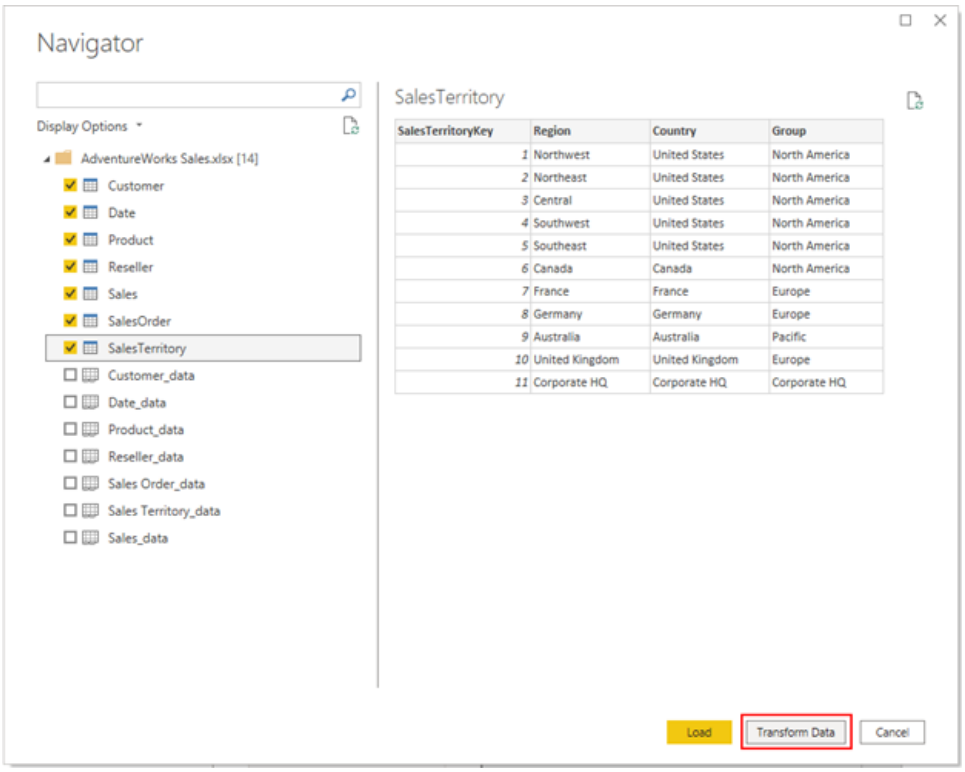
Power BI Next Level Mid-term Lab

Use AdventureWorks Data set supplied by instructor

Prepare your data

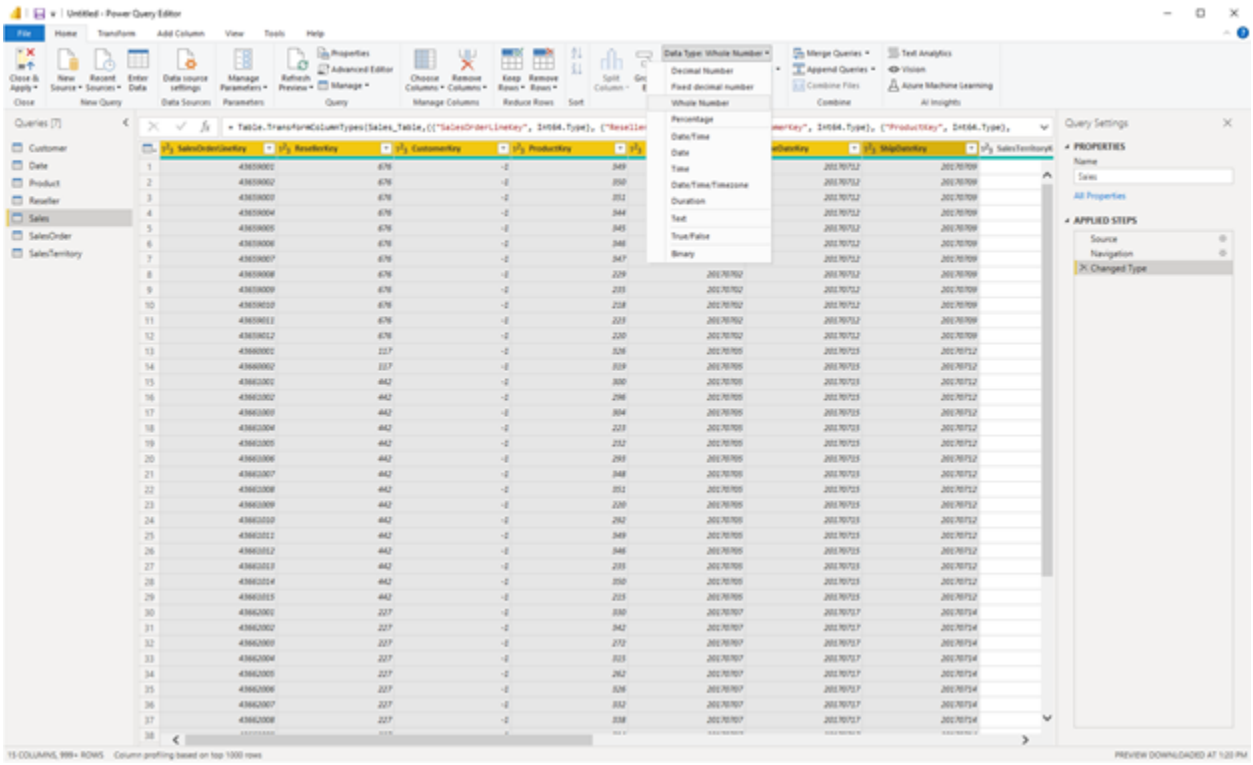
In the Navigator pane, you have the option to *transform* or *load* the data. The Navigator provides a preview of your data so you can verify that you have the correct range of data. Numeric data types are italicized. In this tutorial, we're going to transform the data before loading.

Select all tables, and choose Transform Data. Make sure not to select the sheets (labeled *_data*).



Check that the data types of the columns match those in the following table. To let Power BI detect data types for you, select a query, then select one or more columns. On the Transform tab, select Detect Data Type. To make any changes to the detected

