY TotalRevenue DESC;
```

CategoryName	TotalQuantity	TotalRevenue	RevenuePercentage
Beverages	9532	₹ 2,67,868.18	21.16%
Dairy Products	9149	₹ 2,34,507.28	18.53%
Confections	7906	₹ 1,67,357.22	13.22%
Meat/Poultry	4199	₹ 1,63,022.36	12.88%
Seafood	7681	₹ 1,31,261.74	10.37%
Condiments	5298	₹ 1,06,047.08	8.38%
Produce	2990	₹ 99,984.58	7.90%
Grains/Cereals	4562	₹ 95,744.59	7.56%





Conclusion: Beverages & Dairy Products are high-revenue generators and should be further promoted. In contrast, Grains/Cereals, Produce & Condiments are low-performing categories, necessitating a review of their discontinuation or discounting. To optimize operations, focusing on best-selling categories for improved supply chain and inventory management is crucial. Additionally, offering targeted promotions on high-revenue but low-order products can effectively boost sales.



Question 5. Are there any correlations between order size and customer demographics or product categories? Can we explore this visually using scatter plots or heatmaps?

SQL Query

```
SELECT
  c.Country,
  c.ContactTitle,
  cat.CategoryName,  -- Corrected the column name for categories
  AVG(od.Quantity) AS AvgOrderQuantity,
  AVG(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS AvgOrderRevenue
FROM Orders o
JOIN Order_Details od ON o.OrderID = od.OrderID
JOIN Customers c ON o.CustomerID = c.CustomerID
JOIN Products p ON od.ProductID = p.ProductID
JOIN Categories cat ON p.CategoryID = cat.CategoryID
GROUP BY c.Country, c.ContactTitle, cat.CategoryName -- Added cat.CategoryName in GROUP BY
ORDER BY AvgOrderRevenue DESC;
```

Country	ContactTitle	CategoryName	AvgOrderQuantity	AvgOrderRevenue
Denmark	Owner	Beverages	50	₹ 10,540.00
Ireland	Sales Associate	Meat/Poultry	37	₹ 3,485.70
Switzerland	Sales Manager	Meat/Poultry	53	₹ 3,261.42
Spain	Sales Manager	Produce	40	₹ 2,120.00
Canada	Marketing Assistant	Meat/Poultry	70	₹ 2,074.80
USA	Marketing Manager	Beverages	13	₹ 2,067.05
Brazil	Accounting Manager	Beverages	27	₹ 1,951.83
Germany	Accounting Manager	Meat/Poultry	46	₹ 1,950.99
Germany	Accounting Manager	Beverages	47	₹ 1,906.13
Sweden	Owner	Meat/Poultry	29	₹ 1,799.37
France	Assistant Sales Agent	Seafood	30	₹ 1,736.00
USA	Sales Representative	Meat/Poultry	42	₹ 1,703.44
Germany	Accounting Manager	Produce	48	₹ 1,616.28
Sweden	Owner	Produce	37	₹ 1,616.00
USA	Assistant Sales Representative	Beverages	19	₹ 1,600.68
Canada	Marketing Assistant	Beverages	27	₹ 1,585.55
Spain	Owner	Meat/Poultry	30	₹ 1,513.43
UK	Sales Agent	Produce	50	₹ 1,500.00
Brazil	Sales Associate	Meat/Poultry	15	₹ 1,485.00
UK	Sales Agent	Meat/Poultry	28	₹ 1,459.50
Austria	Sales Manager	Produce	43	₹ 1,457.85
Germany	Accounting Manager	Confections	52	₹ 1,425.39
Denmark	Sales Manager	Produce	35	₹ 1,381.20
Germany	Sales Associate	Beverages	18	₹ 1,350.73
France	Marketing Manager	Meat/Poultry	25	₹ 1,341.93
France	Assistant Sales Agent	Condiments	30	₹ 1,317.00
France	Sales Manager	Meat/Poultry	15	₹ 1,248.00
Portugal	Sales Representative	Meat/Poultry	10	₹ 1,237.90
USA	Assistant Sales Representative	Confections	31	₹ 1,216.36
Denmark	Owner	Produce	30	₹ 1,192.50
Ireland	Sales Associate	Produce	40	₹ 1,138.22
USA	Owner	Beverages	29	₹ 1,130.93
Brazil	Assistant Sales Agent	Dairy Products	30	₹ 1,126.72
Austria	Sales Manager	Meat/Poultry	36	₹ 1,082.16
Denmark	Owner	Meat/Poultry	60	₹ 1,080.00
USA	Sales Representative	Condiments	53	₹ 1,068.22
Germany	Sales Associate	Meat/Poultry	24	₹ 1,063.60
Austria	Sales Manager	Beverages	45	₹ 1,059.88
Austria	Sales Manager	Dairy Products	38	₹ 1,040.99
Germany	Sales Associate	Dairy Products	26	₹ 1,014.04
Sweden	Owner	Grains/Cereals	38	₹ 1,007.00
Belgium	Sales Agent	Dairy Products	22	₹ 990.67
Germany	Accounting Manager	Dairy Products	36	₹ 985.77

Quantities by Categories & Countries

Row Labels	Beverages	Condiments	Confections	Dairy Products	Grains/Cereals	Meat/Poultry	Produce	Seafood
Argentina	15	28	16	16	20	0	16	20
Austria	45	45	41	38	39	36	43	44
Belgium	44	43	54	60	38	39	46	30
Brazil	132	127	120	127	108	90	58	106
Canada	55	51	59	55	40	94	52	51
Denmark	74	47	55	38	15	89	65	48
Finland	23	33	26	31	30	23	21	33
France	103	101	118	109	81	76	89	106
Germany	153	127	174	181	133	136	130	170
Ireland	22	30	30	30	17	37	40	36
Italy	29	45	41	41	49	13	25	42
Mexico	34	12	28	23	30	19	25	32
Norway	10	18	9	14	0	5	9	9
Poland	12	11	14	23	0	3	11	15
Portugal	28	46	34	10	42	30	18	24
Spain	72	49	20	19	51	48	40	37
Sweden	44	49	46	36	63	41	59	49
Switzerland	44	31	42	55	71	74	30	32
UK	107	80	68	109	69	68	82	70
USA	132	140	118	141	111	120	74	112
Venezuela	70	60	79	75	81	96	57	74

Revenue by Categories & Countries

Row Labels	Beverages	Condiments	Confections	Dairy Products	Grains/Cereals	Meat/Poultry	Produce	Seafood
Argentina	₹ 738.83	₹ 596.00	₹ 611.82	₹ 382.30	₹ 390.00	₹ -	₹ 627.00	₹ 257.17
Austria	₹ 1,059.88	₹ 952.33	₹ 966.74	₹ 1,040.99	₹ 968.51	₹ 1,082.16	₹ 1,457.85	₹ 778.19
Belgium	₹ 1,047.69	₹ 808.50	₹ 1,495.92	₹ 1,938.67	₹ 1,044.33	₹ 936.83	₹ 1,682.40	₹ 459.12
Brazil	₹ 4,049.64	₹ 2,377.01	₹ 2,003.30	₹ 3,622.87	₹ 2,007.92	₹ 4,136.71	₹ 2,162.16	₹ 2,101.60
Canada	₹ 1,938.10	₹ 952.01	₹ 1,307.88	₹ 1,393.26	₹ 1,031.01	₹ 2,638.80	₹ 1,176.00	₹ 1,081.01
Denmark	₹ 10,787.62	₹ 848.14	₹ 786.57	₹ 1,124.18	₹ 99.75	₹ 1,774.17	₹ 2,573.70	₹ 821.18
Finland	₹ 465.58	₹ 811.00	₹ 294.79	₹ 890.57	₹ 682.25	₹ 764.16	₹ 379.20	₹ 426.10
France	₹ 2,030.55	₹ 2,739.09	₹ 2,849.14	₹ 2,493.01	₹ 1,379.15	₹ 3,239.63	₹ 3,022.38	₹ 3,191.56
Germany	₹ 4,448.90	₹ 2,474.30	₹ 4,012.48	₹ 5,324.95	₹ 2,147.27	₹ 5,033.88	₹ 4,205.23	₹ 2,453.28
Ireland	₹ 349.48	₹ 579.60	₹ 558.79	₹ 693.09	₹ 480.80	₹ 3,485.70	₹ 1,138.22	₹ 574.93
Italy	₹ 256.49	₹ 641.06	₹ 766.35	₹ 1,144.92	₹ 792.10	₹ 352.17	₹ 825.60	₹ 631.40
Mexico	₹ 704.00	₹ 247.09	₹ 382.95	₹ 464.73	₹ 257.92	₹ 743.62	₹ 935.81	₹ 492.83
Norway	₹ 551.20	₹ 234.00	₹ 140.08	₹ 393.00	₹ -	₹ 164.00	₹ 289.20	₹ 312.20
Poland	₹ 138.08	₹ 313.50	₹ 389.55	₹ 405.00	₹ -	₹ 22.35	₹ 153.00	₹ 159.00
Portugal	₹ 369.60	₹ 1,109.76	₹ 351.05	₹ 332.60	₹ 1,082.20	₹ 1,338.20	₹ 648.72	₹ 632.40
Spain	₹ 616.40	₹ 867.08	₹ 339.72	₹ 646.00	₹ 851.50	₹ 2,368.89	₹ 2,120.00	₹ 657.01
Sweden	₹ 960.47	₹ 996.90	₹ 768.57	₹ 1,063.16	₹ 1,182.00	₹ 2,122.02	₹ 2,454.40	₹ 686.63
Switzerland	₹ 521.34	₹ 1,132.40	₹ 877.41	₹ 1,699.42	₹ 1,274.02	₹ 3,604.14	₹ 922.83	₹ 533.01
UK	₹ 1,403.16	₹ 1,737.86	₹ 1,668.84	₹ 2,358.39	₹ 870.65	₹ 2,644.38	₹ 2,745.15	₹ 1,196.36
USA	₹ 6,359.54	₹ 2,884.36	₹ 3,036.28	₹ 2,989.27	₹ 3,062.07	₹ 4,423.57	₹ 2,442.65	₹ 2,120.06
Venezuela	₹ 940.83	₹ 710.10	₹ 1,332.62	₹ 2,330.31	₹ 1,166.75	₹ 2,085.61	₹ 2,185.83	₹ 1,091.66

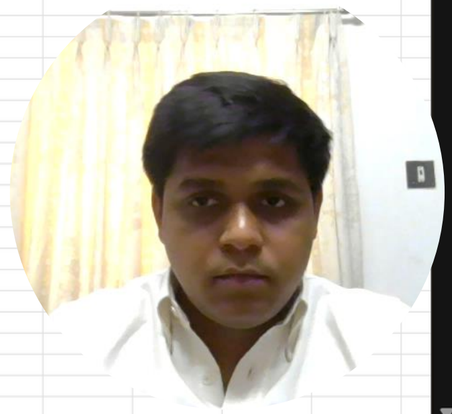
Quantity by Categories & Titles

Row Labels	Beverages	Condiments	Confections	Dairy Products	Grains/Cereals	Meat/Poultry	Produce	Seafood
Accounting Manager	167	164	190	186	180	172	148	173
Assistant Sales Agent	28	65	56	42	38	18	25	56
Assistant Sales Representative	19	10	31	26	20	18	19	9
Marketing Assistant	72	70	57	78	54	95	85	61
Marketing Manager	95	88	102	104	132	52	45	97
Order Administrator	32	17	36	39	25	33	22	33
Owner	278	247	204	210	190	238	189	174
Owner/Marketing Assistant	10	8	11	7	6	5	3	12
Sales Agent	78	73	75	80	26	48	90	56
Sales Associate	86	110	88	103	61	89	82	95
Sales Manager	206	152	199	206	199	227	161	206
Sales Representative	178	169	139	147	157	141	121	169

Revenue by Categories & Titles

Row Labels	Beverages	Condiments	Confections	Dairy Products	Grains/Cereals	Meat/Poultry	Produce	Seafood

Conclusion: As per the heatmaps, we can see some correlation between order size (in terms of revenue and quantities) and customer demographics (Location, designation) / product categories. The red cells depict strong opposite correlation, the yellow cells depict weak correlation & green cells depicts strong positive correlation between entities.

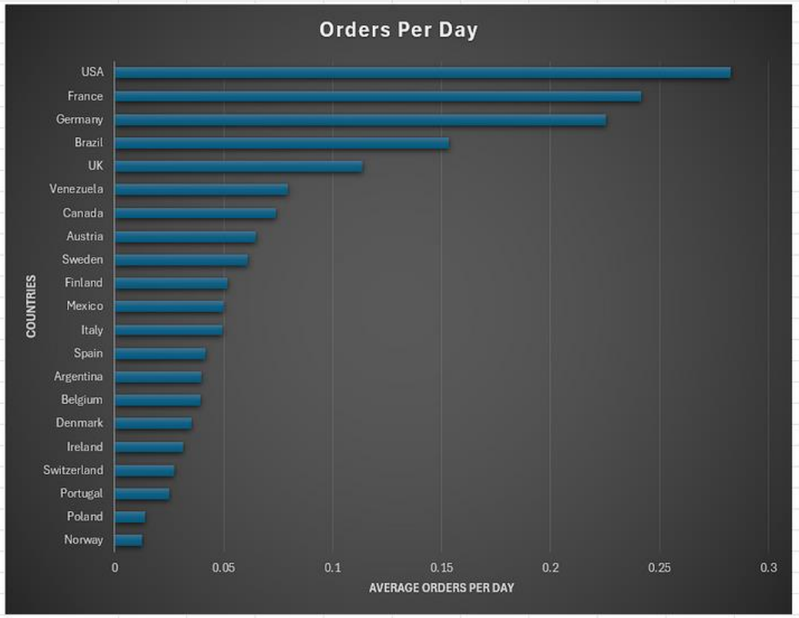


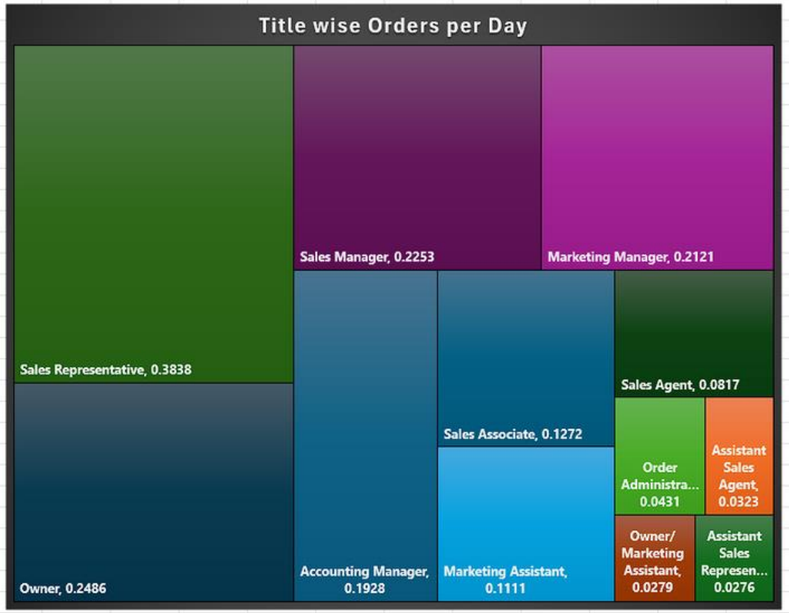
6. How does order frequency vary across different customer segments? Can we visualize this using bar charts or treemaps?

SQL Query

```
SELECT
  c.CustomerID,
  c.Country,
  c.ContactTitle,
  COUNT(o.OrderID) AS TotalOrders,
  COUNT(o.OrderID) / DATEDIFF(MAX(o.OrderDate), MIN(o.OrderDate)) AS OrdersPerDay
FROM Orders o
JOIN Customers c ON o.CustomerID = c.CustomerID
GROUP BY c.CustomerID, c.Country, c.ContactTitle;
```

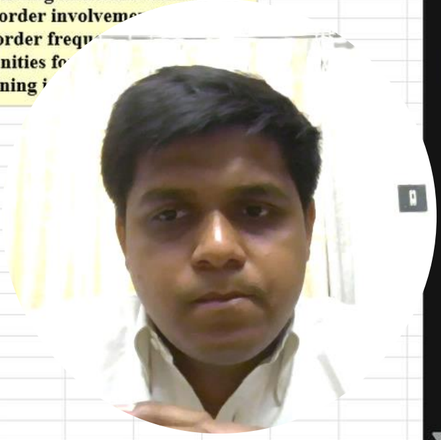
CustomerID	Country	ContactTitle	TotalOrders	OrdersPerDay
ALFKI	Germany	Sales Representative	6	0.03
ANATR	Mexico	Owner	4	0.01
ANTON	Mexico	Owner	7	0.02
AROUT	UK	Sales Representative	13	0.03
BERGS	Sweden	Order Administrator	18	0.03
BLAUS	Germany	Sales Representative	7	0.02
BLONP	France	Marketing Manager	11	0.02
BOLID	Spain	Owner	3	0.01
BONAP	France	Owner	17	0.03
BOTTM	Canada	Accounting Manager	14	0.03
BSBEV	UK	Sales Representative	10	0.02
CACTU	Argentina	Sales Agent	6	0.02
CENTC	Mexico	Marketing Manager	1	0.00
CHOPS	Switzerland	Owner	8	0.01
COMMI	Brazil	Sales Associate	5	0.01
CONSH	UK	Sales Representative	3	0.01
DRACD	Germany	Order Administrator	6	0.01
DUMON	France	Owner	4	0.01
EASTC	UK	Sales Agent	8	0.02
ERNSH	Austria	Sales Manager	30	0.05
FAMIA	Brazil	Marketing Assistant	7	0.02
FOLIG	France	Assistant Sales Agent	5	0.01
FOLKO	Sweden	Owner	19	0.03
FRANK	Germany	Marketing Manager	15	0.02
FRANR	France	Marketing Manager	3	0.02
FRANS	Italy	Sales Representative	6	0.01
FURIB	Portugal	Sales Manager	8	0.02
GALED	Spain	Marketing Manager	5	0.01
GODOS	Spain	Sales Manager	10	0.02
GOURL	Brazil	Sales Associate	9	0.02
GREAL	USA	Marketing Manager	11	0.03
GROSR	Venezuela	Owner	2	0.00
HANAR	Brazil	Accounting Manager	14	0.02
HILAA	Venezuela	Sales Representative	18	0.03
HUNGC	USA	Sales Representative	5	0.02
HUNGO	Ireland	Sales Associate	19	0.03
ISLAT	UK	Marketing Manager	10	0.02
KOENE	Germany	Sales Associate	14	0.03
LACOR	France	Sales Representative	4	0.07
LAMAI	France	Sales Manager	14	0.03
LAUGB	Canada	Marketing Assistant	3	0.01
LAZYK	USA	Marketing Manager	2	0.03
LEHMS	Germany	Sales Representative	15	0.02
LETSS	USA	Owner	4	0.02
LILAS	Venezuela	Accounting Manager	14	0.02





The bar chart illustrates a significant disparity in order frequency across different countries. The United States exhibits the highest average orders per day, indicating a considerably higher order frequency compared to other nations. France and Germany follow closely, while the majority of countries demonstrate a relatively consistent order frequency. Countries like Norway and Poland exhibit the lowest order frequency, suggesting less frequent orders compared to other nations. This analysis highlights the non-uniform nature of order frequency across different customer segments, suggesting potential opportunities for customer segmentation based on order frequency.

The Tree map reveals significant disparities in order frequency across different employee job titles within Northwind Traders. Sales Representatives demonstrate the highest average orders per day, indicating a considerably greater order frequency compared to other roles. The Owner and Marketing Managers follow closely, while roles such as Order Administrators, Assistant Sales Agents, and Marketing Assistants exhibit the lowest order frequency, suggesting less frequent order involvem... analysis underscores the non-uniform nature of order freq... employee segments, suggesting potential opportunities fo... evaluation, resource allocation, and targeted training ...

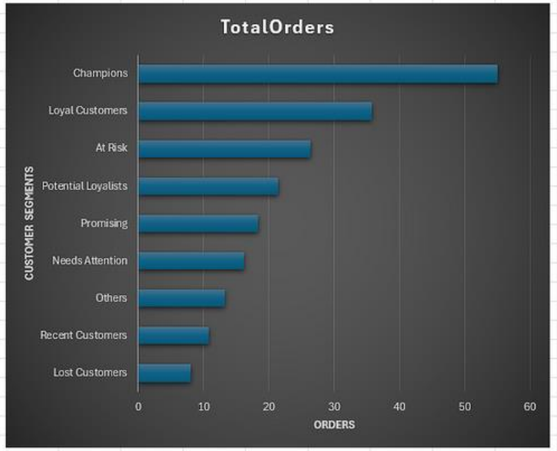


Horizontal (Category) Axis

Question 6. How does order frequency vary across different customer segments? Can we visualize this using bar charts or treemaps?

SQL Query

```
WITH RFM_Calculations AS (
  SELECT
    c.CustomerID,
    MAX(o.OrderDate) AS RecentPurchaseDate,
    DATEDIFF("2000/12/31", MAX(o.OrderDate)) AS DaysSinceLastOrder,
    COUNT(o.OrderID) AS TotalOrders,
    SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS TotalRevenue
  FROM Customers c
  JOIN Orders o ON c.CustomerID = o.CustomerID
  JOIN Order_Details od ON o.OrderID = od.OrderID
  GROUP BY c.CustomerID
),
RFM_Scored AS (
  SELECT
    CustomerID,
    RecentPurchaseDate,
    DaysSinceLastOrder,
    TotalOrders,
    TotalRevenue,
    NTILE(10) OVER (ORDER BY DaysSinceLastOrder DESC) - 1 AS RecencyScore,  -- Lower days is better, so DESC
    NTILE(10) OVER (ORDER BY TotalOrders ASC) - 1 AS FrequencyScore,  -- Higher orders are better
    NTILE(10) OVER (ORDER BY TotalRevenue ASC) - 1 AS MonetaryScore  -- Higher revenue is better
  FROM RFM_Calculations
)
SELECT
  CustomerID,
  RecentPurchaseDate,
  DaysSinceLastOrder,
  TotalOrders,
  TotalRevenue,
  RecencyScore,
  FrequencyScore,
  MonetaryScore,
  CASE
    WHEN RecencyScore >= 7 AND FrequencyScore >= 7 AND MonetaryScore >= 7 THEN 'Champions'
    WHEN RecencyScore >= 4 AND FrequencyScore >= 6 AND MonetaryScore >= 5 THEN 'Loyal Customers'
    WHEN RecencyScore >= 7 AND FrequencyScore BETWEEN 3 AND 6 AND MonetaryScore BETWEEN 4 AND 6 THEN 'Potential Loyalists'
    WHEN RecencyScore >= 7 AND FrequencyScore <= 3 AND MonetaryScore <= 3 THEN 'Recent Customers'
    WHEN RecencyScore BETWEEN 5 AND 6 AND FrequencyScore BETWEEN 2 AND 5 AND MonetaryScore BETWEEN 3 AND 5 THEN 'Promising'
    WHEN RecencyScore BETWEEN 3 AND 4 AND FrequencyScore BETWEEN 3 AND 5 AND MonetaryScore BETWEEN 3 AND 5 THEN 'Needs Attention'
    WHEN RecencyScore BETWEEN 0 AND 3 AND FrequencyScore >= 4 AND MonetaryScore >= 4 THEN 'At Risk'
    WHEN RecencyScore BETWEEN 0 AND 2 AND FrequencyScore <= 3 AND MonetaryScore <= 3 THEN 'Lost Customers'
    ELSE 'Others' -- Catch-all category
  END AS CustomerSegment
FROM RFM_Scored;
```



Conclusion: The Tree plot illustrates distinct variations in order frequency across different customer segments. Champions exhibit the highest average orders per day, indicating a considerably greater order frequency compared to other segments. Loyal Customers and Potential Loyalists follow closely, while segments like Lost Customers, Recent Customers, and Needs Attention exhibit lower order frequencies. This analysis highlights the non-uniform nature of order frequency across customer segments, suggesting potential opportunities for targeted marketing campaigns, customer retention strategies, and personalized outreach initiatives.

Conclusion: The bar chart illustrates a significant disparity in order frequency across different customer segments. Champions exhibit the highest average orders per day, indicating a considerably greater order frequency compared to other segments. Loyal Customers and Potential Loyalists follow closely, while segments like Lost Customers, Recent Customers, and Needs Attention exhibit lower order frequencies. This analysis underscores the non-uniform nature of order frequency across customer segments, suggesting potential opportunities for targeted marketing campaigns, customer retention strategies, and personalized outreach initiatives.

CustomerID	RecentPurchaseDate	DaysSinceLastOrder	TotalOrders	TotalRevenue	RecencyScore	FrequencyScore	MonetaryScore	CustomerSegment
CENTC	34564	2327	2	₹ 100.80	0	0	0	Lost Customers
LAZYK	34872	2019	2	₹ 357.00	0	0	0	Lost Customers
LAUGB	35096	1795	8	₹ 522.50	0	1	0	Lost Customers
NORTS	35214	1677	6	₹ 649.00	7	0	0	Recent Customers
GALED	35159	1732	8	₹ 836.70	2	1	0	Lost Customers
ANATR	35158	1733	10	₹ 1,402.95	2	2	0	Lost Customers
ROMEY	35194	1697	14	₹ 1,467.29	4	3	0	Others
VINET	35046	1845	10	₹ 1,480.00	0	1	0	Lost Customers
GROSR	35082	1809	4	₹ 1,488.70	0	0	0	Lost Customers
FRANS	35215	1676	10	₹ 1,545.70	8	2	1	Recent Customers
TRAIH	35103	1788	9	₹ 1,571.20	1	1	1	Lost Customers
DUMON	35142	1749	9	₹ 1,615.90	1	1	1	Lost Customers
CONSH	35118	1773	7	₹ 1,719.10	1	0	1	Lost Customers
CACTU	35213	1678	11	₹ 1,814.80	7	2	1	Recent Customers
THECR	35191	1700	8	₹ 1,947.24	3	1	1	Others
LACOR	35178	1713	11	₹ 1,992.05	3	2	1	Others
SPECD	35207	1684	6	₹ 2,423.35	6	0	1	Others
RANCH	35198	1693	12	₹ 2,844.10	4	2	1	Others
HUNGC	34981	1910	9	₹ 3,063.20	0	1	2	Lost Customers
LETSS	35138	1753	10	₹ 3,076.47	1	1	2	Lost Customers
WILMK	35192	1699	17	₹ 3,161.35	4	4	2	Others

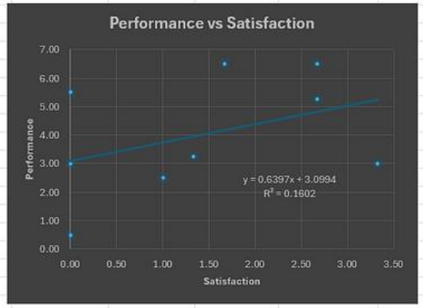
Question 7. Are there any correlations between employee satisfaction levels and key performance indicators? Can we explore this visually through scatter plots or

SQL Query

```
WITH EmployeeMetrics AS (
  SELECT
    e.EmployeeID,
    e.FirstName,
    e.LastName,
    DATEDIFF("2000/12/31", e.HireDate) / 365 AS TenureYears,
    COUNT(o.OrderID) AS TotalOrdersProcessed,
    SUM(od.UnitPrice * od.Quantity * (1 - od.Discount)) AS TotalRevenueGenerated,
    AVG(DATEDIFF(o.ShippedDate, o.OrderDate)) AS AvgOrderProcessingTime
  FROM Employees e
  LEFT JOIN Orders o ON e.EmployeeID = o.EmployeeID
  LEFT JOIN Order_Details od ON o.OrderID = od.OrderID
  WHERE o.ShippedDate IS NOT NULL
  GROUP BY e.EmployeeID, e.FirstName, e.LastName
),
NormalizedMetrics AS (
  SELECT
    EmployeeID,
    FirstName,
    LastName,
    TenureYears,
    TotalOrdersProcessed,
    TotalRevenueGenerated,
    AvgOrderProcessingTime,
    -- Normalize tenure (0-9 scale)
    NTILE(10) OVER (ORDER BY TenureYears DESC) - 1 AS TenureScore,
    -- Normalize workload (higher orders → higher workload)
    NTILE(10) OVER (ORDER BY TotalOrdersProcessed DESC) - 1 AS WorkloadScore,
    -- Normalize processing time (inverted scale: faster processing is better)
    9 - NTILE(10) OVER (ORDER BY AvgOrderProcessingTime ASC) AS ProcessingScore,
    -- Normalize revenue generated (higher revenue → better performance)
    NTILE(10) OVER (ORDER BY TotalRevenueGenerated DESC) - 1 AS RevenueScore
  FROM EmployeeMetrics
)
SELECT
  EmployeeID,
  FirstName,
  LastName,
  TenureYears,
  TotalOrdersProcessed,
  TotalRevenueGenerated,
  AvgOrderProcessingTime,
  TenureScore,
  WorkloadScore,
  ProcessingScore,
  RevenueScore,
  -- Employee Satisfaction Score (Higher tenure & processing speed, lower workload)
  ROUND((TenureScore + ProcessingScore - WorkloadScore) / 3, 2) AS EmployeeSatisfactionScore,
  -- Employee Performance Score (Higher orders, higher revenue, faster processing)
  ROUND((WorkloadScore + RevenueScore + ProcessingScore) / 3, 2) AS EmployeePerformanceScore
FROM NormalizedMetrics
ORDER BY EmployeePerformanceScore DESC;
```

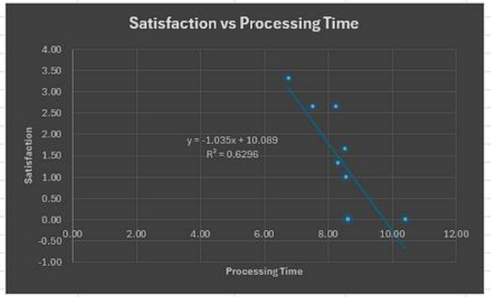
EmployeeID	FirstName	LastName	TenureYears	TotalOrdersProcessed	TotalRevenueGenerated	AvgOrderProcessingTime	TenureScore	OrdersProcessedScore	RevenueScore	ProcessingScore	WorkloadScore	EmployeeSatisfactionScore	EmployeePerformanceScore
9	Anne	Dodsworth	6.1	104	₹ 76,450.07	10.39	0	0	2	0	0	0.00	0.50
8	Laura	Callahan	6.8	250	₹ 1,23,842.68	8.62	1	5	4	2	5	0.00	3.00
4	Margaret	Peacock	7.7	409	₹ 2,25,763.70	8.62	5	8	8	1	8	0.00	5.50
6	Michael	Suyama	7.2	164	₹ 72,527.63	8.54	4	2	1	3	2	1.00	2.50
7	Robert	King	7.0	171	₹ 1,19,619.25	8.28	2	3	3	5	3	1.33	3.25
3	Janet	Leverling	8.8	321	₹ 2,02,812.84	8.53	8	7	7	4	7	1.67	6.50
2	Andrew	Fuller	8.4	232	₹ 1,62,769.78	8.25	6	4	5	6	4	2.67	5.25
1	Nancy	Davolio	8.7	314	₹ 1,87,277.38	7.50	7	6	6	7	6	2.67	6.50
5	Steven	Buchanan	7.2	117	₹ 68,792.28	6.75	3	1	0	8	1	3.33	3.00

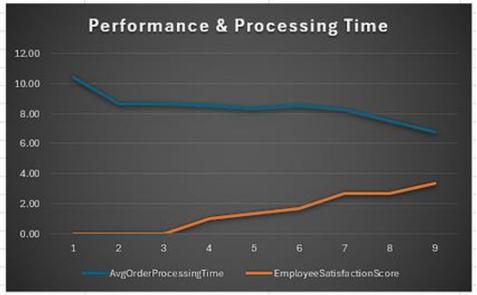
Correlation b/w Satisfaction & Performaance : 0.40



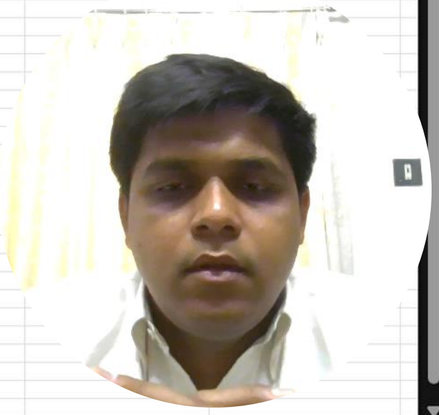
Conclusion: Correlation b/w Satisfaction & Performaance is 0.40, which indicates that as satisfaction of the employee increases, the performance also increases at some extent. The scatter plot verifies that. The line graph gives final verdict and shows how the increment in performance happens with the increment of satisfaction

Correlation b/w Satisfaction & Processing Time: -0.79





Conclusion: Correlation b/w Satisfaction & Performaance is -0.79, which clearly indicates that as satisfaction of the employee decreases, the processing time decreases very significantly. The scatter plot verifies that. The line graph gives final verdict and shows how the processing time in performance happens with the increment of satisfaction.



Question 8. How does employee turnover vary across different departments or job roles? Can we visualize this using bar charts or heatmaps?

SQL Query

```
ALTER TABLE employees
DROP COLUMN LeavingDate;

ALTER TABLE Employees
ADD LeavingDate DATE;

SELECT MIN(OrderDate) AS FirstOrderDate, MAX(OrderDate) AS LastOrderDate
FROM Orders;

SELECT EmployeeID, MAX(OrderDate) AS LastSaleDate
FROM Orders
GROUP BY EmployeeID;

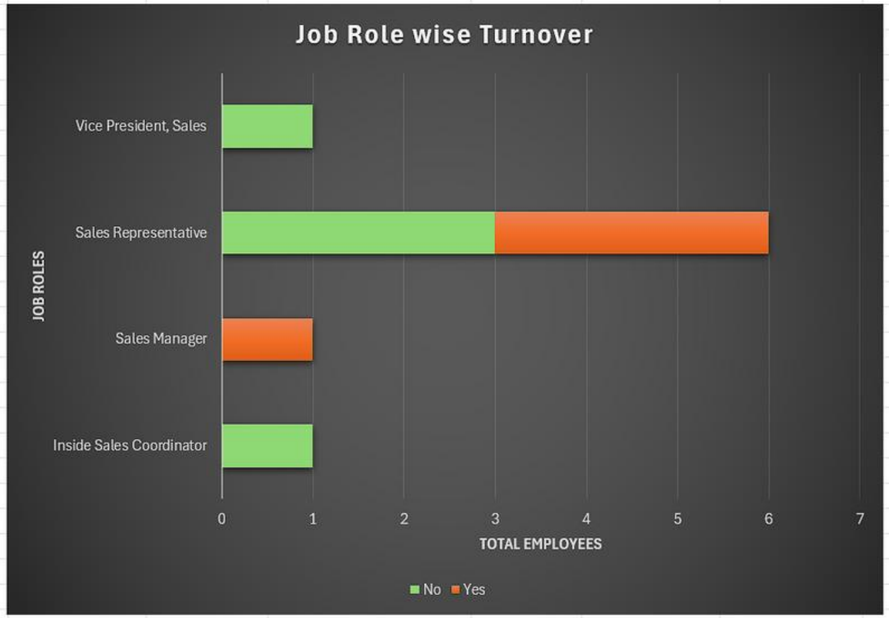
-- Step 1: Create a temporary table to store 3 random EmployeeIDs
CREATE TEMPORARY TABLE TempEmployees AS
SELECT EmployeeID
FROM Employees
ORDER BY RAND()
LIMIT 4;

-- Step 2: Update the LeavingDate for selected employees
UPDATE Employees e
JOIN (
  SELECT EmployeeID, MAX(OrderDate) AS LastSaleDate
  FROM Orders
  GROUP BY EmployeeID
) o ON e.EmployeeID = o.EmployeeID
SET e.LeavingDate = DATE_ADD(o.LastSaleDate, INTERVAL FLOOR(RAND() * 90) DAY)
WHERE e.EmployeeID IN (SELECT EmployeeID FROM TempEmployees);

-- Step 3: Drop the temporary table (optional, as it will be removed after session ends)
DROP TEMPORARY TABLE IF EXISTS TempEmployees;

select EmployeeID, FirstName, Title, HireDate, LeavingDate from employees;
```

EmployeeID	FirstName	Title	HireDate	LeavingDate	TurnedOver?
1	Nancy	Sales Representative	01-05-1992		No
2	Andrew	Vice President, Sales	14-08-1992		No
3	Janet	Sales Representative	01-04-1992		No
4	Margaret	Sales Representative	03-05-1993	27-08-1996	Yes
5	Steven	Sales Manager	17-10-1993	05-07-1996	Yes
6	Michael	Sales Representative	17-10-1993	26-06-1996	Yes
7	Robert	Sales Representative	02-01-1994	16-06-1996	Yes
8	Laura	Inside Sales Coordinator	05-03-1994		No
9	Anne	Sales Representative	15-11-1994		No



Conclusion:The bar chart gives the insights about employee turover in each Job roles. Out of all the job roles, sales representatives have maximum turnover throught the time period, which is 50% other than that sales manager also has left the job.

Question 9. Can we identify any patterns or clusters in employee skill sets or qualifications through visualizations? How can this information be used for talent management?

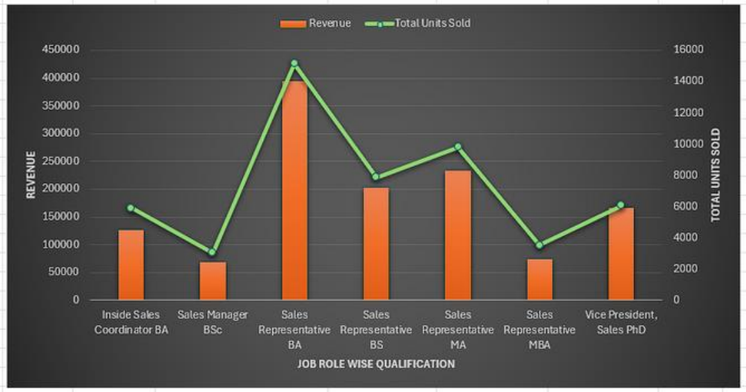
SQL Query

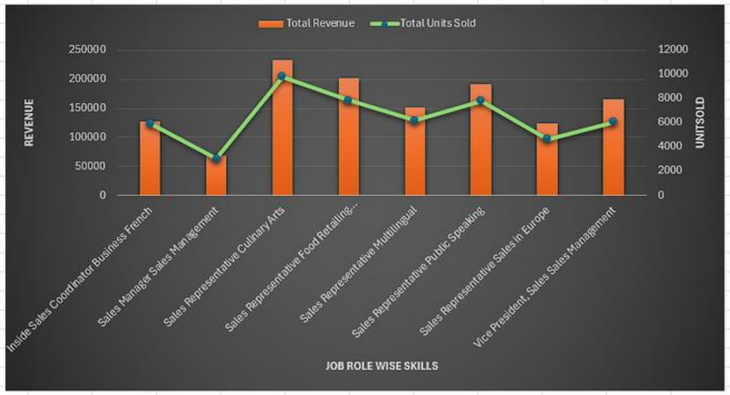
```
ALTER TABLE Employees
ADD Skills VARCHAR(255),
ADD Qualifications VARCHAR(255);

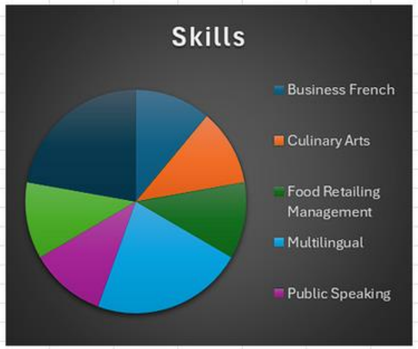
UPDATE Employees
SET Skills = CASE
   WHEN EmployeeID = 1 THEN 'Public Speaking'
   WHEN EmployeeID = 2 THEN 'Sales Management'
   WHEN EmployeeID = 3 THEN 'Food Retailing Management'
   WHEN EmployeeID = 4 THEN 'Culinary Arts'
   WHEN EmployeeID = 5 THEN 'Sales Management'
   WHEN EmployeeID = 6 THEN 'Multilingual'
   WHEN EmployeeID = 7 THEN 'Sales in Europe'
   WHEN EmployeeID = 8 THEN 'Business French'
   WHEN EmployeeID = 9 THEN 'Multilingual'
   ELSE NULL
END,
Qualifications = CASE
   WHEN EmployeeID = 1 THEN 'BA'
   WHEN EmployeeID = 2 THEN 'PhD'
   WHEN EmployeeID = 3 THEN 'BS'
   WHEN EmployeeID = 4 THEN 'MA'
   WHEN EmployeeID = 5 THEN 'BSc'
   WHEN EmployeeID = 6 THEN 'MBA'
   WHEN EmployeeID = 7 THEN 'BA'
   WHEN EmployeeID = 8 THEN 'BA'
   WHEN EmployeeID = 9 THEN 'BA'
   ELSE NULL
END;

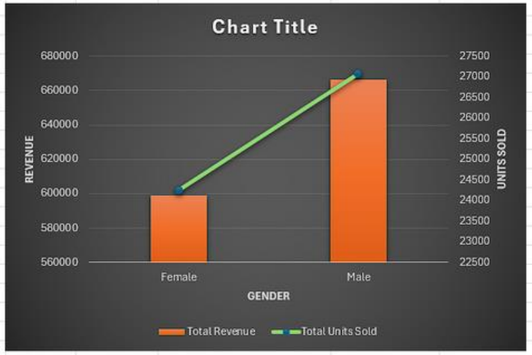
select EmployeeID, FirstName, Title, TitleOfCourtesy, City, Country, ReportsTo, Skills,
Qualifications
from employees;

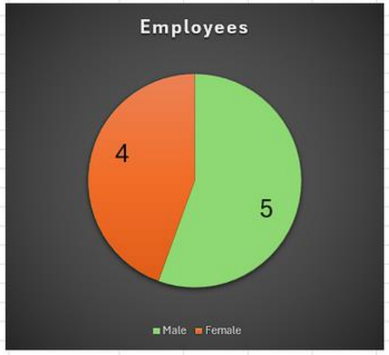
SELECT
   e.EmployeeID, e.FirstName, e.Title, e.TitleOfCourtesy, e.City, e.Country, e.ReportsTo,
e.Skills, e.Qualifications,
   COALESCE(SUM(od.Quantity), 0) AS TotalUnitsSold,
   COALESCE(SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)), 0) AS TotalRevenue
FROM Employees e
LEFT JOIN Orders o ON e.EmployeeID = o.EmployeeID
LEFT JOIN order_details od ON o.OrderID = od.OrderID
GROUP BY e.EmployeeID, e.FirstName, e.Title, e.TitleOfCourtesy, e.City, e.Country,
e.ReportsTo, e.Skills, e.Qualifications
```





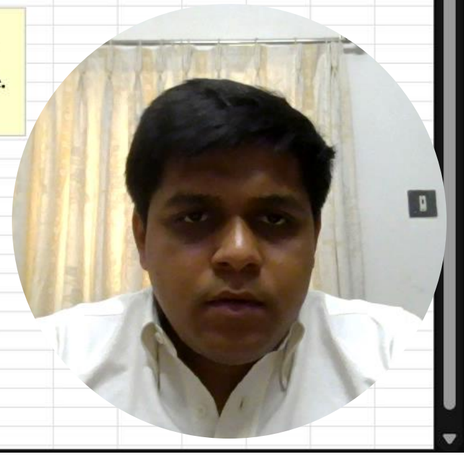






EmployeeID	FirstName	Title	TitleOfCourtesy	Gender	City	Country	ReportsTo	Skills	Qualifications	TotalUnitsSold	TotalRevenue
4	Margaret	Sales Representative	Mrs.	Male	Redmond	USA	2	Culinary Arts	MA	9798	₹ 2,32,890.85
3	Janet	Sales Representative	Ms.	Female	Kirkland	USA	2	Food Retailing Management	BS	7852	₹ 2,02,812.84
1	Nancy	Sales Representative	Ms.	Female	Seattle	USA	2	Public Speaking	BA	7812	₹ 1,92,107.60
2	Andrew	Vice President, Sales	Dr.	Male	Tacoma	USA	NULL	Sales Management	PhD	6055	₹ 1,66,537.75
8	Laura	Inside Sales Coordinator	Ms.	Female	Seattle	USA	2	Business French	BA	5913	₹ 1,26,862.28
7	Robert	Sales Representative	Mr.	Male	London	UK	5	Sales in Europe	BA	4654	₹ 1,24,568.23
9	Anne	Sales Representative	Ms.	Female	London	UK	5	Multilingual	BA	2670	₹ 77,308.07
6	Michael	Sales Representative	Mr.	Male	London	UK	5	Multilingual	MBA	3527	₹ 73,913.13
5	Steven	Sales Manager	Mr.	Male	London	UK	2	Sales Management	BSc	3036	₹ 68,792.28

Conclusion: Clustering on employees data have been done based on employees Education, Skills & Gender. 1st combo chart gives job role wise qualification holder employees' performance. 2nd combo chart gives job role wise skills set holder employees' performance. 3rd combo chart gives gender wise performance.



Question 10. Are there any correlations between product attributes (e.g., size, color, features) and sales performance? Can we explore this visually using scatter plots or

SQL Query

```
SELECT
  p.ProductID,
  p.ProductName,
  c.CategoryName,
  p.QuantityPerUnit,

  -- Extract the first part before '-' (or the full value if no '-')
  SUBSTRING_INDEX(p.QuantityPerUnit, ' - ', 1) AS PackageQuantity,

  -- Extract the second part after '-' (or assign '0' if no '-')
  CASE
    WHEN p.QuantityPerUnit LIKE '%-%'
    THEN SUBSTRING_INDEX(p.QuantityPerUnit, ' - ', -1)
    ELSE '0'
  END AS QuantityPerPackage,

  p.UnitPrice,
  SUM(od.Quantity) AS TotalUnitsSold,
  SUM(od.UnitPrice * od.Quantity * (1 - od.Discount)) AS TotalRevenue,
  AVG(od.Discount) AS AvgDiscount
FROM Products p
JOIN Categories c ON p.CategoryID = c.CategoryID
JOIN Order_Details od ON p.ProductID = od.ProductID
GROUP BY
  p.ProductID, p.ProductName, c.CategoryName,
  p.QuantityPerUnit, p.UnitPrice
ORDER BY TotalRevenue DESC;

SELECT
  p.ProductID,
  p.ProductName,
  c.CategoryName,
  p.QuantityPerUnit,

  -- Extract the first part before '-' (or the full value if no '-')
  SUBSTRING_INDEX(p.QuantityPerUnit, ' - ', 1) AS PackageQuantity,

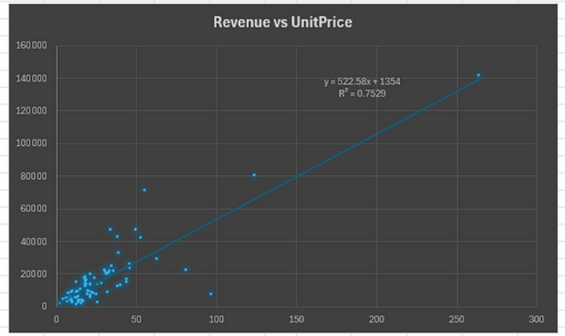
  -- Extract numbers from PackageQuantity
  COALESCE(NULLIF(REGEXP_SUBSTR(SUBSTRING_INDEX(p.QuantityPerUnit, ' - ', 1), '[0-9]+'), ''), '0') AS
PackageQuantityNum,

  -- Extract the second part after '-' (or assign '0' if no '-')
  CASE
    WHEN p.QuantityPerUnit LIKE '%-%'
    THEN SUBSTRING_INDEX(p.QuantityPerUnit, ' - ', -1)
    ELSE '0'
  END AS QuantityPerPackage,