data type, on the Home tab, select Data Type, then select the appropriate data type from the list.

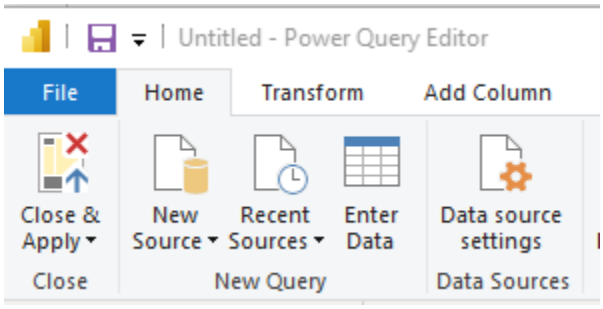


Query	Column	Data type
Customer	CustomerKey	Whole Number
Date	DateKey	Whole Number
	Date	Date
	MonthKey	Whole Number
Product	ProductKey	Whole Number

	Standard Cost	Decimal Number
	List Price	Decimal Number
Reseller	ResellerKey	Whole Number
Sales	SalesOrderLineKey	Whole Number
	ResellerKey	Whole Number
	CustomerKey	Whole Number
	ProductKey	Whole Number
	OrderDateKey	Whole Number
	DueDateKey	Whole Number
	ShipDateKey	Whole Number
	SalesTerritoryKey	Whole Number
	Order Quantity	Whole Number
	Unit Price	Decimal Number

	Extended Amount	Decimal Number
	Unit Price Discount Pct	Percentage
	Product Standard Cost	Decimal Number
	Total Product Cost	Decimal Number
	Sales Amount	Decimal Number
SalesTerritory	SalesTerritoryKey	Whole Number
SalesOrder	SalesOrderLineKey	Whole Number