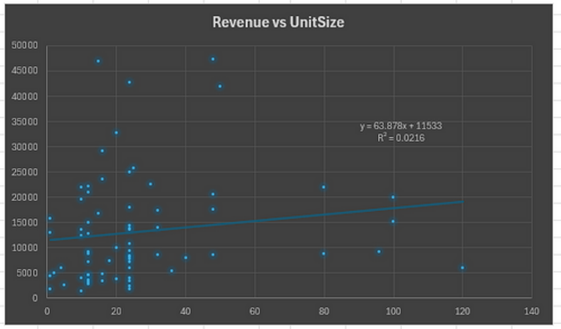
  -- Extract numbers from QuantityPerPackage
  COALESCE(NULLIF(REGEXP_SUBSTR(
    CASE
      WHEN p.QuantityPerUnit LIKE '%-%'
      THEN SUBSTRING_INDEX(p.QuantityPerUnit, ' - ', -1)
      ELSE '0'
    END, '[0-9]+'), ''), '0') AS QuantityPerPackageNum,

  p.UnitPrice,
  SUM(od.Quantity) AS TotalUnitsSold,
  SUM(od.UnitPrice * od.Quantity * (1 - od.Discount)) AS TotalRevenue,
  AVG(od.Discount) AS AvgDiscount
FROM Products p
JOIN Categories c ON p.CategoryID = c.CategoryID
JOIN Order_Details od ON p.ProductID = od.ProductID
GROUP BY
  p.ProductID, p.ProductName, c.CategoryName,
  p.QuantityPerUnit, p.UnitPrice
ORDER BY TotalRevenue DESC;
```

ProductID	ProductName	CategoryName	QuantityPerUnit	PackageQuantityNum	QuantityPerPackageNum	UnitSize	UnitPrice	TotalUnitsSold	TotalRevenue	AvgDiscount
1	Chai	Beverages	10 boxes x 20 bags	10	21	210	₹ 18.00	828	₹ 12,788.10	7.76%
2	Chang	Beverages	24 - 12 oz bottles	24	12	288	₹ 19.00	1057	₹ 16,355.96	10.23%
3	Aniseed Syrup	Condiments	12 - 550 ml bottles	12	1	12	₹ 10.00	328	₹ 3,044.00	1.67%
4	Chef Anton's Cajun Seasoning	Condiments	48 - 6 oz jars	48	1	48	₹ 22.00	453	₹ 8,567.90	7.50%
5	Chef Anton's Gumbo Mix	Condiments	36 boxes	36	1	36	₹ 21.35	298	₹ 5,347.20	7.50%
6	Grandma's Boysenberry Spread	Condiments	12 - 8 oz jars	12	1	12	₹ 25.00	301	₹ 7,137.00	3.08%
7	Uncle Bob's Organic Dried Pears	Produce	12 - 1 lb pkgs.	12	1	12	₹ 30.00	763	₹ 22,044.30	2.76%
8	Northwoods Cranberry Sauce	Condiments	12 - 12 oz jars	12	1	12	₹ 40.00	372	₹ 12,772.00	6.54%
9	Mishi Kobe Niku	Meat/Poultry	18 - 500 g pkgs.	18	1	18	₹ 97.00	95	₹ 7,226.50	10.00%
10	Ikura	Seafood	12 - 200 ml jars	12	1	12	₹ 31.00	742	₹ 20,867.34	4.39%
11	Queso Cabrales	Dairy Products	1 kg pkg.	1	1	1	₹ 21.00	706	₹ 12,901.77	5.66%
12	Queso Manchego La Pastora	Dairy Products	10 - 500 g pkgs.	10	1	10	₹ 38.00	344	₹ 12,257.66	6.43%
13	Konbu	Seafood	2 kg box	2	1	2	₹ 6.00	891	₹ 4,960.44	4.25%
14	Tofu	Produce	40 - 100 g pkgs.	40	1	40	₹ 23.25	404	₹ 7,991.49	6.73%
15	Genen Shouyu	Condiments	24 - 250 ml bottles	24	1	24	₹ 15.50	122	₹ 1,784.82	1.67%
16	Pavlova	Confections	32 - 500 g boxes	32	1	32	₹ 17.45	1158	₹ 17,215.78	6.70%
17	Alice Mutton	Meat/Poultry	20 - 1 kg tins	20	1	20	₹ 39.00	978	₹ 32,698.38	6.22%
18	Carnarvon Tigers	Seafood	16 kg pkg.	16	1	16	₹ 62.50	539	₹ 29,171.87	7.96%
19	Teatime Chocolate Biscuits	Confections	10 boxes x 12 pieces	10	12	120	₹ 9.20	723	₹ 5,862.62	5.54%
20	Sir Rodney's Marmalade	Confections	30 gift boxes	30	1	30	₹ 81.00	313	₹ 22,563.36	4.63%
21	Sir Rodney's Scones	Confections	24 pkgs. x 4 pieces	24	4	96	₹ 10.00	1016	₹ 9,104.00	5.64%
22	Gustaf's KnÃ¤ckebrÃ¶d	Grains/Cereals	24 - 500 g pkgs.	24	1	24	₹ 21.00	348	₹ 7,122.36	2.14%
23	TunnbrÃ¶d	Grains/Cereals	12 - 250 g pkgs.	12	1	12	₹ 9.00	580	₹ 4,601.70	3.75%
24	GuaranÃ¡ FantÃ¡stica	Beverages	12 - 355 ml cans	12	1	12	₹ 4.50	1125	₹ 4,504.36	5.69%
25	NuNuCa NuÃŸ-Nougat-Creme	Confections	20 - 450 g glasses	20	1	20	₹ 14.00	318	₹ 3,704.40	8.61%
26	GumbÃ¤r Gummibärchen	Confections	100 - 250 g bags	100	1	100	₹ 31.23	753	₹ 19,849.14	5.16%
27	Schoggi Schokolade	Confections	100 - 100 g pieces	100	1	100	₹ 43.90	365	₹ 15,099.88	2.78%
28	RÃ¶ssle Sauerkraut	Produce	25 - 825 g cans	25	1	25	₹ 45.60	640	₹ 25,696.64	3.79%
29	ThÃ¼ringer Rostbratwurst	Meat/Poultry	50 bags x 30 sausgs.	50	31	1550	₹ 123.79	746	₹ 80,368.67	6.41%
30	Nord-Ost Matjeshering	Seafood	10 - 200 g glasses	10	1	10	₹ 25.89	612	₹ 13,424.20	8.13%
31	Gorgonzola Telino	Dairy Products	12 - 100 g pkgs	12	1	12	₹ 12.50	1397	₹ 14,920.87	6.27%
32	Mascarpone Fabioli	Dairy Products	24 - 200 g pkgs.	24	1	24	₹ 32.00	297	₹ 8,404.16	7.33%
33	Geitost	Dairy Products	500 g	1	1	1	₹ 2.50	755	₹ 1,648.12	4.38%
34	Sasquatch Ale	Beverages	24 - 12 oz bottles	24	12	288	₹ 14.00	506	₹ 6,350.40	5.00%
35	Steeleye Stout	Beverages	24 - 12 oz bottles	24	1	24	₹ 18.00	883	₹ 13,644.00	4.72%
36	Inlagd Sill	Seafood	24 - 250 g jars	24	1	24	₹ 19.00	805	₹ 13,458.46	7.90%
37	Gravad lax	Seafood	12 - 500 g pkgs.	12	1	12	₹ 26.00	125	₹ 2,688.40	5.00%
38	CÃ´te de Blaye	Beverages	12 - 75 cl bottles	12	75	900	₹ 263.50	623	₹ 1,41,396.73	4.58%
39	Chartreuse verte	Beverages	750 cc per bottle	750	1	750	₹ 18.00	793	₹ 12,294.54	6.67%
40	Boston Crab Meat	Seafood	24 - 4 oz tins	24	1	24	₹ 18.40	1103	₹ 17,910.63	5.12%
41	Jack's New England Clam Chowder	Seafood	12 - 12 oz cans	12	1	12	₹ 9.65	981	₹ 8,680.34	4.04%
42	Singaporean Hokkien Fried Mee	Grains/Cereals	32 - 1 kg pkgs.	32	1	32	₹ 14.00	697	₹ 8,575.00	5.50%
43	Ipoh Coffee	Beverages	16 - 500 g tins	16	1	16	₹ 46.00	580	₹ 23,526.70	5.00%
44	Gula Malacca	Condiments	20 - 2 kg bags	20	1	20	₹ 19.45	601	₹ 9,915.94	6.04%
45	RÃ¸gede sild	Seafood	1 kg pkg.	1	1	1	₹ 9.50	508	₹ 4,338.17	7.50%
46	Spegesild	Seafood	4 - 450 g glasses	4	1	4	₹ 12.00	548	₹ 5,883.00	6.37%
47	Zaanse koeken	Confections	10 - 4 oz boxes	10	1	10	₹ 9.50	485	₹ 3,958.08	7.38%
48	Chocolade	Confections	10 pkgs.	10	1	10	₹ 12.75	138	₹ 1,368.71	10.83%
49	Maxilaku	Confections	24 - 50 g pkgs.	24	1	24	₹ 20.00	520	₹ 9,244.60	3.10%
50	Valkoinen suklaa	Confections	12 - 100 g bars	12	1	12	₹ 16.25	235	₹ 3,437.69	2.50%
51	Manjimup Dried Apples	Produce	50 - 300 g pkgs.	50	1	50	₹ 53.00	886	₹ 41,819.65	5.13%
52	Filo Mix	Grains/Cereals	16 - 2 kg boxes	16	1	16	₹ 7.00	500	₹ 3,232.95	4.14%
53	Perth Pasties	Meat/Poultry	48 pieces	48	1	48	₹ 32.80	722	₹ 20,574.17	3.83%
54	TourtiÃ¨re	Meat/Poultry	16 pies	16	1	16	₹ 7.45	755	₹ 4,728.24	7.22%
55	PÃ¢tÃ© chinois	Meat/Poultry	24 boxes x 2 pies	24	2	48	₹ 24.00	903	₹ 17,426.40	7.73%
56	Gnocchi di nonna Alice	Grains/Cereals	24 - 250 g pkgs.	24	1	24	₹ 38.00	1263	₹ 42,593.06	6.20%
57	Ravioli Angelo	Grains/Cereals	24 - 250 g pkgs.	24	1	24	₹ 19.50	434	₹ 7,661.55	2.83%
58	Escargots de Bourgogne	Seafood	24 pieces	24	1	24	₹ 13.25	534	₹ 5,881.67	10.00%
59	Raclette Courdavault	Dairy Products	5 kg pkg.	5	1	5	₹ 55.00	1496	₹ 71,155.70	4.72%
60	Camembert Pierrot	Dairy Products	15 - 300 g rounds	15	1	15	₹ 34.00	1577	₹ 46,825.48	6.39%
61	Sirop d'Ã©rable	Condiments	24 - 500 ml bottles	24	1	24	₹ 28.50	603	₹ 14,352.60	7.08%
62	Tarte au sucre	Confections	48 pies	48	1	48	₹ 49.30	1083	₹ 47,234.97	5.42%
63	Vegie-spread	Condiments	15 - 625 g jars	15	1	15	₹ 43.90	445	₹ 16,701.09	4.12%
64	Wimmers gute SemmelknÃ¶del	Grains/Cereals	20 bags x 4 pieces	20	4	80	₹ 33.25	740	₹ 21,957.97	4.10%
65	Louisiana Fiery Hot Pepper Sauce	Condiments	32 - 8 oz bottles	32	1	32	₹ 21.05	745	₹ 13,869.89	4.84%
66	Louisiana Hot Spiced Okra	Condiments	24 - 8 oz jars	24	1	24	₹ 17.00	239	₹ 3,383.00	3.13%
67	Laughing Lumberjack Lager	Beverages	24 - 12 oz bottles	24	1	24	₹ 14.00	184	₹ 2,396.80	6.00%
68	Scottish Longbreads	Confections	10 boxes x 8 pieces	10	8	80	₹ 12.50	799	₹ 8,714.00	5.88%
69	Gudbrandsdalsost	Dairy Products	10 kg pkg.	10	1	10	₹ 36.00	714	₹ 21,942.36	7.42%
70	Outback Lager	Beverages	24 - 355 ml bottles	24	1	24	₹ 15.00	817	₹ 10,672.65	6.28%
71	FlÃ¸temysost	Dairy Products	10 - 500 g pkgs.	10	1	10	₹ 21.50	1057	₹ 19,551.02	4.29%
72	Mozzarella di Giovanni	Dairy Products	24 - 200 g pkgs.	24	1	24	₹ 34.80	806	₹ 24,900.13	2.37%
73	RÃ¶d Kaviar	Seafood	24 - 150 g jars	24	1	24	₹ 15.00	293	₹ 3,997.20	4.71%
74	Longlife Tofu	Produce	5 kg pkg.	5	1	5	₹ 10.00	207	₹ 2,422.50	5.00%



Correlation b/w Revenue & Unit Price 0.87



Correlation b/w Revenue & Unit Size 0.60

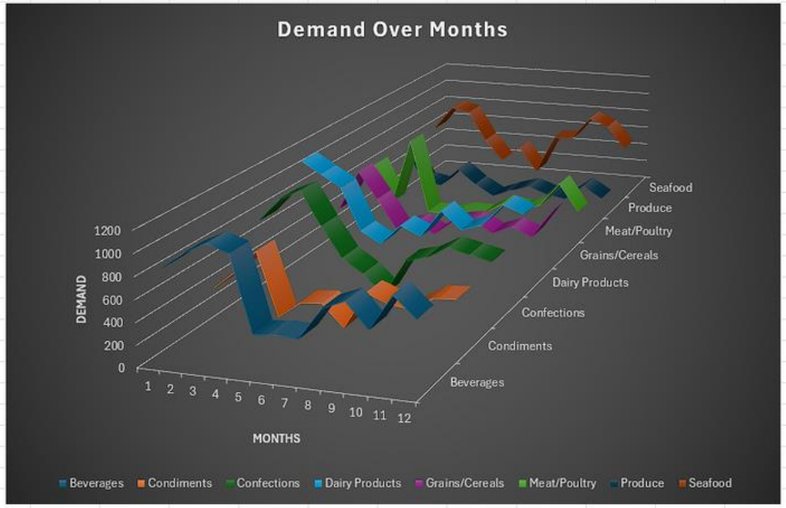
Conclusion: There is very strong correlation between Revenue & Unit price of the products. The scatter plot verifies that. That means Unit Price attribute of products have huge impact on th… …uct. On the other hand there is very mild corre… … Size (total quantities of products in … same visually. That means Unit … not at all impact on the reven…

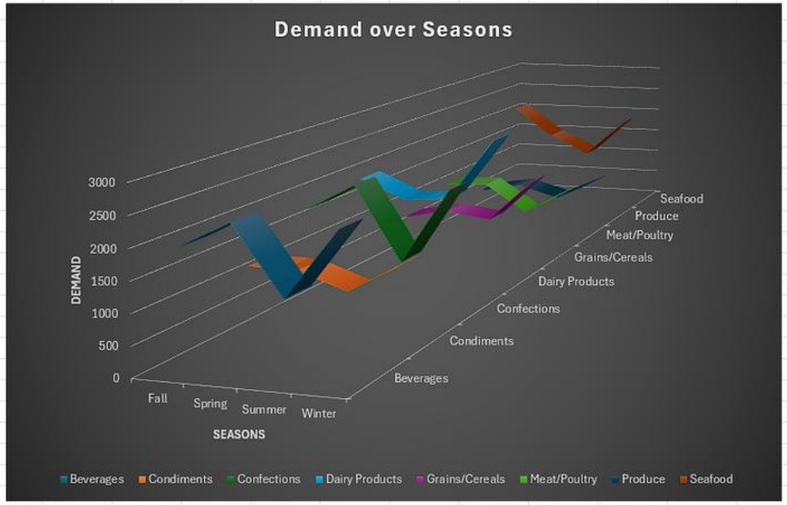
Question 11. How does product demand fluctuate over different seasons or months? Can we visualize this through line charts or area charts?

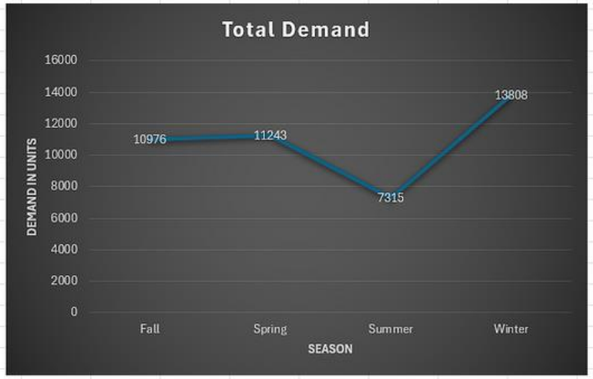
SQL Query

```
SELECT
  YEAR(o.OrderDate) AS Year,
  MONTH(o.OrderDate) AS Month,
  CASE
    WHEN MONTH(o.OrderDate) IN (12, 1, 2) THEN 'Winter'
    WHEN MONTH(o.OrderDate) IN (3, 4, 5) THEN 'Spring'
    WHEN MONTH(o.OrderDate) IN (6, 7, 8) THEN 'Summer'
    WHEN MONTH(o.OrderDate) IN (9, 10, 11) THEN 'Fall'
  END AS Season,
  p.ProductID,
  p.ProductName,
  c.CategoryName,
  SUM(od.Quantity) AS TotalUnitsSold,
  SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS TotalRevenue
FROM Orders o
JOIN Order_Details od ON o.OrderID = od.OrderID
JOIN Products p ON od.ProductID = p.ProductID
JOIN Categories c ON p.CategoryID = c.CategoryID
GROUP BY YEAR(o.OrderDate), MONTH(o.OrderDate), Season, p.ProductID,
p.ProductName, c.CategoryName
ORDER BY Year, Month, TotalUnitsSold DESC;
```

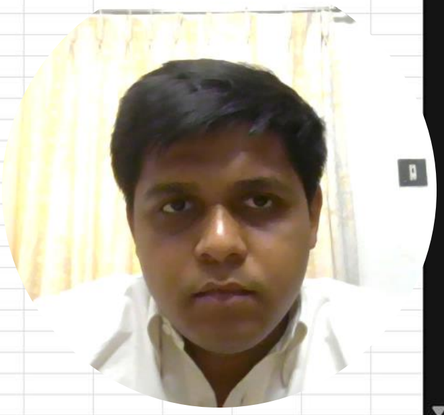
Year	Month	Season	ProductID	ProductName	CategoryName	TotalUnitsSold	TotalRevenue
1994	8	Summer	2	Chang	Beverages	105	₹ 1,444.00
1994	8	Summer	59	Raclette Courdavault	Dairy Products	100	₹ 3,938.00
1994	8	Summer	16	Pavlova	Confections	95	₹ 1,112.00
1994	8	Summer	33	Geitost	Dairy Products	85	₹ 161.50
1994	8	Summer	5	Chef Anton's Gumbo Mix	Condiments	77	₹ 1,047.20
1994	8	Summer	51	Manjimup Dried Apples	Produce	75	₹ 2,957.40
1994	8	Summer	57	Ravioli Angelo	Grains/Cereals	65	₹ 1,002.30
1994	8	Summer	30	Nord-Ost Matjeshering	Seafood	60	₹ 931.50
1994	8	Summer	74	Longlife Tofu	Produce	57	₹ 384.00
1994	8	Summer	41	Jack's New England Clam Chowder	Seafood	51	₹ 333.02
1994	8	Summer	40	Boston Crab Meat	Seafood	50	₹ 735.00
1994	8	Summer	39	Chartreuse verte	Beverages	48	₹ 691.20
1994	8	Summer	24	GuaranÃ¡ FantÃ¡stica	Beverages	43	₹ 146.70
1994	8	Summer	70	Outback Lager	Beverages	41	₹ 429.00
1994	8	Summer	20	Sir Rodney's Marmalade	Confections	40	₹ 2,462.40
1994	8	Summer	49	Maxilaku	Confections	40	₹ 640.00
1994	8	Summer	60	Camembert Pierrot	Dairy Products	40	₹ 1,088.00
1994	8	Summer	65	Louisiana Fiery Hot Pepper Sauce	Condiments	35	₹ 550.20
1994	8	Summer	17	Alice Mutton	Meat/Poultry	30	₹ 936.00
1994	8	Summer	21	Sir Rodney's Scones	Confections	30	₹ 240.00
1994	8	Summer	72	Mozzarella di Giovanni	Dairy Products	29	₹ 813.40
1994	8	Summer	77	Original Frankfurter grÃ¼ne SoÅŸe	Condiments	27	₹ 280.80
1994	8	Summer	27	Schoggi Schokolade	Confections	25	₹ 877.50
1994	8	Summer	36	Inlagd Sill	Seafood	25	₹ 380.00
1994	8	Summer	55	PÂ¢tÃ© chinois	Meat/Poultry	21	₹ 342.72
1994	8	Summer	31	Gorgonzola Telino	Dairy Products	20	₹ 200.00
1994	8	Summer	35	Steeleye Stout	Beverages	20	₹ 288.00
1994	8	Summer	7	Uncle Bob's Organic Dried Pears	Produce	15	₹ 360.00
1994	8	Summer	53	Perth Pasties	Meat/Poultry	15	₹ 393.00
1994	8	Summer	62	Tarte au sucre	Confections	15	₹ 443.25
1994	8	Summer	76	LakkalikÃ¶Ã¶ri	Beverages	15	₹ 183.60
1994	8	Summer	11	Queso Cabrales	Dairy Products	12	₹ 168.00
1994	8	Summer	12	Queso Manchego La Pastora	Dairy Products	12	₹ 346.56
1994	8	Summer	29	ThÃ¼ringer Rostbratwurst	Meat/Poultry	10	₹ 990.00
1994	8	Summer	42	Singaporean Hokkien Fried Mee	Grains/Cereals	10	₹ 98.00
1994	8	Summer	14	Tofu	Produce	9	₹ 167.40







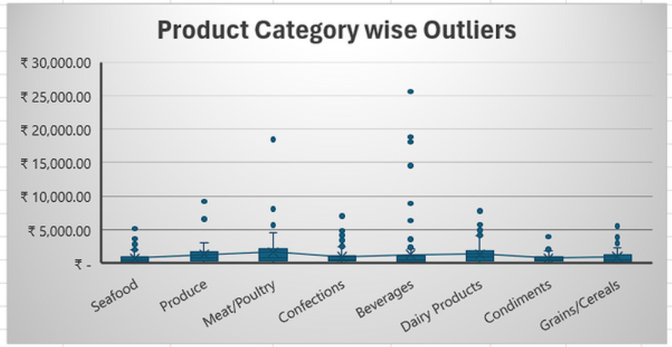
Conclusion: As per the line charts, it is conclusive that total demand over all seasons for all the product categories, demand stays stable throught Fall & winter is stable, but it goes down by around 35% in summer and it goes up very significantly by around 90% in winter. Variation of Demand for all product categories across all seasons and months can be seen from other two charts. Every category behaves in a different manner.



Question 12. Can we identify any outliers or anomalies in product performance or sales using visualizations? How can this information be used for product optimization?

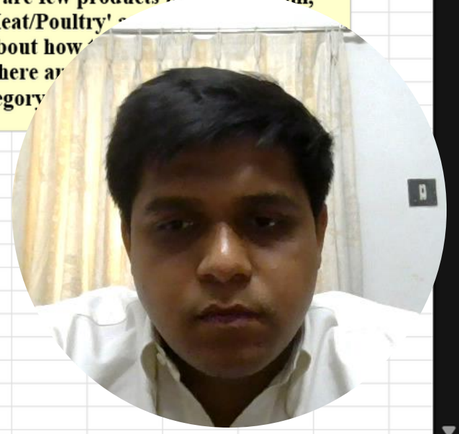
SQL Query

```
SELECT
  o.OrderDate,
  p.ProductID,
  p.ProductName,
  c.CategoryName,
  SUM(od.Quantity) AS TotalUnitsSold,
  SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS TotalRevenue
FROM Orders o
JOIN Order_Details od ON o.OrderID = od.OrderID
JOIN Products p ON od.ProductID = p.ProductID
JOIN Categories c ON p.CategoryID = c.CategoryID
GROUP BY o.OrderDate, p.ProductID, p.ProductName, c.CategoryName
ORDER BY  o.OrderDate, TotalUnitsSold DESC;
```



OrderDate	ProductID	ProductName	CategoryName	TotalUnitsSold	TotalRevenue	Avg of Prod	SD of Prod	Z Score Prod	Outliers?
22-02-1995	36	Inlagd Sill	Seafood	120	₹ 2,223.00	624.31	498.24	3.21	Yes
10-05-1995	41	Jack's New England Clam Chowder	Seafood	168	₹ 1,582.60	421.20	382.19	3.04	Yes
03-07-1995	51	Manjimup Dried Apples	Produce	188	₹ 9,195.50	2098.09	2225.90	3.19	Yes
21-08-1995	29	ThÃ¼ringer Rostbratwurst	Meat/Poultry	164	₹ 18,444.71	4187.46	4172.13	3.42	Yes
22-08-1995	30	Nord-Ost Matjeshering	Seafood	126	₹ 2,983.82	675.31	680.81	3.39	Yes
11-09-1995	13	Konbu	Seafood	288	₹ 1,584.60	266.67	396.85	3.32	Yes
11-09-1995	7	Uncle Bob's Organic Dried Pears	Produce	217	₹ 6,510.00	1374.48	1619.09	3.17	Yes
12-09-1995	16	Pavlova	Confections	173	₹ 2,830.39	865.92	598.42	3.28	Yes
04-08-1994	2	Chang	Beverages	105	₹ 1,444.00	816.23	492.61	1.27	No
04-08-1994	59	Raclette Courdavault	Dairy Products	100	₹ 3,938.00	3036.12	1907.65	0.47	No
04-08-1994	16	Pavlova	Confections	95	₹ 1,112.00	865.92	598.42	0.41	No
05-08-1994	33	Geitost	Dairy Products	85	₹ 161.50	97.17	72.71	0.88	No
05-08-1994	5	Chef Anton's Gumbo Mix	Condiments	77	₹ 1,047.20	490.89	306.31	1.82	No
08-08-1994	51	Manjimup Dried Apples	Produce	75	₹ 2,957.40	2098.09	2225.90	0.39	No
08-08-1994	57	Ravioli Angelo	Grains/Cereals	65	₹ 1,002.30	449.85	362.83	1.52	No
08-08-1994	30	Nord-Ost Matjeshering	Seafood	60	₹ 931.50	675.31	680.81	0.38	No
08-08-1994	74	Longlife Tofu	Produce	57	₹ 384.00	279.06	190.11	0.55	No
08-08-1994	41	Jack's New England Clam Chowder	Seafood	51	₹ 333.02	421.20	382.19	-0.23	No
09-08-1994	40	Boston Crab Meat	Seafood	50	₹ 735.00	966.98	690.30	-0.34	No
09-08-1994	39	Chartreuse verte	Beverages	48	₹ 691.20	757.36	742.05	-0.09	No
09-08-1994	24	GuaranÃ¡ FantÃ¡stica	Beverages	43	₹ 146.70	241.30	221.48	-0.43	No
10-08-1994	70	Outback Lager	Beverages	41	₹ 429.00	608.35	412.78	-0.43	No
10-08-1994	20	Sir Rodney's Marmalade	Confections	40	₹ 2,462.40	1755.90	771.33	0.92	No
10-08-1994	49	Maxilaku	Confections	40	₹ 640.00	553.72	403.17	0.21	No
11-08-1994	60	Camembert Pierrot	Dairy Products	40	₹ 1,088.00	2231.08	1423.88	-0.80	No
11-08-1994	65	Louisiana Fiery Hot Pepper Sauce	Condiments	35	₹ 550.20	745.99	419.37	-0.47	No
11-08-1994	17	Alice Mutton	Meat/Poultry	30	₹ 936.00	1779.67	1219.26	-0.69	No
12-08-1994	21	Sir Rodney's Scones	Confections	30	₹ 240.00	475.82	381.12	-0.62	No
12-08-1994	72	Mozzarella di Giovanni	Dairy Products	29	₹ 813.40	1435.55	667.18	-0.93	No
12-08-1994	77	Original Frankfurter grÃ¼ne SoÃŸe	Condiments	27	₹ 280.80	384.05	285.48	-0.36	No
12-08-1994	27	Schoggi Schokolade	Confections	25	₹ 877.50	1812.20	1552.13	-0.60	No
15-08-1994	36	Inlagd Sill	Seafood	25	₹ 380.00	624.31	498.24	-0.49	No
15-08-1994	55	PÃ¢tÃ© chinois	Meat/Poultry	21	₹ 342.72	741.53	751.71	-0.53	No
16-08-1994	31	Gorgonzola Telino	Dairy Products	20	₹ 200.00	804.63	614.04	-0.98	No
16-08-1994	35	Steeleye Stout	Beverages	20	₹ 288.00	668.42	399.81	-0.95	No
16-08-1994	7	Uncle Bob's Organic Dried Pears	Produce	15	₹ 360.00	1374.48	1619.09	-0.63	No

Conclusion: From this conditionally formated sales table, we can observe that there are few products like 'Inlagd Sill, Konbu, Manjimup Dried Apples, Pavlova' from product categories like 'Seafood, Meat/Poultry' [illegible] marked by red fills and sorted at the top of the table, in order to get clear insights about how [illegible] performed and to figure out what optimization strategies can be applied on them. There ar[illegible] out of them only 8 products are outliers. The Box & Whisker plot gives product category

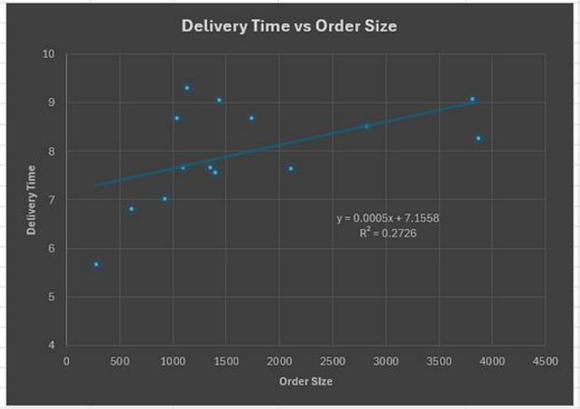


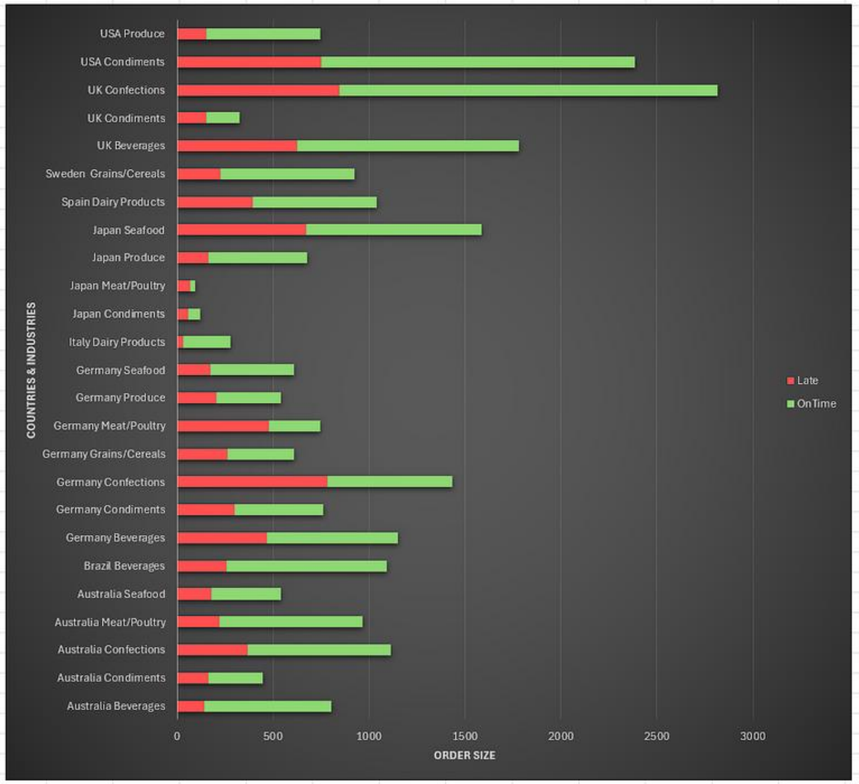
Question 13. Are there any correlations between supplier attributes (e.g., location, size, industry) and performance metrics (e.g., on-time delivery, product quality)? Can we explore this visually through scatter plots or heatmaps?

SQL Query

```
SELECT
  o.OrderID,
  s.SupplierID,
  s.CompanyName AS Supplier,
  s.Country AS SupplierLocation,
  o.ShipCountry AS CustomerLocation,
  p.ProductName,
  t.CategoryName AS SupplierIndustry,
  SUM(od.Quantity) AS OrderSize,
  DATEDIFF(o.ShippedDate, o.OrderDate) AS DeliveryTime
FROM Suppliers s
JOIN Products p ON s.SupplierID = p.SupplierID
JOIN Order_Details od ON p.ProductID = od.ProductID
JOIN Orders o ON od.OrderID = o.OrderID
JOIN Categories t ON p.CategoryID = t.CategoryID
GROUP BY o.OrderID, s.SupplierID, Supplier, SupplierLocation,
CustomerLocation,
      p.ProductName, SupplierIndustry
having DeliveryTime is not null;
```

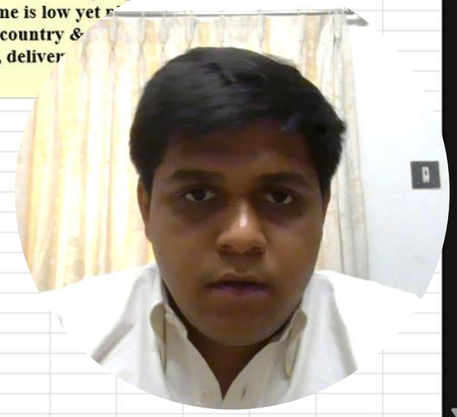
Correlation b/w Order Size & Delivery Time
0.52





OrderID	SupplierID	Supplier	SupplierLocation	CustomerLocation	ProductName	SupplierIndustry	OrderSize	DeliveryTime	DomesticOrInternational?	LateOrOnTime
10248	5	Cooperativa de Quesos 'Las Cabras'	Spain	France	Queso Cabrales	Dairy Products	12	12	International	Late
10249	6	Mayumi's	Japan	Germany	Tofu	Produce	9	5	International	OnTime
10250	2	New Orleans Cajun Delights	USA	Brazil	Louisiana Fiery Hot Pepper Sauce	Condiments	15	4	International	OnTime
10251	2	New Orleans Cajun Delights	USA	France	Louisiana Fiery Hot Pepper Sauce	Condiments	20	7	International	OnTime
10251	9	PB KnÃ¤ckebrÃ¶d AB	Sweden	France	Gustaf's KnÃ¤ckebrÃ¶d	Grains/Cereals	6	7	International	OnTime
10252	8	Specialty Biscuits, Ltd.	UK	Belgium	Sir Rodney's Marmalade	Confections	40	2	International	OnTime
10253	14	Formaggi Fortini s.r.l.	Italy	Brazil	Gorgonzola Telino	Dairy Products	20	6	International	OnTime
10254	4	Tokyo Traders	Japan	Switzerland	Longlife Tofu	Produce	21	12	International	Late
10254	10	Refrescos Americanas LTDA	Brazil	Switzerland	GuaranÃ¡ FantÃ¡stica	Beverages	15	12	International	Late
10255	1	Exotic Liquids	UK	Switzerland	Chang	Beverages	20	3	International	OnTime
10255	7	Pavlova, Ltd.	Australia	Switzerland	Pavlova	Confections	35	3	International	OnTime
10256	12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Germany	Brazil	Original Frankfurter grÃ¼ne SoÃŸe	Condiments	12	2	International	OnTime
10257	11	Heli SÃ¼ÃŸwaren GmbH & Co. KG	Germany	Venezuela	Schoggi Schokolade	Confections	25	6	International	OnTime
10257	12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Germany	Venezuela	Original Frankfurter grÃ¼ne SoÃŸe	Condiments	15	6	International	OnTime
10258	1	Exotic Liquids	UK	Austria	Chang	Beverages	50	6	International	OnTime
10258	2	New Orleans Cajun Delights	USA	Austria	Chef Anton's Gumbo Mix	Condiments	65	6	International	OnTime
10259	8	Specialty Biscuits, Ltd.	UK	Mexico	Sir Rodney's Scones	Confections	10	7	International	OnTime
10260	7	Pavlova, Ltd.	Australia	Germany	Outback Lager	Beverages	21	10	International	Late
10261	8	Specialty Biscuits, Ltd.	UK	Brazil	Sir Rodney's Scones	Confections	20	11	International	Late
10262	2	New Orleans Cajun Delights	USA	USA	Chef Anton's Gumbo Mix	Condiments	12	3	Domestic	OnTime
10262	3	Grandma Kelly's Homestead	USA	USA	Uncle Bob's Organic Dried Pears	Produce	15	3	Domestic	OnTime
10263	4	Tokyo Traders	Japan	Austria	Longlife Tofu	Produce	36	8	International	OnTime
10263	7	Pavlova, Ltd.	Australia	Austria	Pavlova	Confections	60	8	International	OnTime
10263	10	Refrescos Americanas LTDA	Brazil	Austria	GuaranÃ¡ FantÃ¡stica	Beverages	28	8	International	OnTime
10263	13	Nord-Ost-Fisch Handelsgesellschaft mbH	Germany	Austria	Nord-Ost Matjeshering	Seafood	60	8	International	OnTime
10264	1	Exotic Liquids	UK	Sweden	Chang	Beverages	35	30	International	Late
10265	7	Pavlova, Ltd.	Australia	France	Alice Mutton	Meat/Poultry	30	18	International	Late
10265	7	Pavlova, Ltd.	Australia	France	Outback Lager	Beverages	20	18	International	Late
10266	5	Cooperativa de Quesos 'Las Cabras'	Spain	Finland	Queso Manchego La Pastora	Dairy Products	12	5	International	OnTime
10268	12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Germany	Venezuela	ThÃ¼ringer Rostbratwurst	Meat/Poultry	10	3	International	OnTime
10272	8	Specialty Biscuits, Ltd.	UK	USA	Sir Rodney's Marmalade	Confections	6	4	International	OnTime
10272	14	Formaggi Fortini s.r.l.	Italy	USA	Gorgonzola Telino	Dairy Products	40	4	International	OnTime
10273	4	Tokyo Traders	Japan	Germany	Ikura	Seafood	24	7	International	OnTime
10273	14	Formaggi Fortini s.r.l.	Italy	Germany	Gorgonzola Telino	Dairy Products	15	7	International	OnTime
10275	10	Refrescos Americanas LTDA	Brazil	Italy	GuaranÃ¡ FantÃ¡stica	Beverages	12	2	International	OnTime
10276	4	Tokyo Traders	Japan	Mexico	Ikura	Seafood	15	6	International	OnTime
10276	6	Mayumi's	Japan	Mexico	Konbu	Seafood	10	6	International	OnTime
10277	12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Germany	Germany	RÃ¶ssle Sauerkraut	Produce	20	4	Domestic	OnTime
10278	7	Pavlova, Ltd.	Australia	Sweden	Vegie-spread	Condiments	8	4	International	OnTime
10279	7	Pavlova, Ltd.	Australia	Germany	Alice Mutton	Meat/Poultry	15	3	International	OnTime

Conclusion: Scatter plot depicts that as the order size increases for any supp[illegible] time also increases. The impact of order size on delivery time is low yet [illegible] stacked bar chard & the conditionally formated table give country & [illegible] insights of the particular orders, their products, order size, deliver[illegible] on time etc.



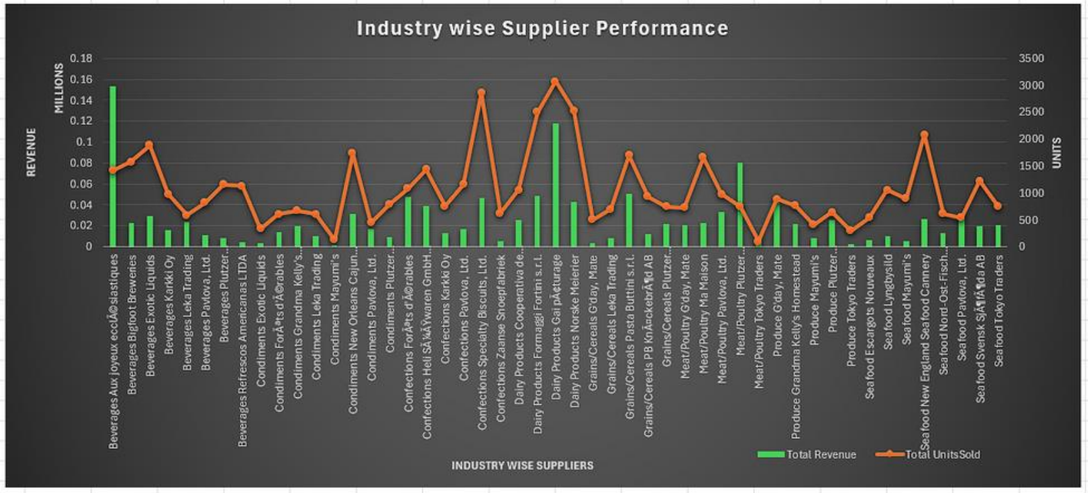
TextBox 2

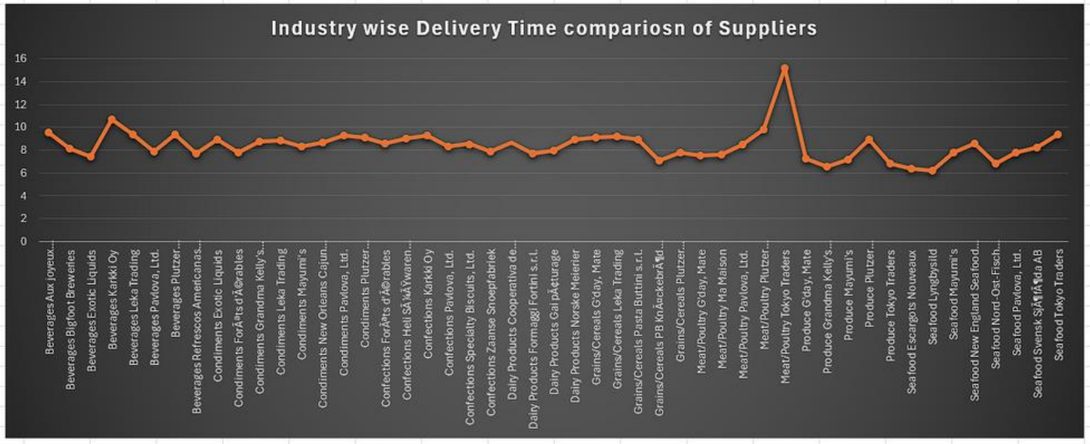
Question 14.How does supplier performance vary across different product categories or departments? Can we visualize this using stacked bar charts or grouped column charts?

SQL Query

```
SELECT
  s.SupplierID,
  s.CompanyName,
  c.CategoryName,
  SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS
TotalRevenue,
  SUM(od.Quantity) AS TotalUnitsSold,
  AVG(DATEDIFF(o.ShippedDate, o.OrderDate)) AS
AvgDeliveryTime
FROM Suppliers s
JOIN Products p ON s.SupplierID = p.SupplierID
JOIN Categories c ON p.CategoryID = c.CategoryID
JOIN Order_Details od ON p.ProductID = od.ProductID
JOIN Orders o ON od.OrderID = o.OrderID
GROUP BY s.SupplierID, s.CompanyName, c.CategoryName
ORDER BY TotalRevenue DESC;
```

SupplierID	CompanyName	CategoryName	TotalRevenue	TotalUnitsSold	AvgDeliveryTime
18	Aux joyeux ecclÃ©siastiques	Beverages	₹ 1,53,691.27	1416	9.51
28	Gai pÃ¢turage	Dairy Products	₹ 1,17,981.18	3073	7.95
12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Meat/Poultry	₹ 80,368.67	746	9.81
26	Pasta Buttini s.r.l.	Grains/Cereals	₹ 50,254.61	1697	8.94
14	Formaggi Fortini s.r.l.	Dairy Products	₹ 48,225.16	2500	7.65
29	ForÃªts d'Ã©rables	Confections	₹ 47,234.97	1083	8.56
8	Specialty Biscuits, Ltd.	Confections	₹ 46,243.98	2851	8.52
15	Norske Meierier	Dairy Products	₹ 43,141.51	2526	8.94
24	G'day, Mate	Produce	₹ 41,819.65	886	7.29
11	Heli SÃ¼ÃŸwaren GmbH & Co. KG	Confections	₹ 38,653.42	1436	9.05
7	Pavlova, Ltd.	Meat/Poultry	₹ 32,698.38	978	8.44
2	New Orleans Cajun Delights	Condiments	₹ 31,167.99	1735	8.69
7	Pavlova, Ltd.	Seafood	₹ 29,171.87	539	7.81
1	Exotic Liquids	Beverages	₹ 29,144.06	1885	7.45
19	New England Seafood Cannery	Seafood	₹ 26,590.97	2084	8.59
12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Produce	₹ 25,696.64	640	8.93
5	Cooperativa de Quesos 'Las Cabras'	Dairy Products	₹ 25,159.43	1050	8.68
20	Leka Trading	Beverages	₹ 23,526.70	580	9.37
16	Bigfoot Breweries	Beverages	₹ 22,391.20	1573	8.11
25	Ma Maison	Meat/Poultry	₹ 22,154.64	1658	7.58
3	Grandma Kelly's Homestead	Produce	₹ 22,044.30	763	6.56
12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Grains/Cereals	₹ 21,957.97	740	7.75
4	Tokyo Traders	Seafood	₹ 20,867.34	742	9.38
24	G'day, Mate	Meat/Poultry	₹ 20,574.17	722	7.48
17	Svensk SjÃ¶fÃ¶da AB	Seafood	₹ 20,144.06	1223	8.20
3	Grandma Kelly's Homestead	Condiments	₹ 19,909.00	673	8.77
7	Pavlova, Ltd.	Confections	₹ 17,215.78	1158	8.33
7	Pavlova, Ltd.	Condiments	₹ 16,701.09	445	9.29
23	Karkki Oy	Beverages	₹ 15,760.44	981	10.68
29	ForÃªts d'Ã©rables	Condiments	₹ 14,352.60	603	7.78
13	Nord-Ost-Fisch Handelsgesellschaft mbH	Seafood	₹ 13,424.20	612	6.81
23	Karkki Oy	Confections	₹ 12,682.29	755	9.29
9	PB KnÃ¤ckebrÃ¶d AB	Grains/Cereals	₹ 11,724.06	928	7.03
7	Pavlova, Ltd.	Beverages	₹ 10,672.65	817	7.89
21	Lyngbysild	Seafood	₹ 10,221.17	1056	6.21
20	Leka Trading	Condiments	₹ 9,915.94	601	8.83
12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Condiments	₹ 9,171.63	791	9.14
20	Leka Trading	Grains/Cereals	₹ 8,575.00	697	9.17
12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Beverages	₹ 8,177.49	1155	9.40
6	Mayumi's	Produce	₹ 7,991.49	404	7.20
4	Tokyo Traders	Meat/Poultry	₹ 7,226.50	95	15.20
27	Escargots Nouveaux	Seafood	₹ 5,881.67	534	6.33
22	Zaanse Snoepfabriek	Confections	₹ 5,226.79	623	7.85





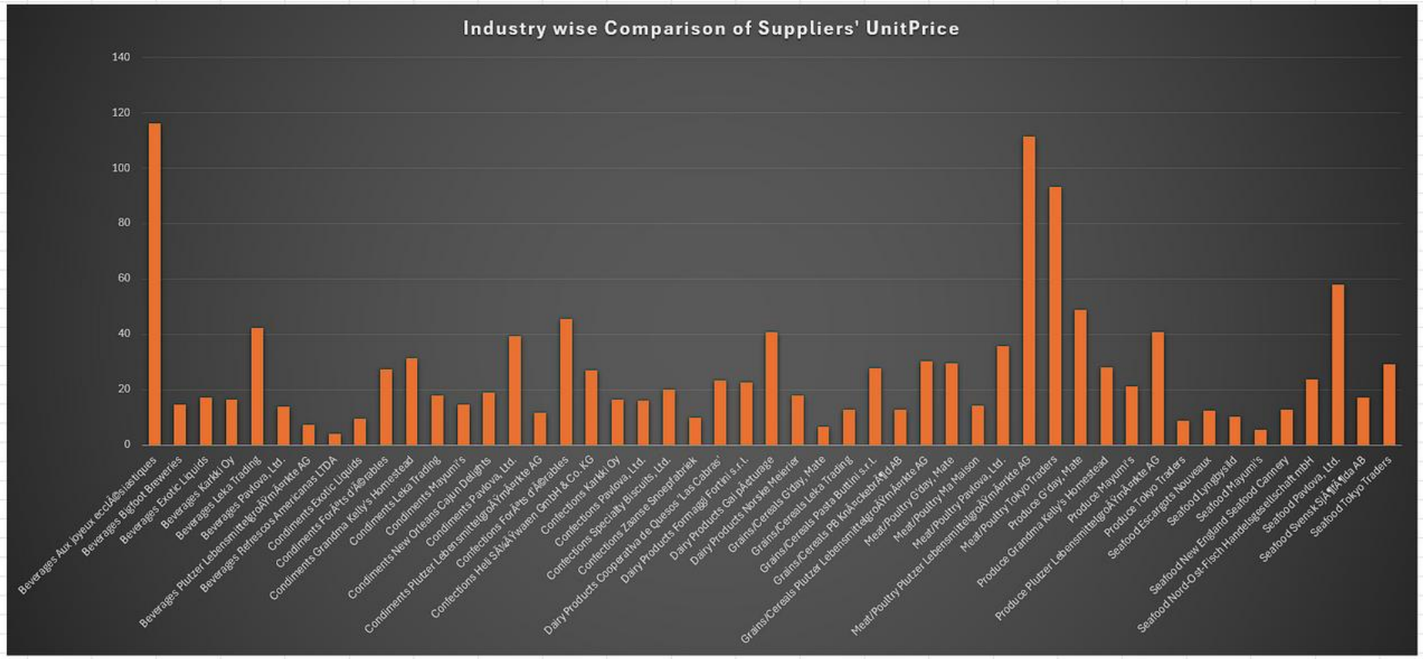
Conclusion: The combo chart shows Industry (Product Category) wise comparison of supplier's Total revenue & Total units sold. This chart can be useful to select the best performing supplier for every industries. For every industries there are different suppliers who performs best & worst. The line chart gives compartive visualisation of average delivery time of each suppliers, for every industry.

Question 15. Can we identify any trends or patterns in supplier costs or pricing structures through visualizations? How can this information be used for procurement optimization?

SQL Query

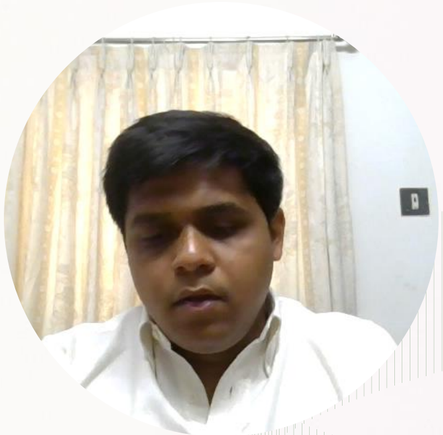
```
SELECT
  s.SupplierID,
  s.CompanyName,
  c.CategoryName,
  SUM(od.Quantity * od.UnitPrice * (1 - od.Discount)) AS
TotalRevenue,
  SUM(od.Quantity) AS TotalUnitsSold,
  AVG(DATEDIFF(o.ShippedDate, o.OrderDate)) AS
AvgDeliveryTime
FROM Suppliers s
JOIN Products p ON s.SupplierID = p.SupplierID
JOIN Categories c ON p.CategoryID = c.CategoryID
JOIN Order_Details od ON p.ProductID = od.ProductID
JOIN Orders o ON od.OrderID = o.OrderID
GROUP BY s.SupplierID, s.CompanyName, c.CategoryName
ORDER BY TotalRevenue DESC;
```

SupplierID	CompanyName	CategoryName	ProductName	AvgPricePerUnit	TotalUnitsSold	TotalRevenue
1	Exotic Liquids	Beverages	Chang	₹ 15.20	105	₹ 1,444.00
2	New Orleans Cajun Delights	Condiments	Chef Anton's Gumbo Mix	₹ 17.00	77	₹ 1,047.20
2	New Orleans Cajun Delights	Condiments	Louisiana Fiery Hot Pepper Sauce	₹ 16.80	35	₹ 550.20
3	Grandma Kelly's Homestead	Produce	Uncle Bob's Organic Dried Pears	₹ 24.00	15	₹ 360.00
4	Tokyo Traders	Produce	Longlife Tofu	₹ 8.00	57	₹ 384.00
5	Cooperativa de Quesos 'Las Cabras'	Dairy Products	Queso Cabrales	₹ 14.00	12	₹ 168.00
5	Cooperativa de Quesos 'Las Cabras'	Dairy Products	Queso Manchego La Pastora	₹ 30.40	12	₹ 346.56
6	Mayumi's	Produce	Tofu	₹ 18.60	9	₹ 167.40
7	Pavlova, Ltd.	Meat/Poultry	Alice Mutton	₹ 31.20	30	₹ 936.00
7	Pavlova, Ltd.	Confections	Pavlova	₹ 13.90	95	₹ 1,112.00
7	Pavlova, Ltd.	Beverages	Outback Lager	₹ 12.00	41	₹ 429.00
8	Specialty Biscuits, Ltd.	Confections	Sir Rodney's Marmalade	₹ 64.80	40	₹ 2,462.40
8	Specialty Biscuits, Ltd.	Confections	Sir Rodney's Scones	₹ 8.00	30	₹ 240.00
9	PB KnÃ¤ckebrÃ¶d AB	Grains/Cereals	Gustaf's KnÃ¤ckebrÃ¶d	₹ 16.80	6	₹ 95.76
10	Refrescos Americanas LTDA	Beverages	GuaranÃ¡ FantÃ¡stica	₹ 3.60	43	₹ 146.70
11	Heli SÃ¼ÃŸwaren GmbH & Co. KG	Confections	Schoggi Schokolade	₹ 35.10	25	₹ 877.50
12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Meat/Poultry	ThÃ¼ringer Rostbratwurst	₹ 99.00	10	₹ 990.00
12	Plutzer LebensmittelgroÃŸmÃ¤rkte AG	Condiments	Original Frankfurter grÃ¼ne SoÃŸe	₹ 10.40	27	₹ 280.80
13	Nord-Ost-Fisch Handelsgesellschaft mbH	Seafood	Nord-Ost Matjeshering	₹ 20.70	60	₹ 931.50
14	Formaggi Fortini s.r.l.	Dairy Products	Gorgonzola Telino	₹ 10.00	20	₹ 200.00
14	Formaggi Fortini s.r.l.	Dairy Products	Mascarpone Fabioli	₹ 25.60	6	₹ 122.88
14	Formaggi Fortini s.r.l.	Dairy Products	Mozzarella di Giovanni	₹ 30.13	29	₹ 813.40
15	Norske Meierier	Dairy Products	Geitost	₹ 2.00	85	₹ 161.50
16	Bigfoot Breweries	Beverages	Steeleye Stout	₹ 14.40	20	₹ 288.00
17	Svensk SjÃ¶fÃ¶da AB	Seafood	Inlagd Sill	₹ 15.20	25	₹ 380.00
17	Svensk SjÃ¶fÃ¶da AB	Seafood	Gravad lax	₹ 20.80	1	₹ 20.80
18	Aux joyeux ecclÃ©siastiques	Beverages	Chartreuse verte	₹ 14.40	48	₹ 691.20
19	New England Seafood Cannery	Seafood	Boston Crab Meat	₹ 14.70	50	₹ 735.00
19	New England Seafood Cannery	Seafood	Jack's New England Clam Chowder	₹ 7.70	51	₹ 333.02
20	Leka Trading	Grains/Cereals	Singaporean Hokkien Fried Mee	₹ 9.80	10	₹ 98.00
23	Karkki Oy	Confections	Maxilaku	₹ 16.00	40	₹ 640.00
23	Karkki Oy	Beverages	LakkalikÃ¶Ã¶ri	₹ 14.40	15	₹ 183.60
24	G'day, Mate	Produce	Manjimup Dried Apples	₹ 42.40	75	₹ 2,957.40
24	G'day, Mate	Meat/Poultry	Perth Pasties	₹ 26.20	15	₹ 393.00
25	Ma Maison	Meat/Poultry	PÃ¢tÃ© chinois	₹ 19.20	21	₹ 342.72
26	Pasta Buttini s.r.l.	Grains/Cereals	Gnocchi di nonna Alice	₹ 30.40	2	₹ 60.80
26	Pasta Buttini s.r.l.	Grains/Cereals	Ravioli Angelo	₹ 15.60	65	₹ 1,002.30
28	Gai pÃ¢turage	Dairy Products	Raclette Courdavault	₹ 44.00	100	₹ 3,938.00
28	Gai pÃ¢turage	Dairy Products	Camembert Pierrot	₹ 27.20	40	₹ 1,088.00
29	ForÃªts d'Ã©rables	Confections	Tarte au sucre	₹ 39.40	15	₹ 443.25
1	Exotic Liquids	Condiments	Aniseed Syrup	₹ 8.00	30	₹ 240.00
1	Exotic Liquids	Beverages	Chai	₹ 14.40	63	₹ 777.60
2	New Orleans Cajun Delights	Condiments	Chef Anton's Gumbo Mix	₹ 17.00	20	₹ 340.00
4	Tokyo Traders	Seafood	Ikura	₹ 24.80	39	₹ 937.44
6	Mayumi's	Seafood	Konbu	₹ 4.80	30	₹ 134.40

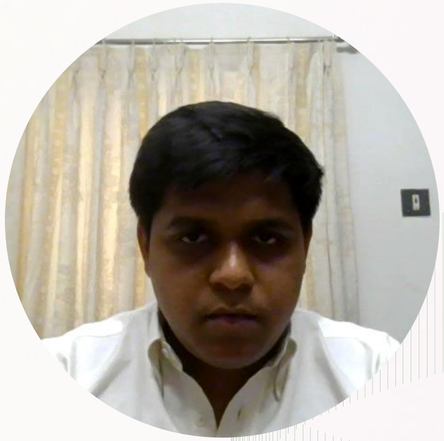


Conclusion: The column chart compares the costs charged or offered by each suppliers in each industries. For all the industries there are different Best performers and worst performers. The chart can be helpful in choosing the most effective cost charging supplier for every industry.

Power BI Dashboard
Problem Statements



Customers
Dashboard



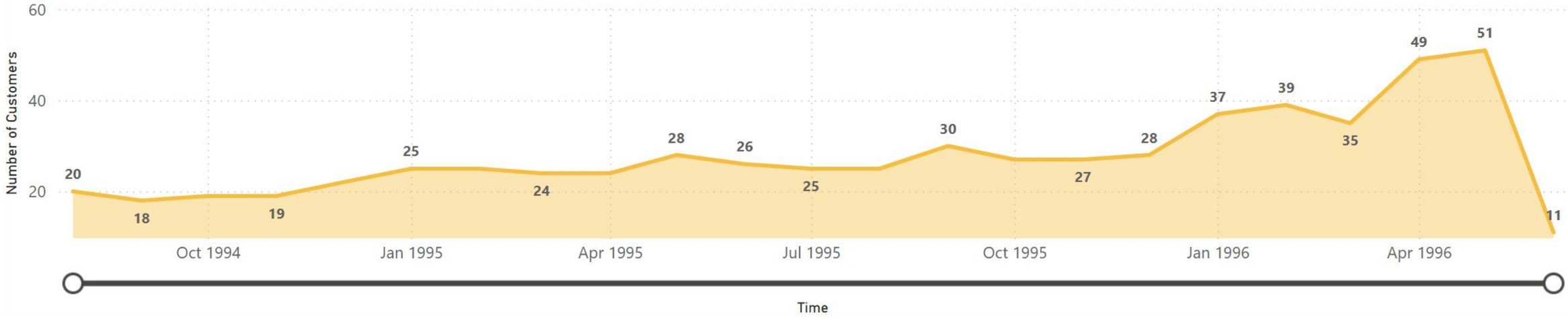
NorthWind Traders

Year: All | Country: All | City: All | Category: All

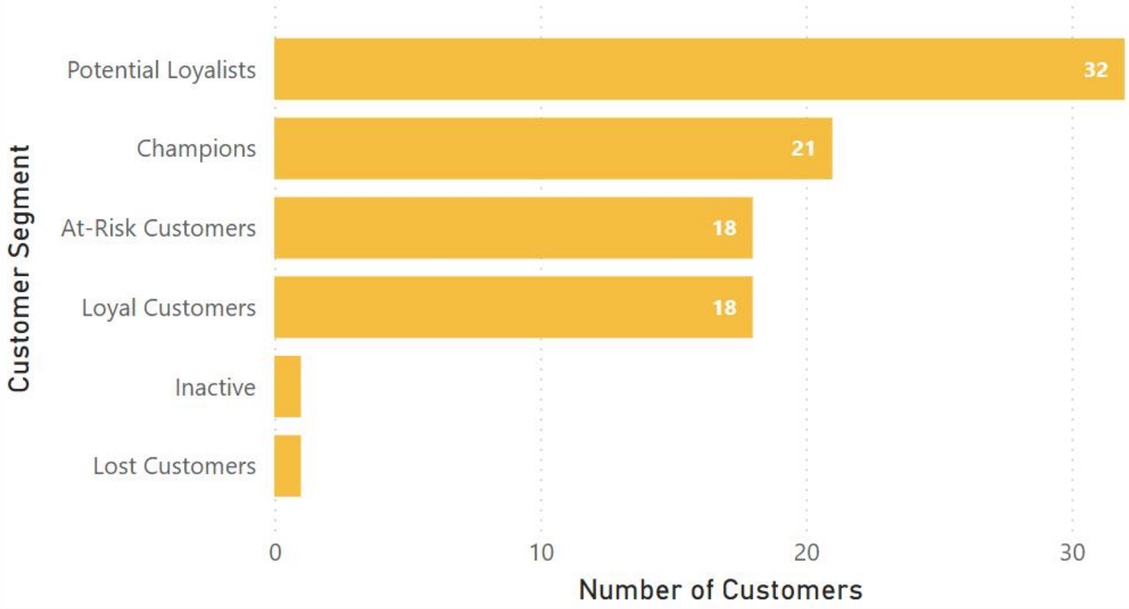
$1.27M Total Revenue

830 Total Orders

Customer Acquisition over Time

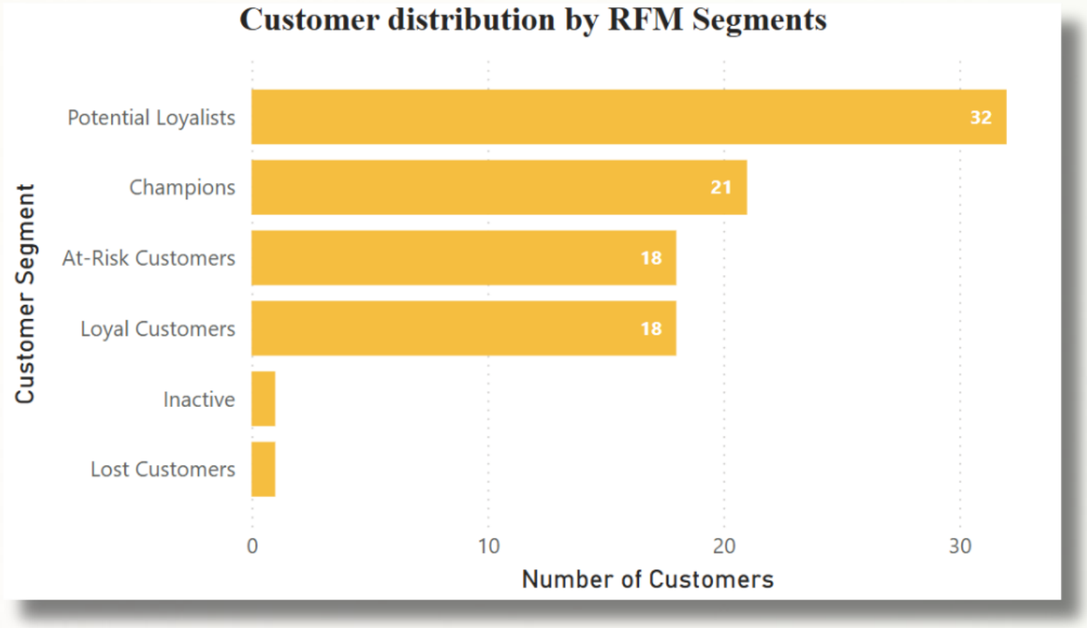


Customer distribution by RFM Segments



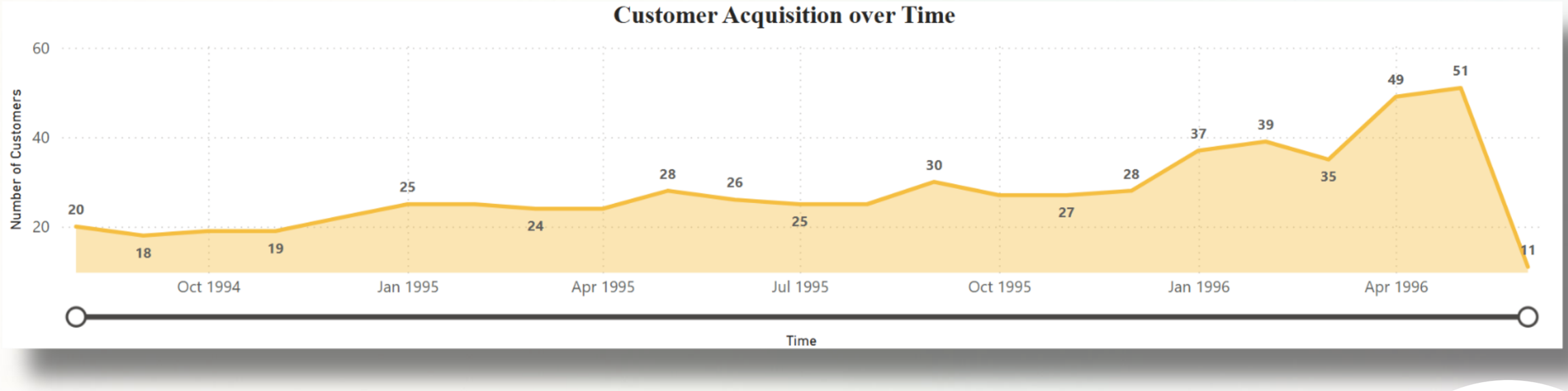
Customer distribution by location (Cities)

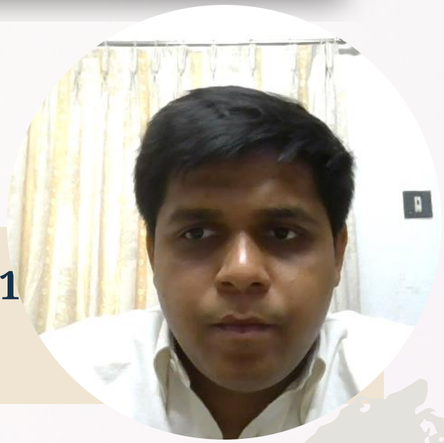
Question 16. How does customer distribution vary across different regions or customer segments? Can we visualize it on a map or bar chart?



Conclusion: RFM analysis highlights "Potential Loyalists" as a key growth segment, while proactiv needed to retain "At-Risk" customers and nurture "Champions" for sustained revenue.

Question 17. What is the trend in customer acquisition over time? Can we create a line chart or area chart to display it?





Customer acquisition has increased gradually for two years since starting. It peaked in April 1 declined, highlighting the need for a sustainable and consistent growth strategy.

Orders
Dashboard

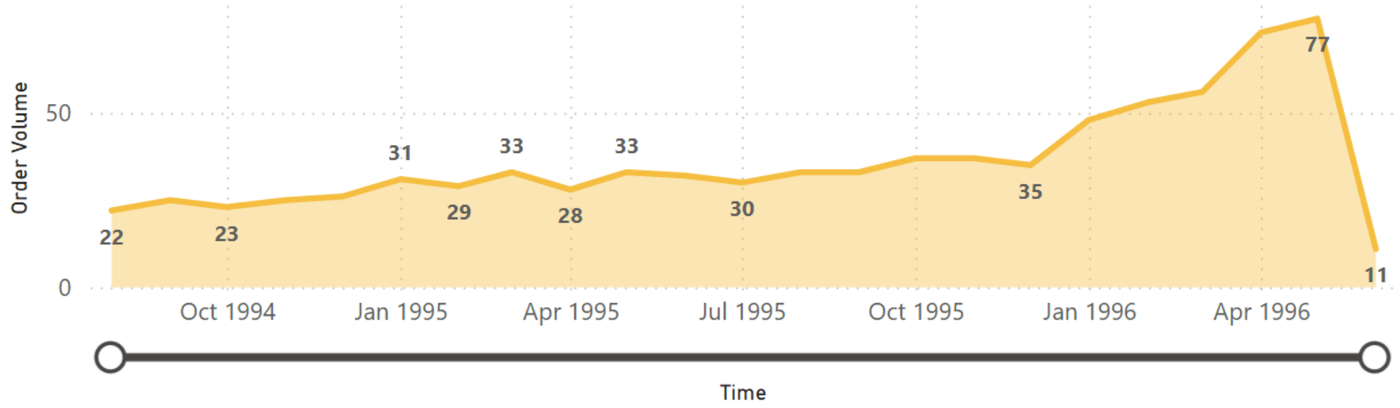
NorthWind Traders

Year: All | Country: All | City: All | Category: All

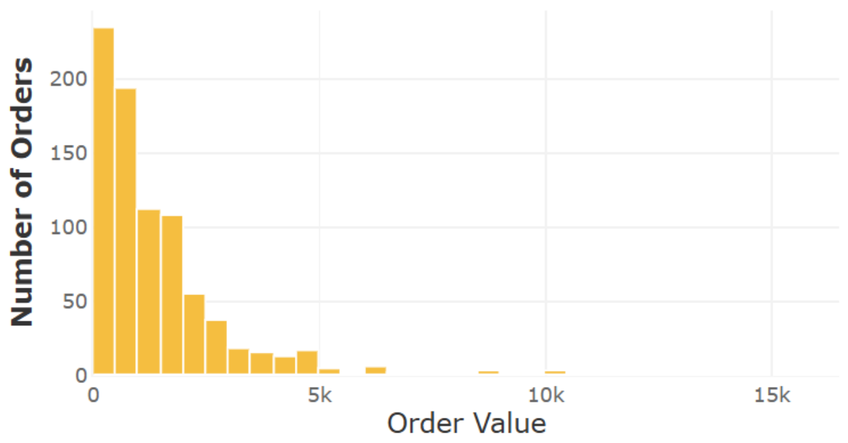
$1.27M Total Revenue

830 Total Orders

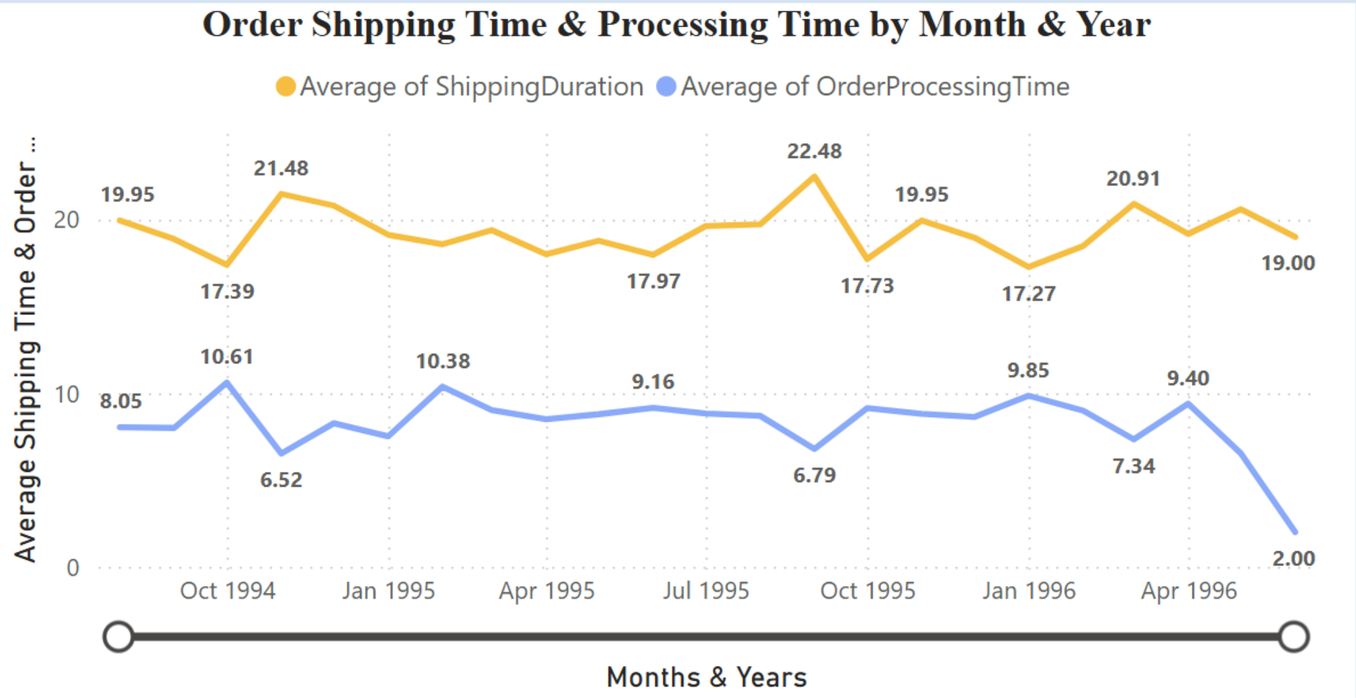
Order Volume over Time



Distribution of Order Values

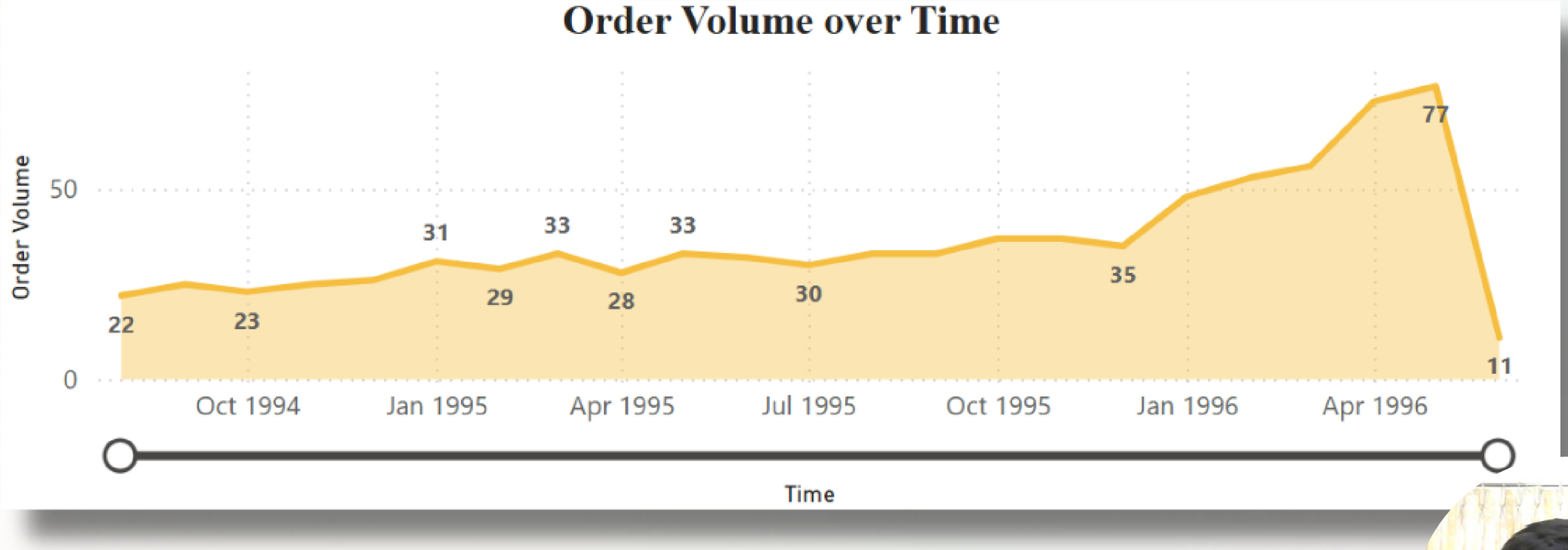


Order Shipping Time & Processing Time by Month & Year



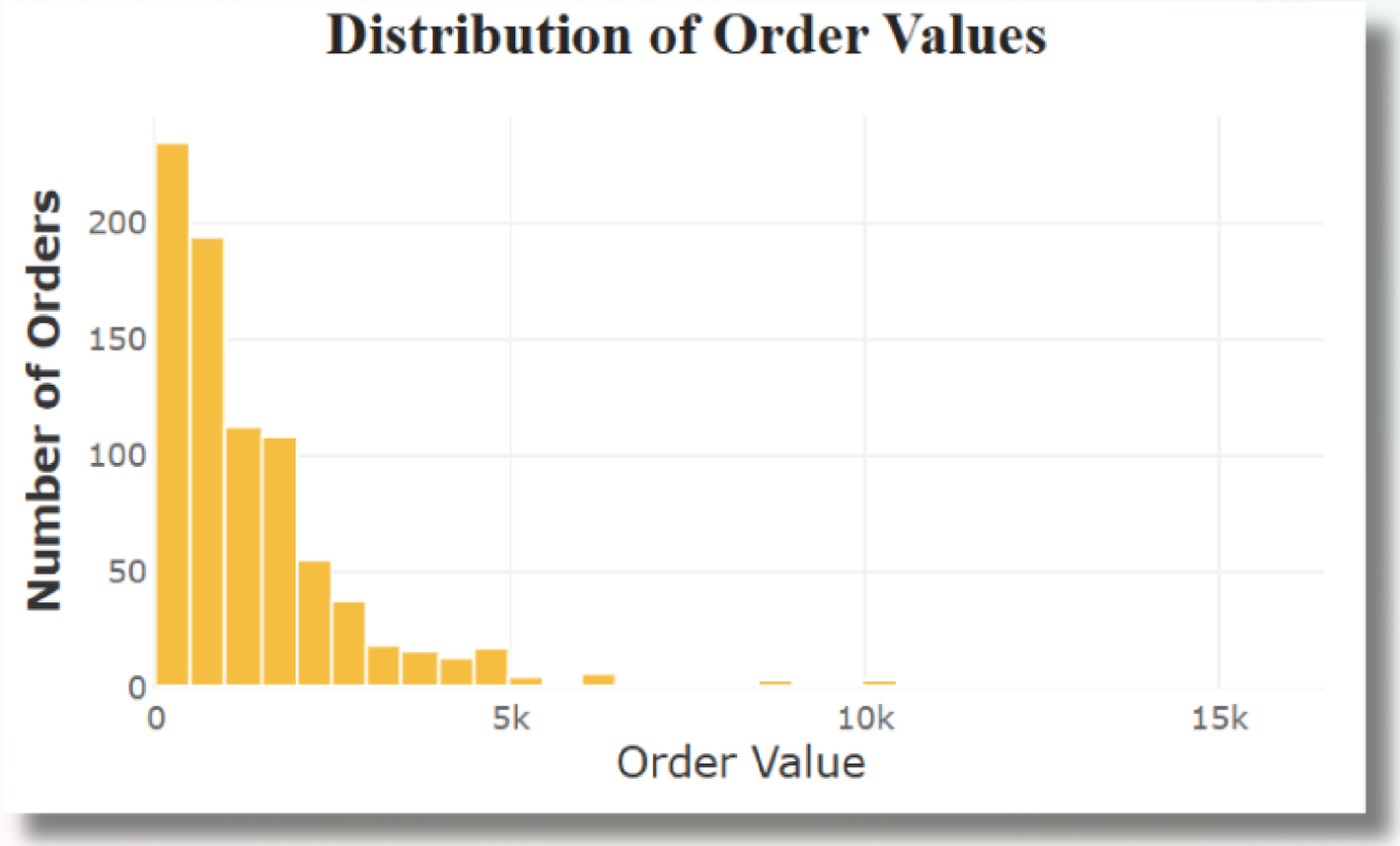
Order Delivery Time by Countries

Question 18. How does order volume change over time? Can we create a time series chart or stacked bar chart to visualize it?



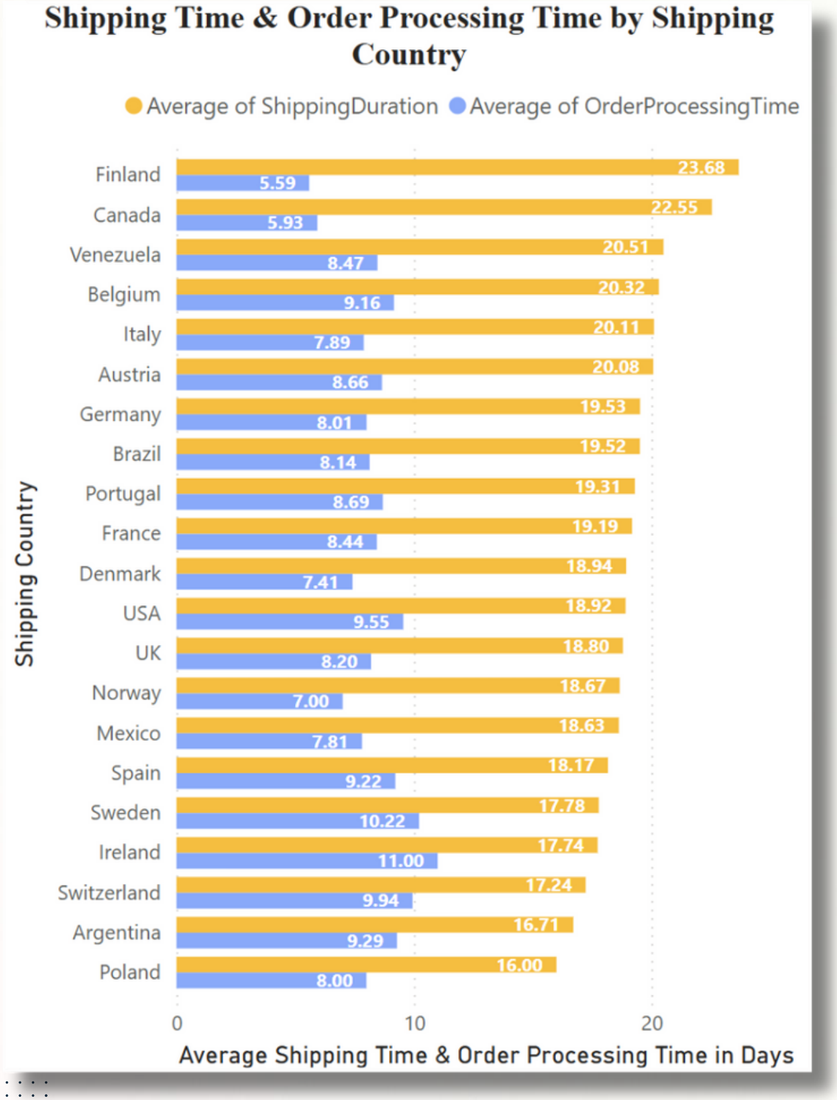
Conclusion: Order volume showed steady growth until late 1995, peaked in April 1996, and then dr
indicating possible seasonal trends, marketing impact, or operational disruptions requiring further an

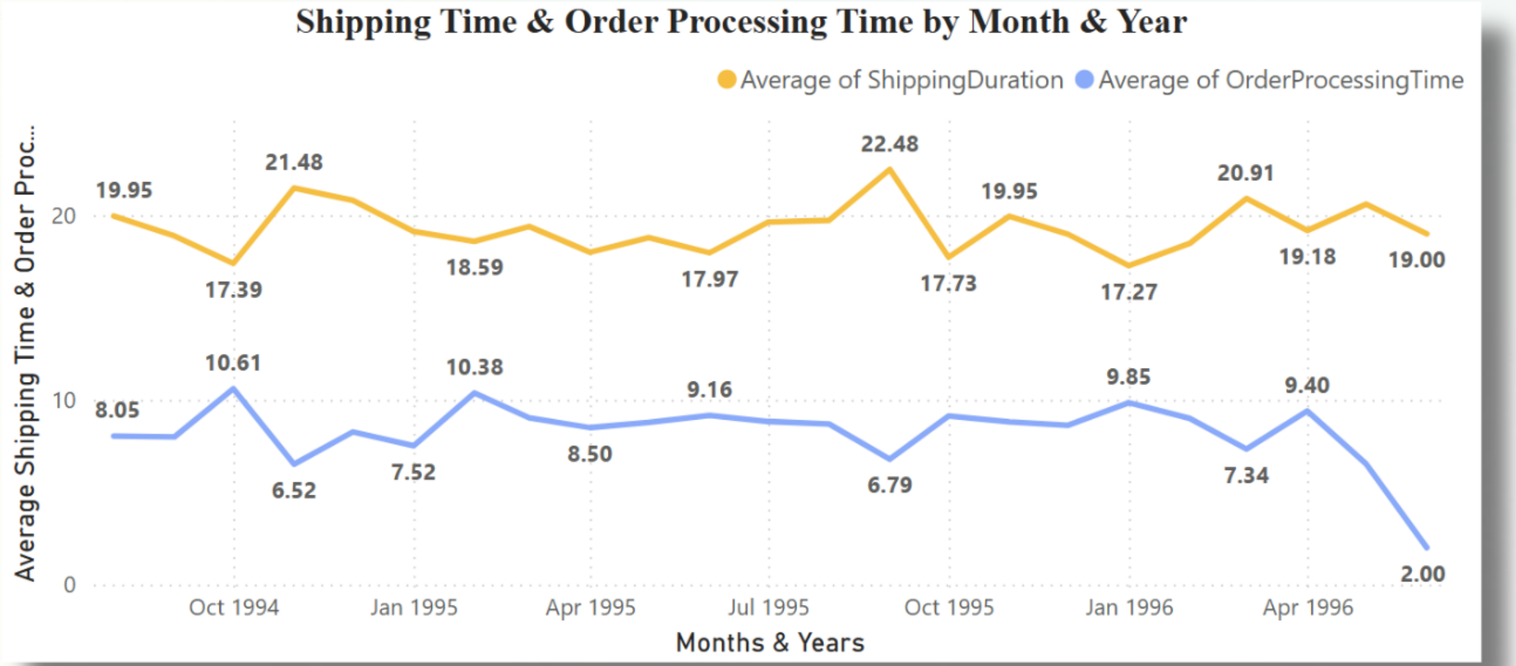
Question 19. What is the distribution of order values? Can we create a histogram or box plot to display it?



Conclusion: Most orders are low-value (<2,000), while high-value orders (>4,000) are rare outliers, suggesting a need for efficient processing for smaller orders and targeted strategies for high-va customers.

Question 20. Can we visualize the average order processing time or shipping duration using a bar chart or box plot?





Conclusion: Finland has the fastest shipping (5.59 da processing (23.68 days), while Poland processes orders Continuous monitoring is needed to optimize logis delays.

Employee *Dashboard*

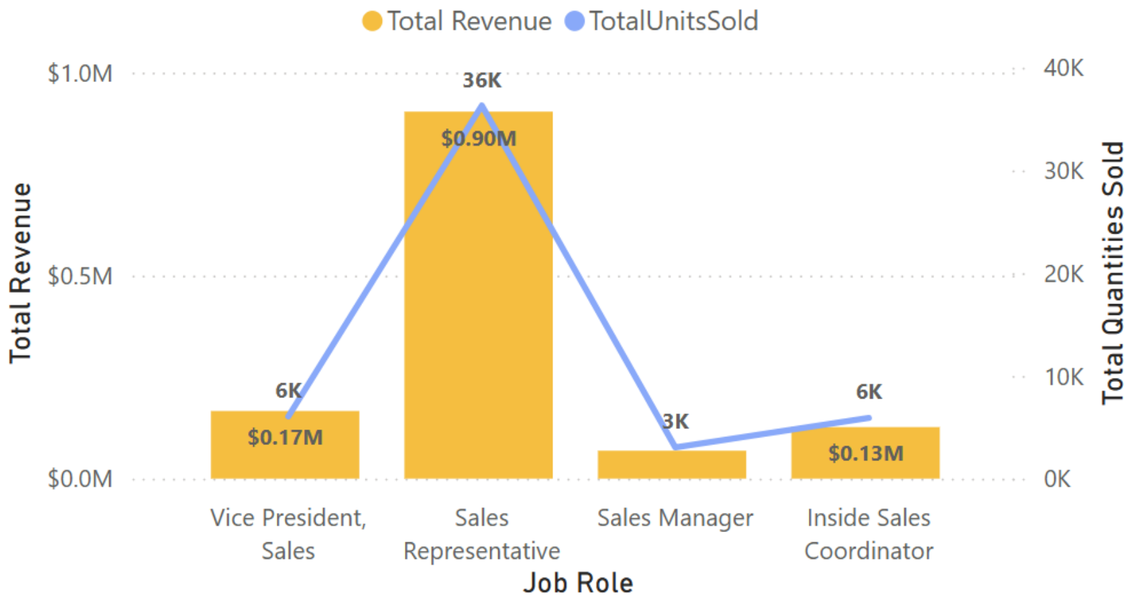
NorthWind Traders

Year: All | Country: All | City: All | Category: All

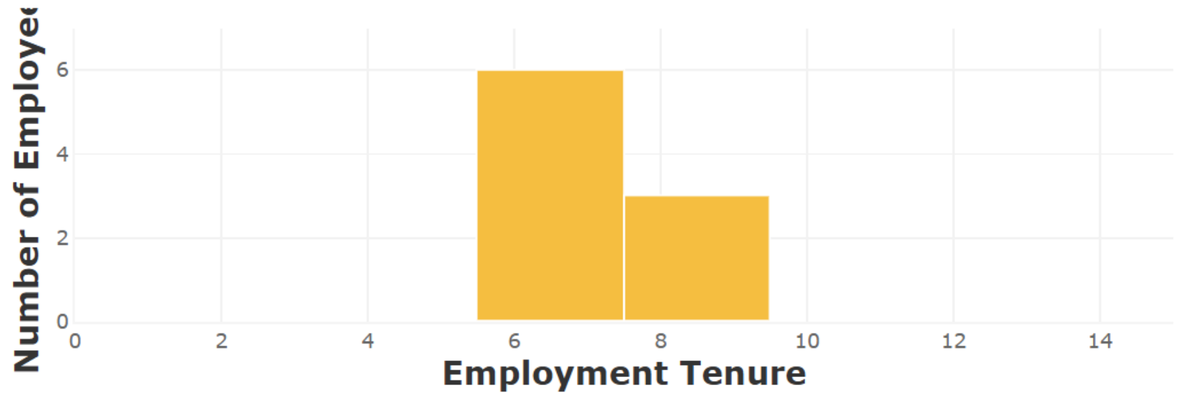
$1.27M Total Revenue

830 Total Orders

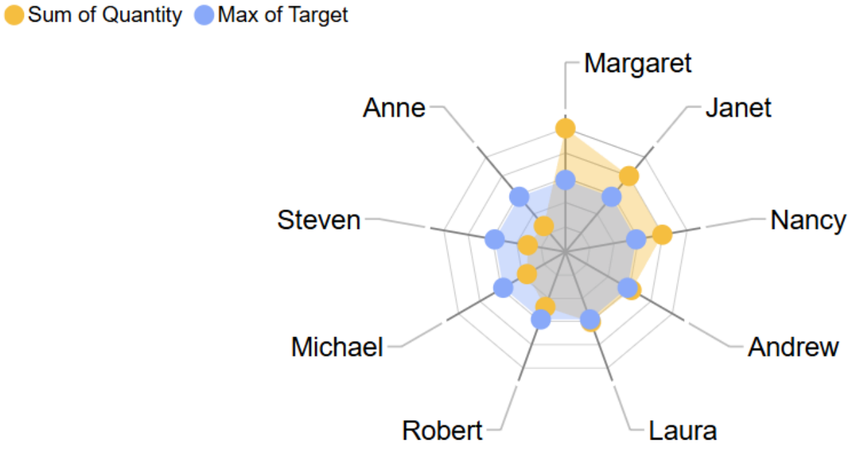
Total Revenue & Sales by Job Roles



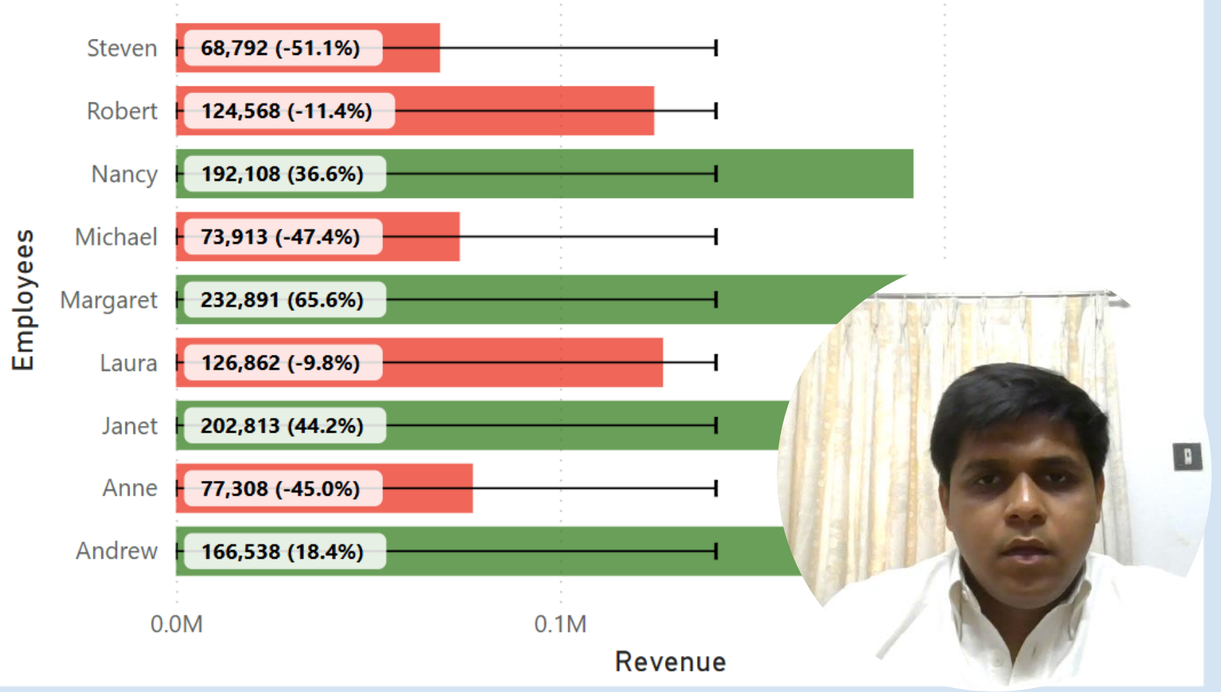
Distribution of Employee Tenure



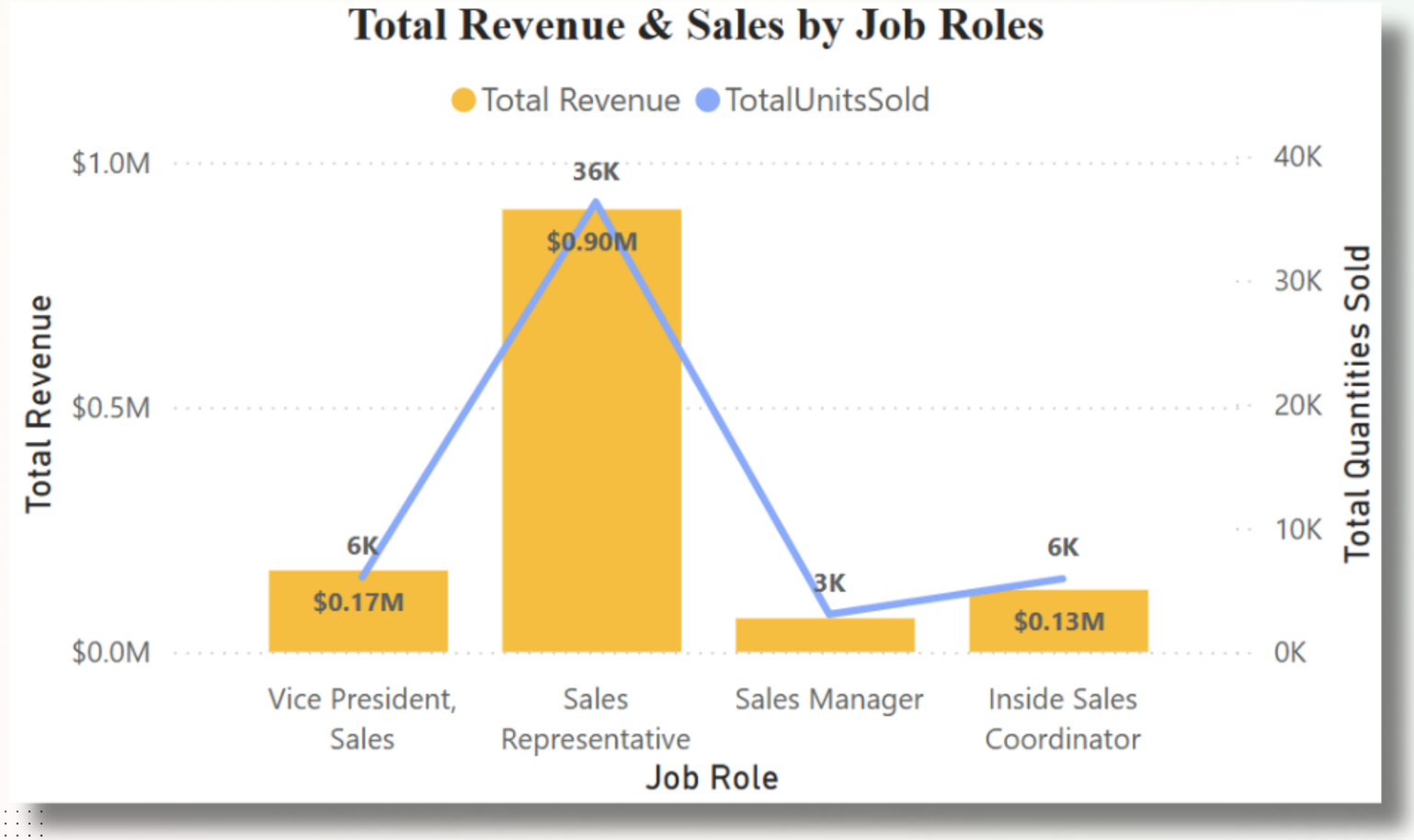
Sales by Employees (Quantities)



Revenue by Employees



Question 21. How does employee productivity vary across different departments or job roles? Can we create a stacked bar chart or grouped column chart to visualize it?

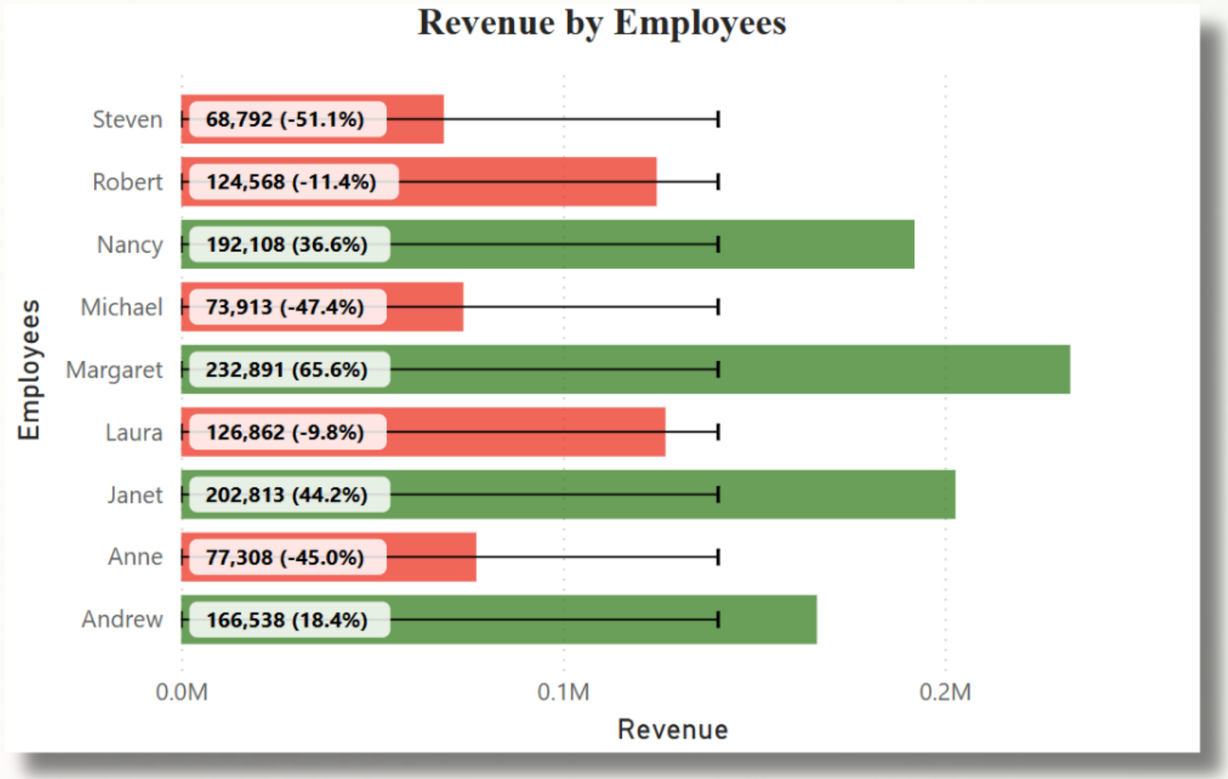


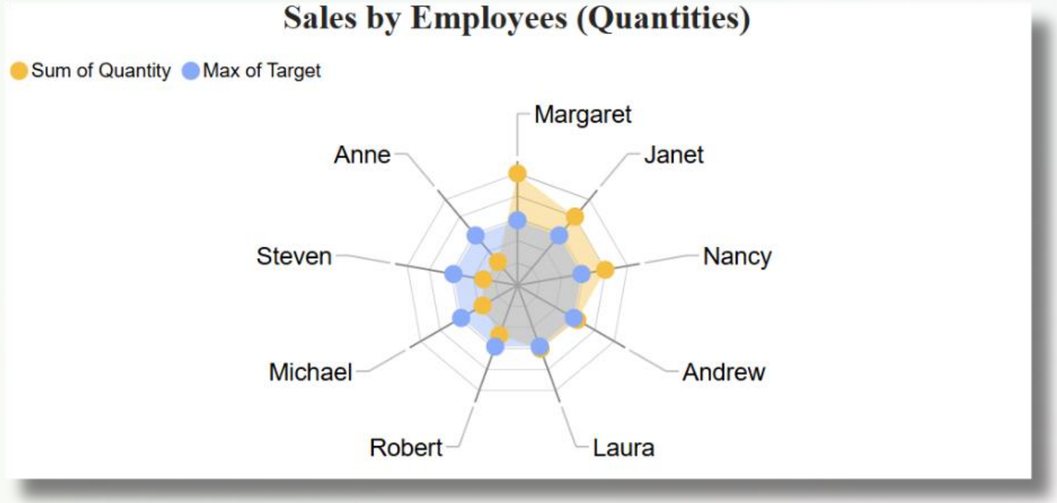
Conclusion: Sales Representatives drive the highest revenue ($0.90M) and sales (36,000 units), while Sales Managers show the lowest performance. Targeted strategies are needed to enhance productivity acro

Question 22. What is the distribution of employee tenure? Can we create a histogram or box plot to display it?

Conclusion: Employee tenure is concentrated between 6-8 years, indicating workforce stability. No employees have tenure below 6 or above 10 years, suggesting potential retention or hiring pa

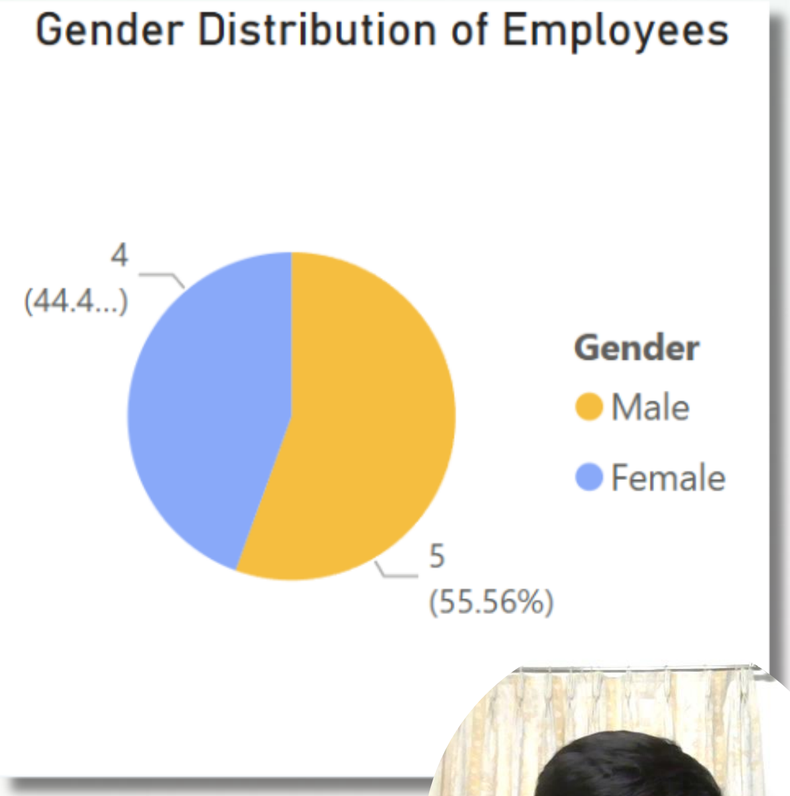
Question 23. Can we visualize employee performance ratings or KPIs using a radar chart or bullet graph?

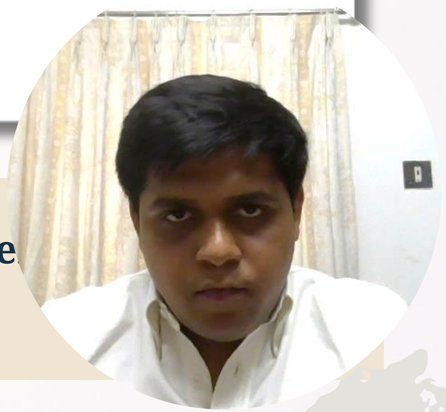




Conclusion: The radar chart highlights employee strengths and weaknesses, with Margaret excelli Nancy in teamwork, and Janet needing improvement. The bullet graph shows the sales target exce strong performance.

Question 24. Can we visualize the distribution of customer demographics such as age, gender, or income using histograms or pie charts?





Conclusion: The workforce is predominantly aged 30-40, indicating a young talent pool, while gende balanced, reflecting workplace diversity.

Products
Dashboard

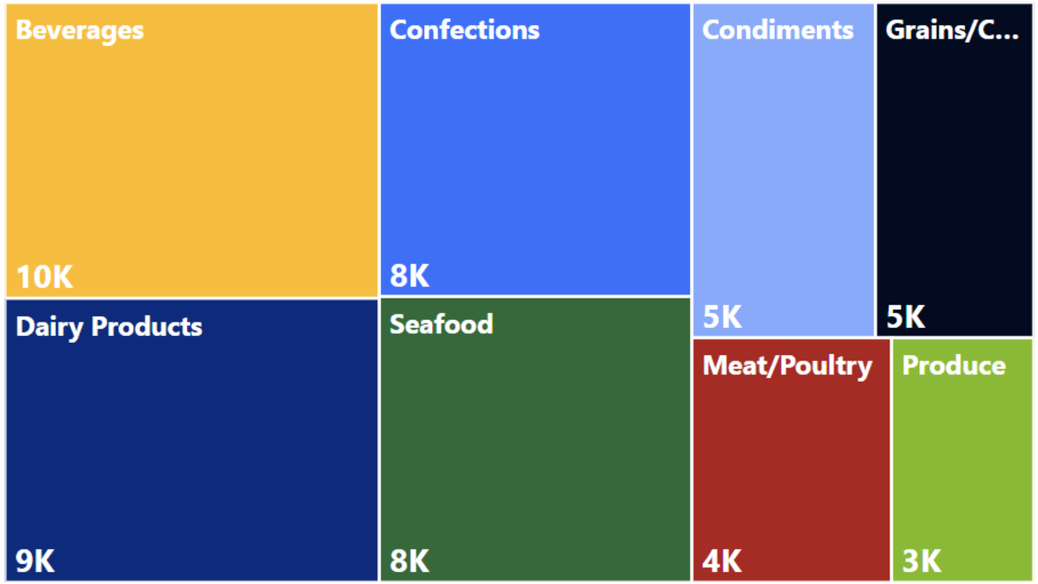
NorthWind Traders

Year: All | Country: All | City: All | Category: All

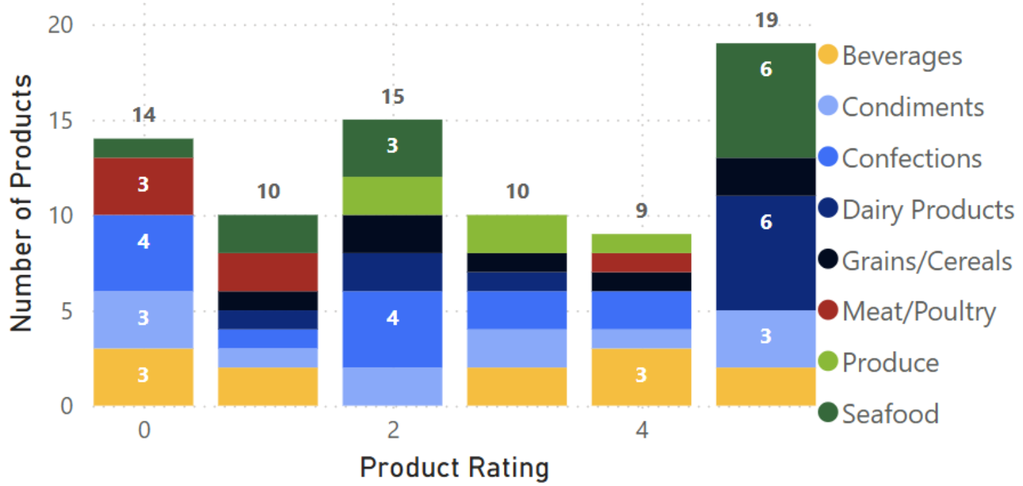
$1.27M Total Revenue

830 Total Orders

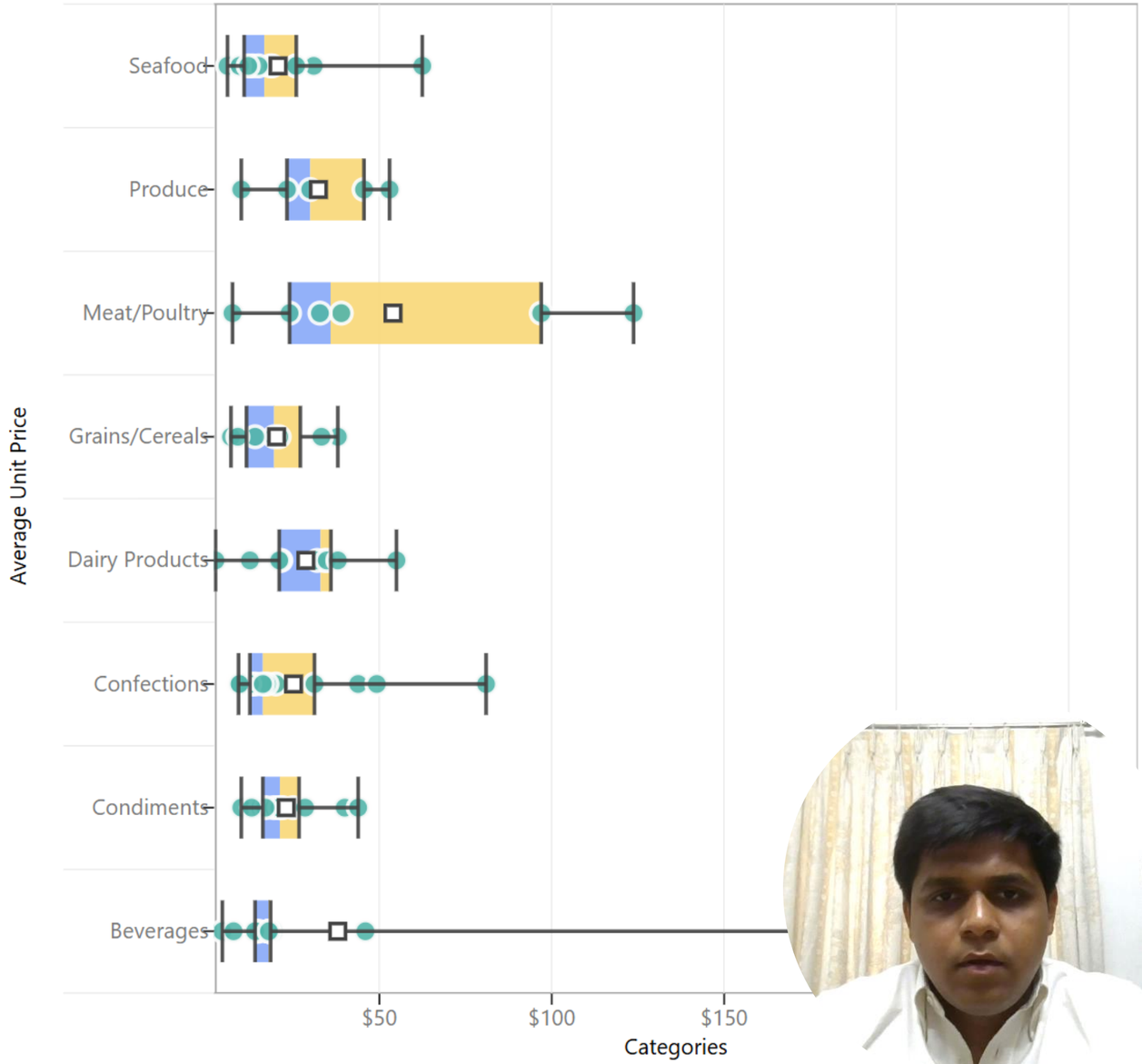
TotalUnitsSold and Total Revenue by CategoryName



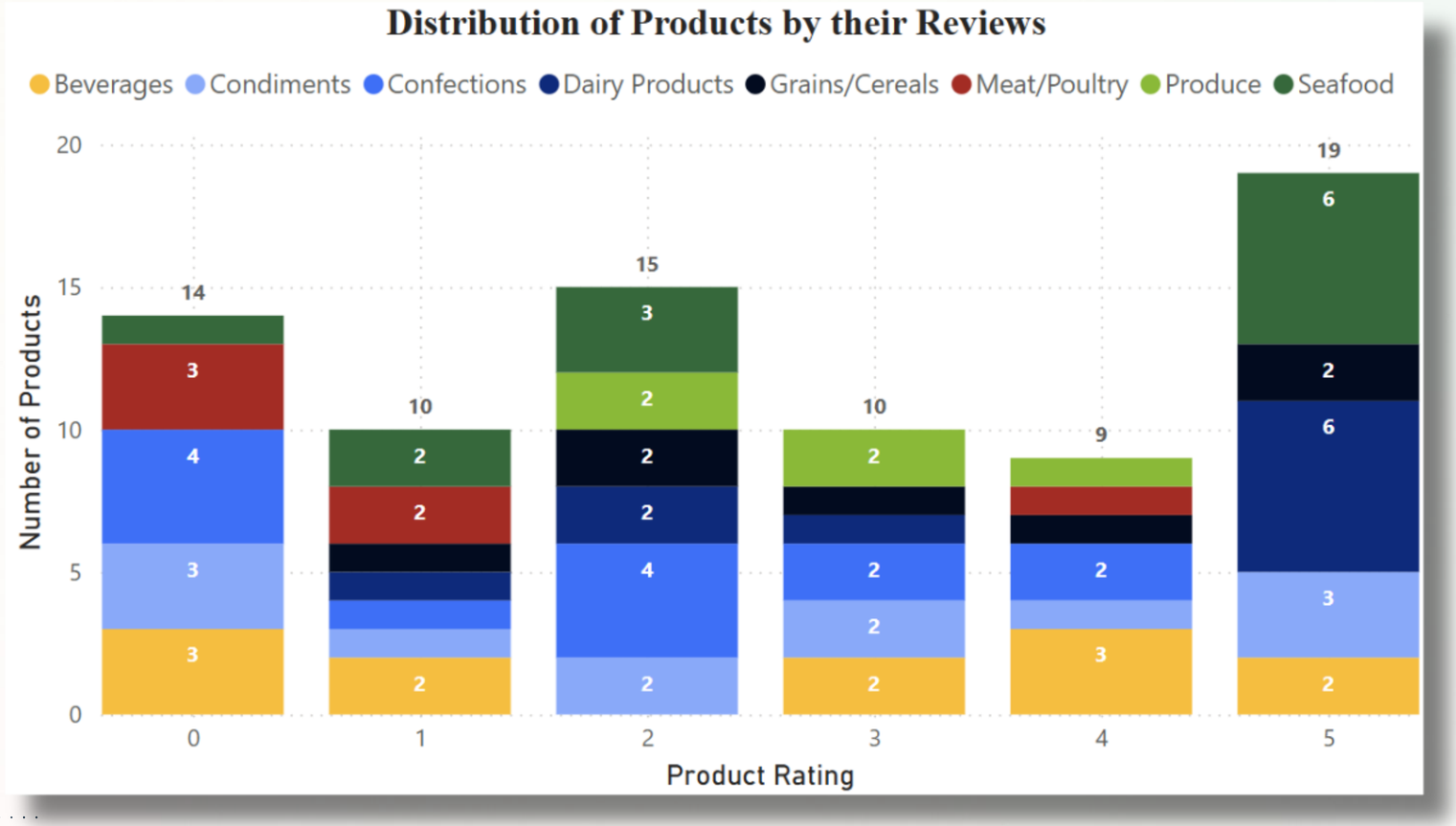
Distribution of Products by their Reviews



Pricing Distribution of Products by Categories

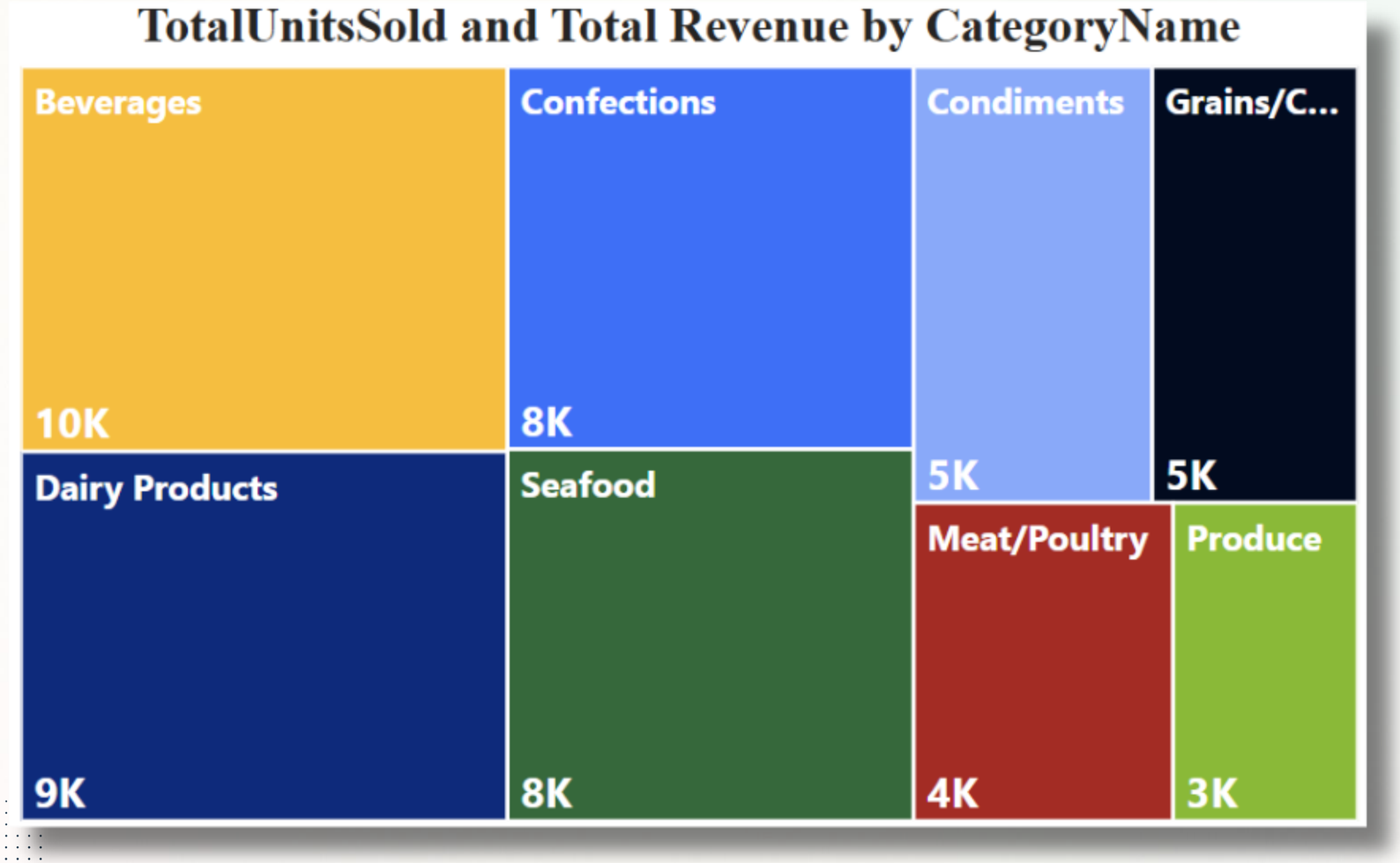


Question 25. What is the distribution of product ratings or reviews? Can we create a histogram or stacked bar chart to visualize it?



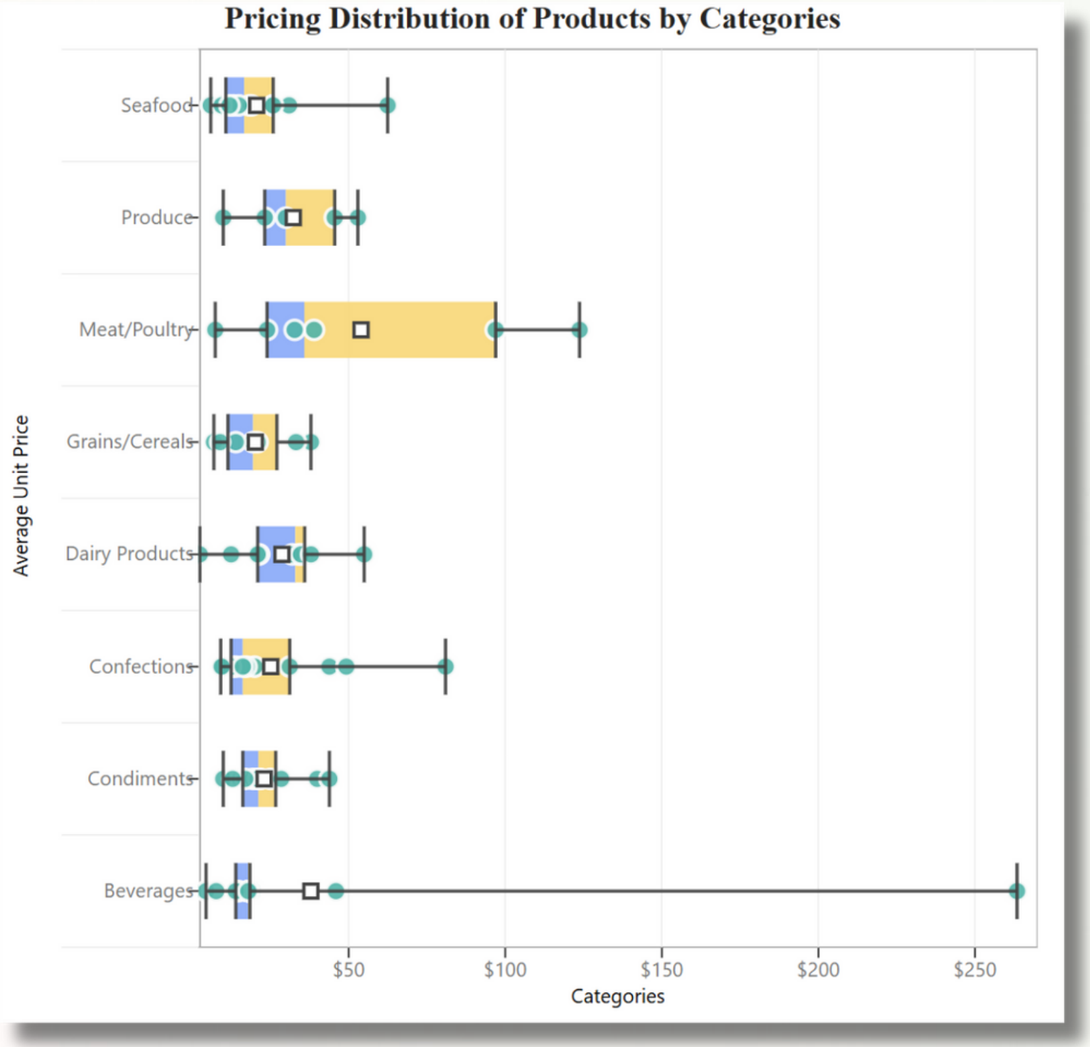
Conclusion: Most products are rated 5, indicating high customer satisfaction, with Beverages leading in top ratings, while lower ratings are rare, suggesting str... overall product qu...

Question 26. How does the sales volume vary across different product categories? Can we create a bar chart or treemap to display it?



Conclusion: Beverages and Dairy Products lead in sales, while Meat/Poultry and Produce lag, highlighting the need for targeted marketing and product strategy.

Question 26. Can we visualize the pricing distribution of products using a box plot or violin plot?



Conclusion: Beverages have the widest price range, while Grains/Cereals and Condiments show stable pricing, highlighting diverse and consistent pricing strategies across categories.

Suppliers
Dashboard

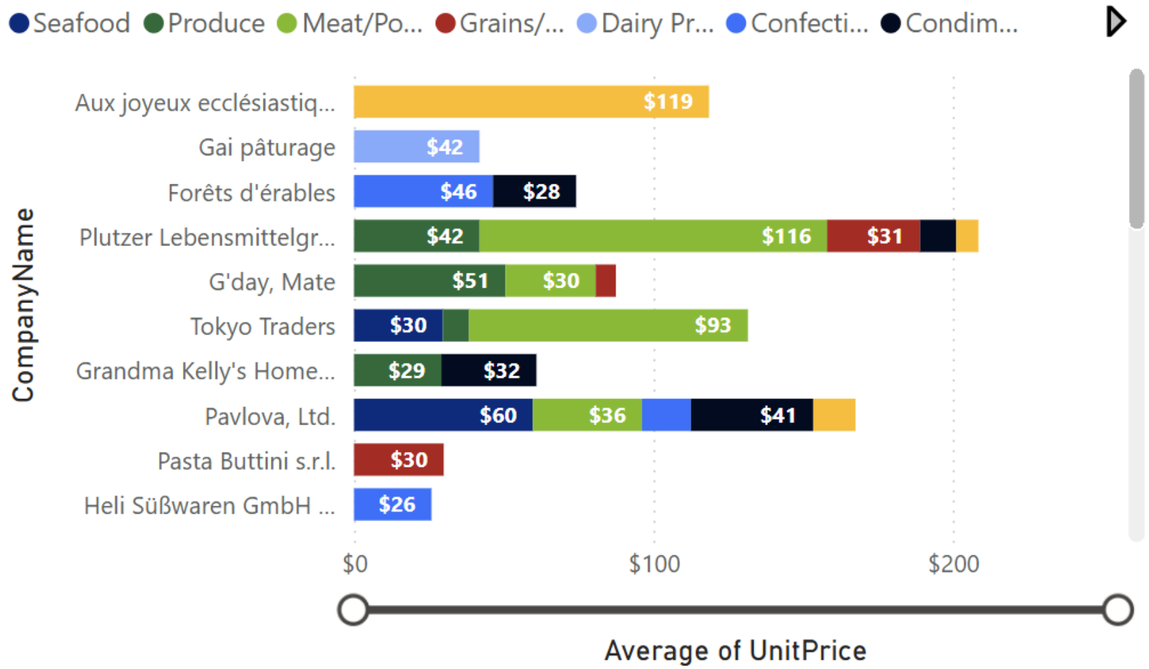
NorthWind Traders

Year: All | Country: All | City: All | Category: All

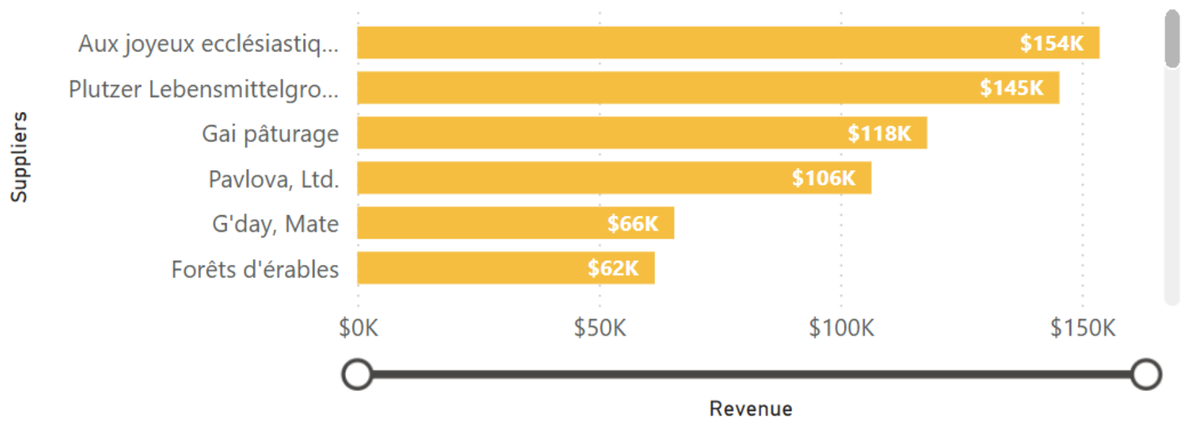
$1.27M Total Revenue

830 Total Orders

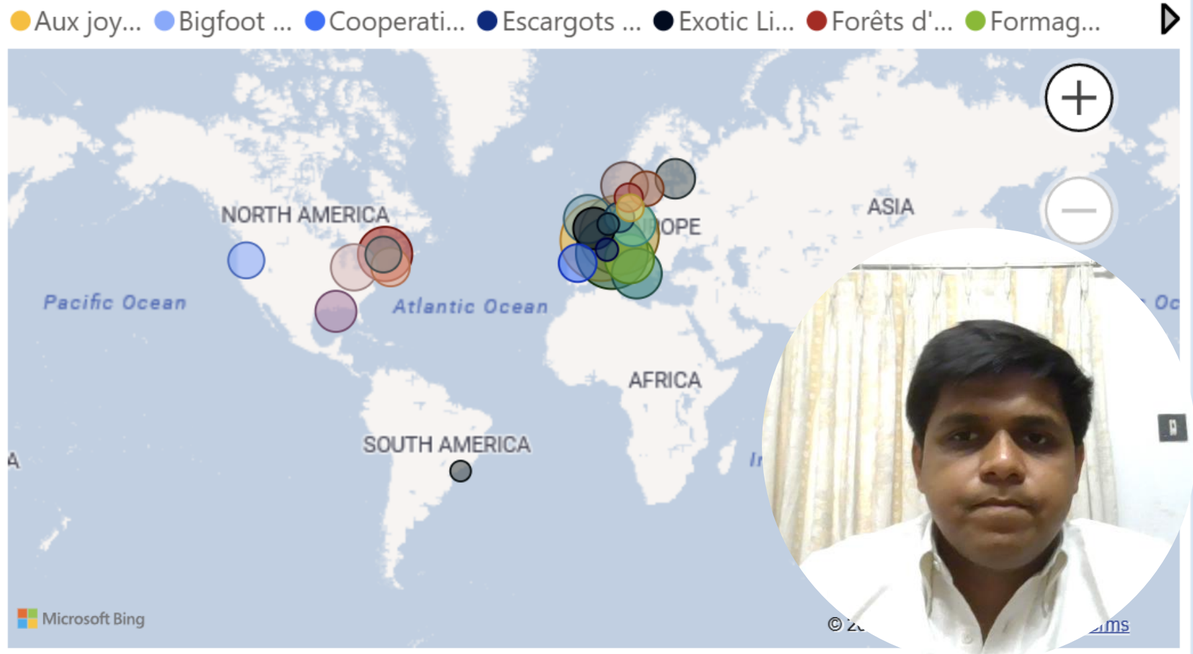
Unit Price Distribution by Suppliers



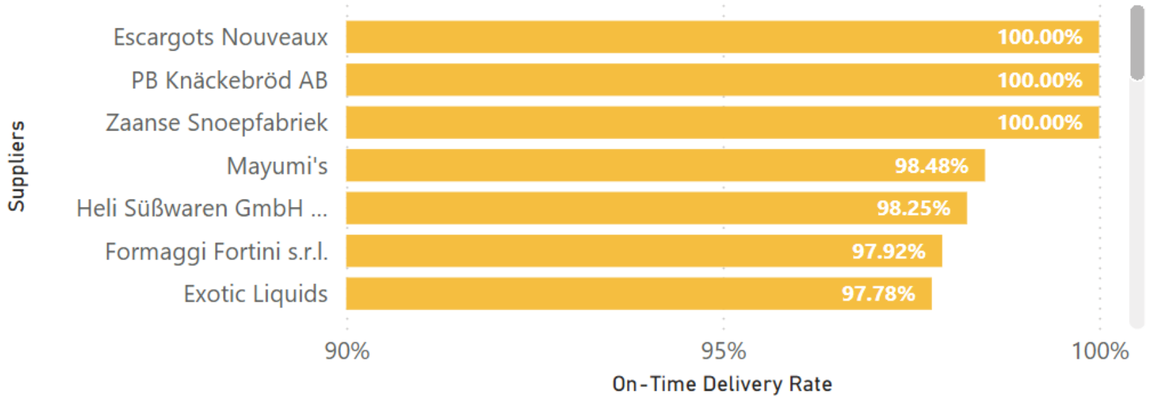
Revenue by Suppliers



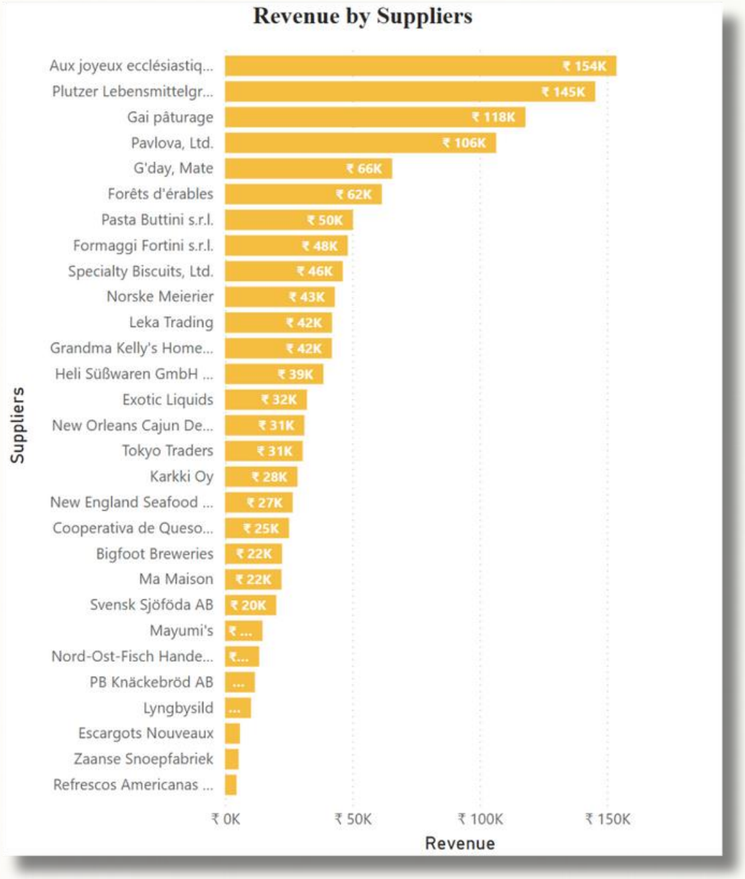
Distribution of Suppliers Globally

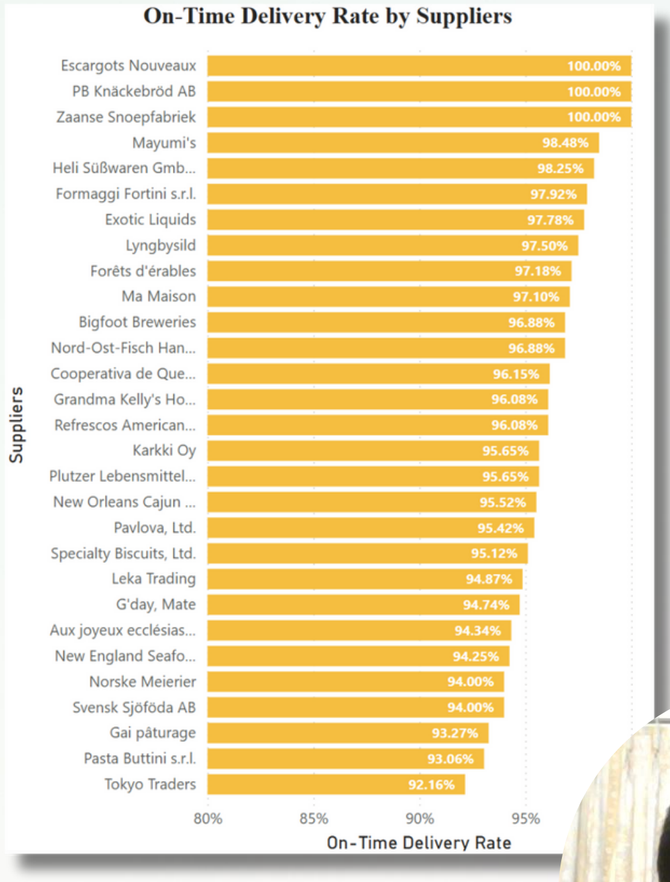


On-Time Delivery Rate by Suppliers



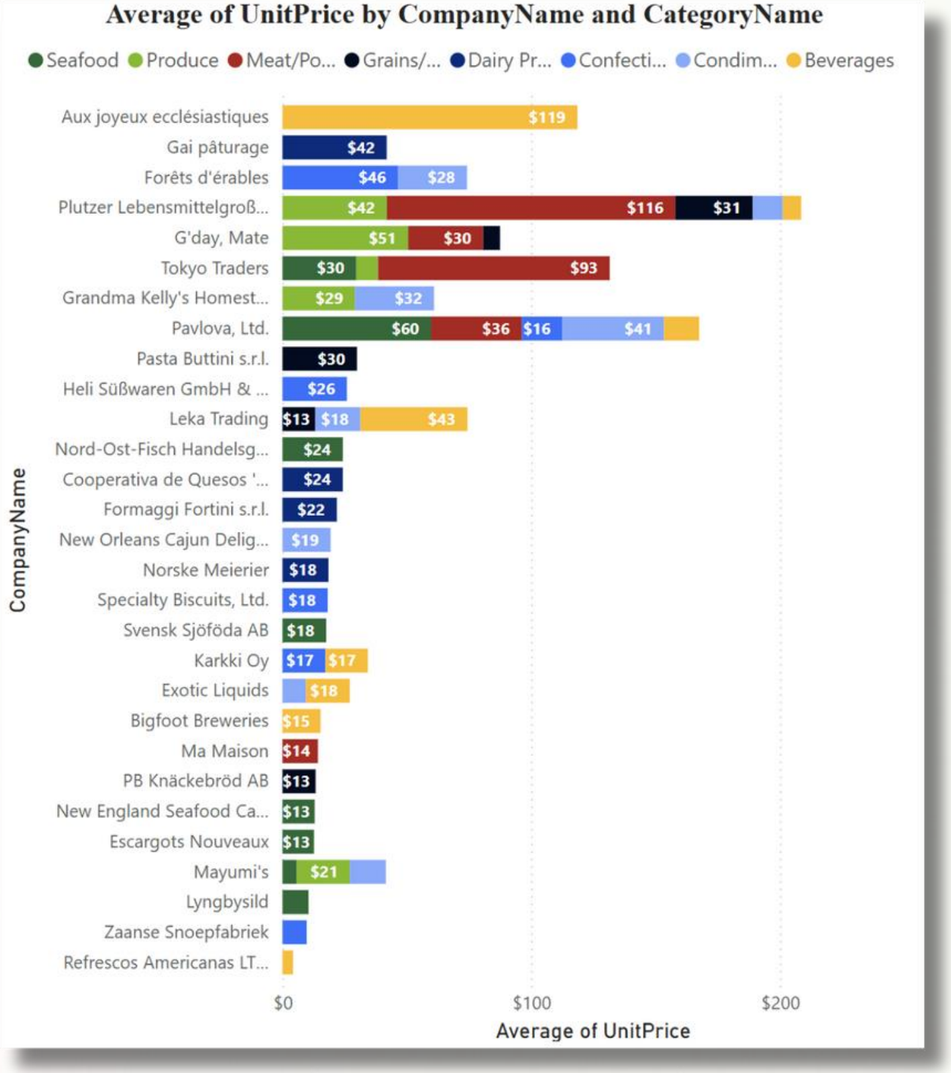
Question 28. What is the distribution of supplier ratings or performance metrics? Can we create a bar chart or radar chart to visualize it?





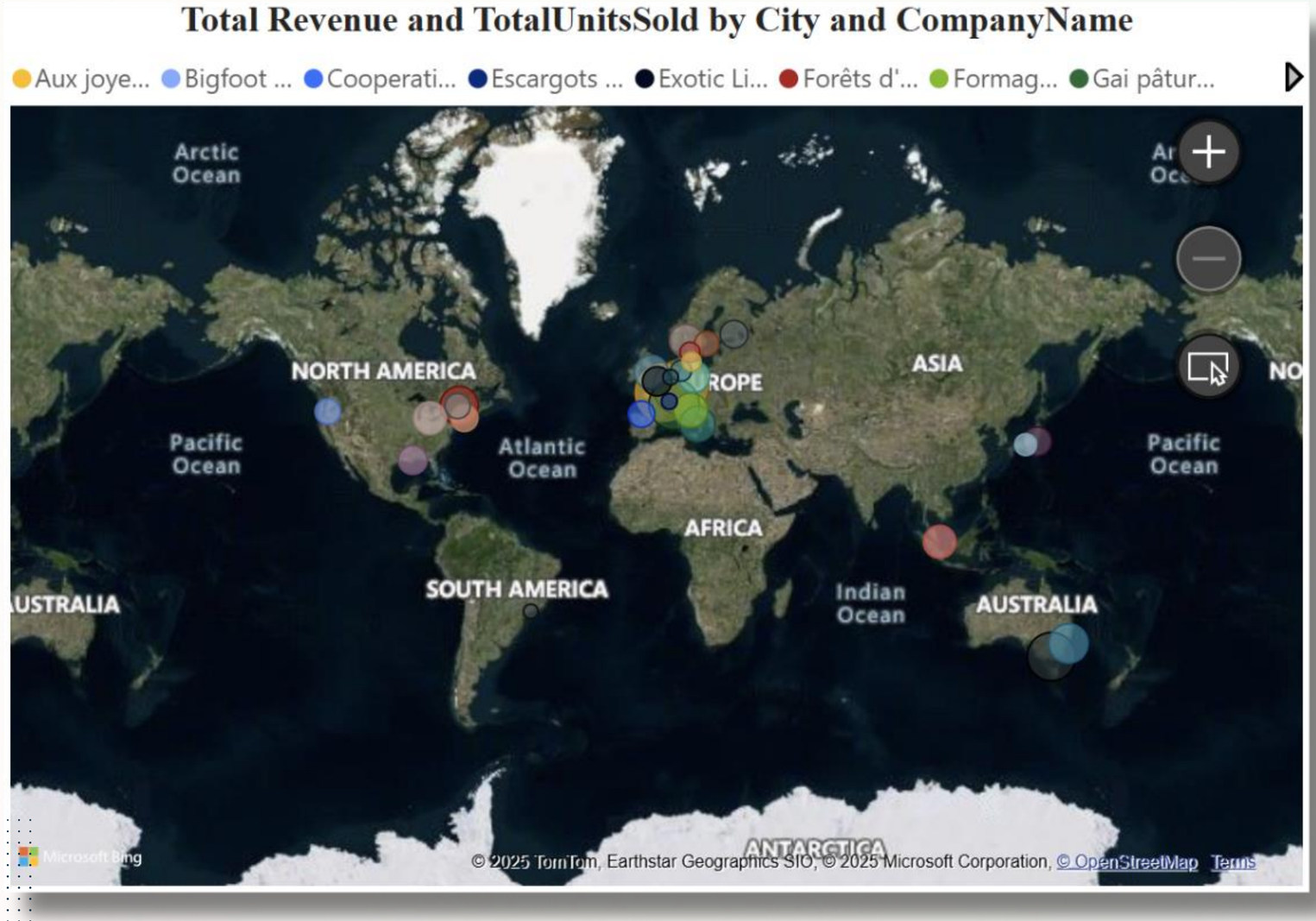
Conclusion: Exotic Liquids excels in both on-time delivery and revenue, while some low-revenue maintain high delivery reliability, indicating multiple factors influencing supplier performance.

Question 29. How does the cost or pricing structure vary across different suppliers? Can we create a box plot or stacked bar chart to display it?

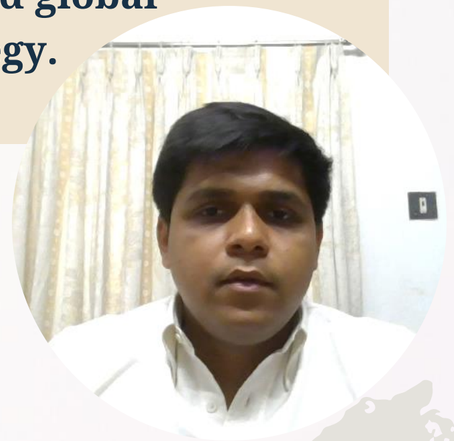


Conclusion: Suppliers vary in pricing strategies—Aux joyeux ecclésiastiques leads with premium-priced seafood, while others like Bigfoot Breweries adopt cost-effective pricing, reflecting diverse market approaches.

Question 30. Can we visualize the geographical distribution of suppliers using a map or bubble chart?



Conclusion: Suppliers are concentrated in Europe, with additional presence in North America, Asia, Australia, and South America, reflecting a well-established global sourcing strategy.



Thank You