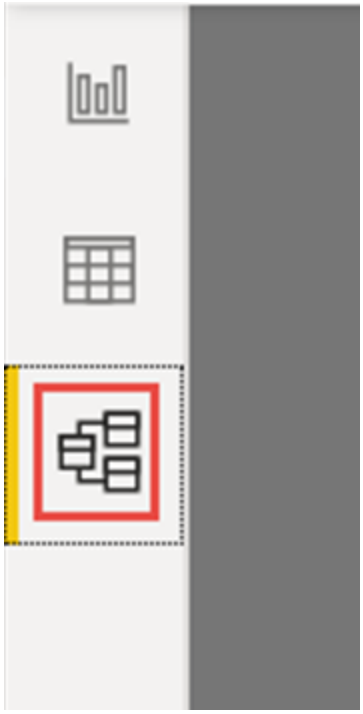
Back on the Home tab, select Close & Apply.



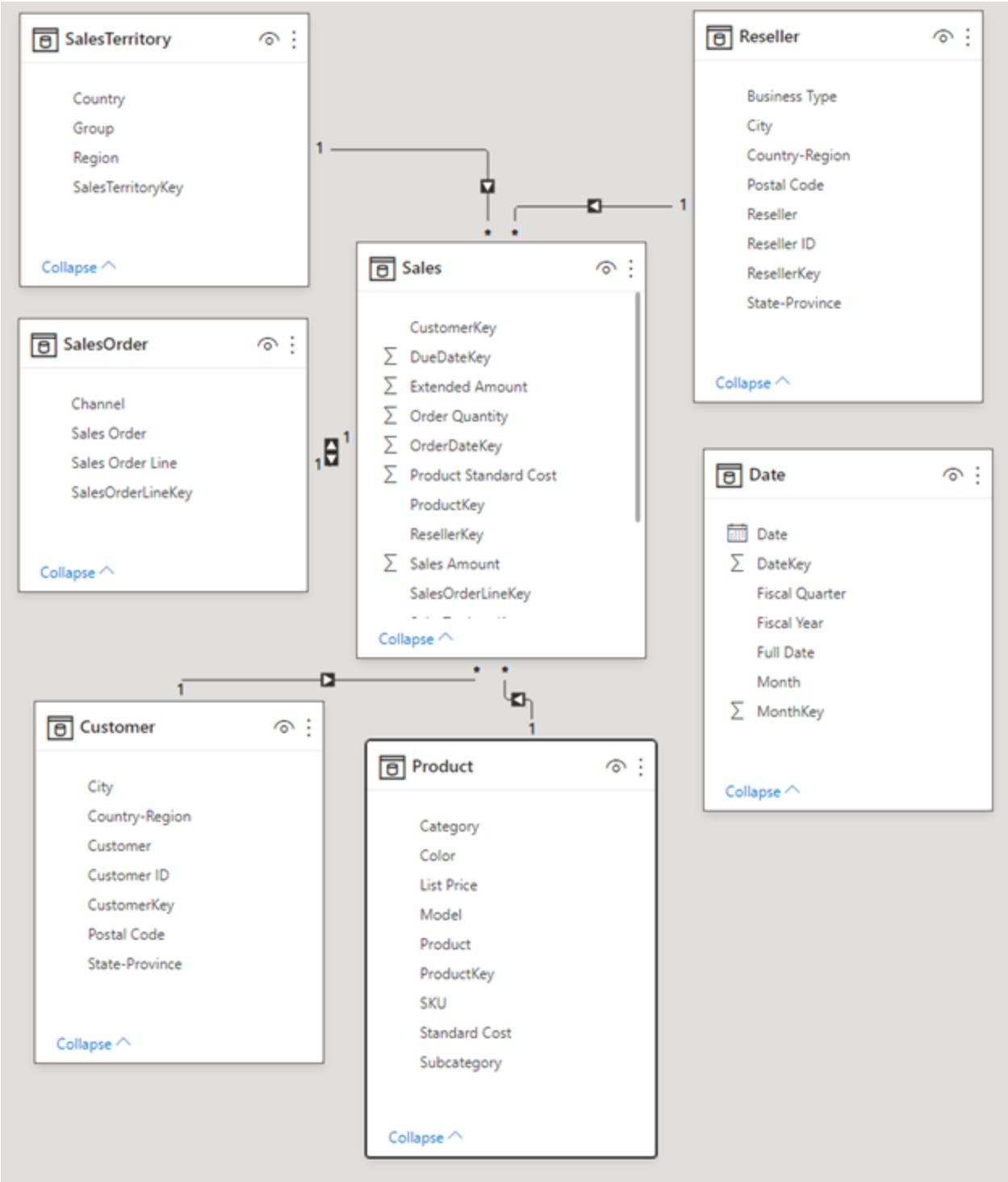
Model your data

The data you loaded is almost ready for reporting. Let's inspect the data model and make some changes.

Select Model View on the left.



Your data model should look like the following image, with each table in a box.



Create relationships

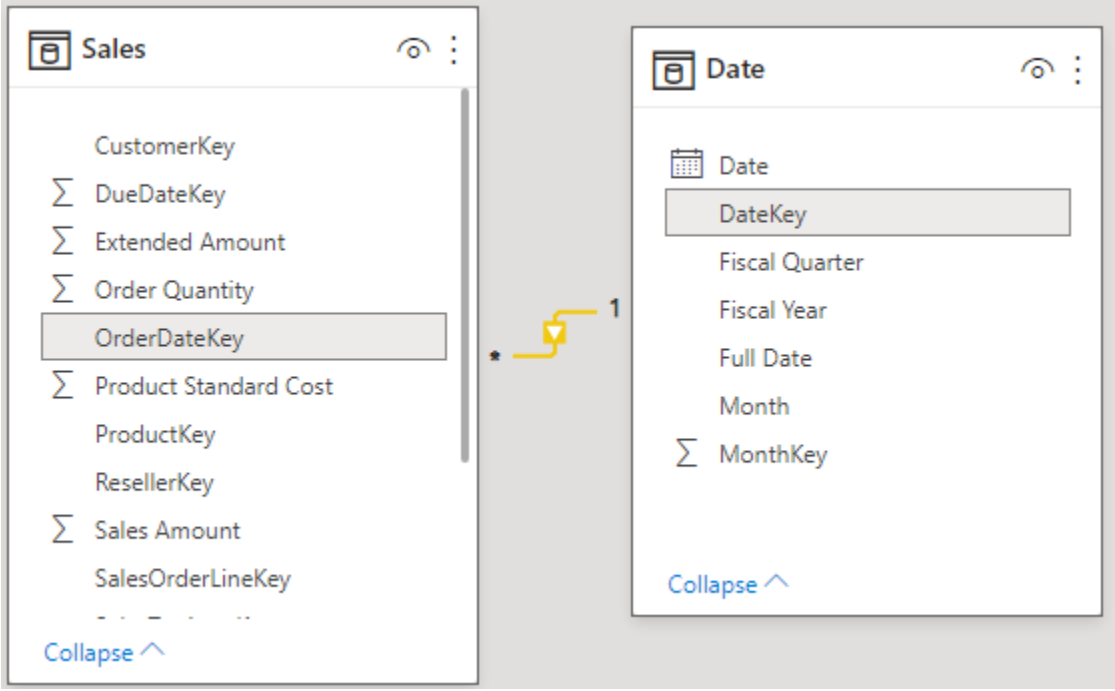
This model is a typical *star schema* that you might see from data warehouses: It resembles a star. The center of the star is a Fact table. The surrounding tables are

called Dimension tables, which are related to the Fact table with relationships. The Fact table contains numerical information about sales transactions, such as Sales Amount and Product Standard Cost. The Dimensions provide context so you can, among other things, analyze:

- What Product was sold...
- to which Customer..
- by which Reseller...
- in which Sales Territory.

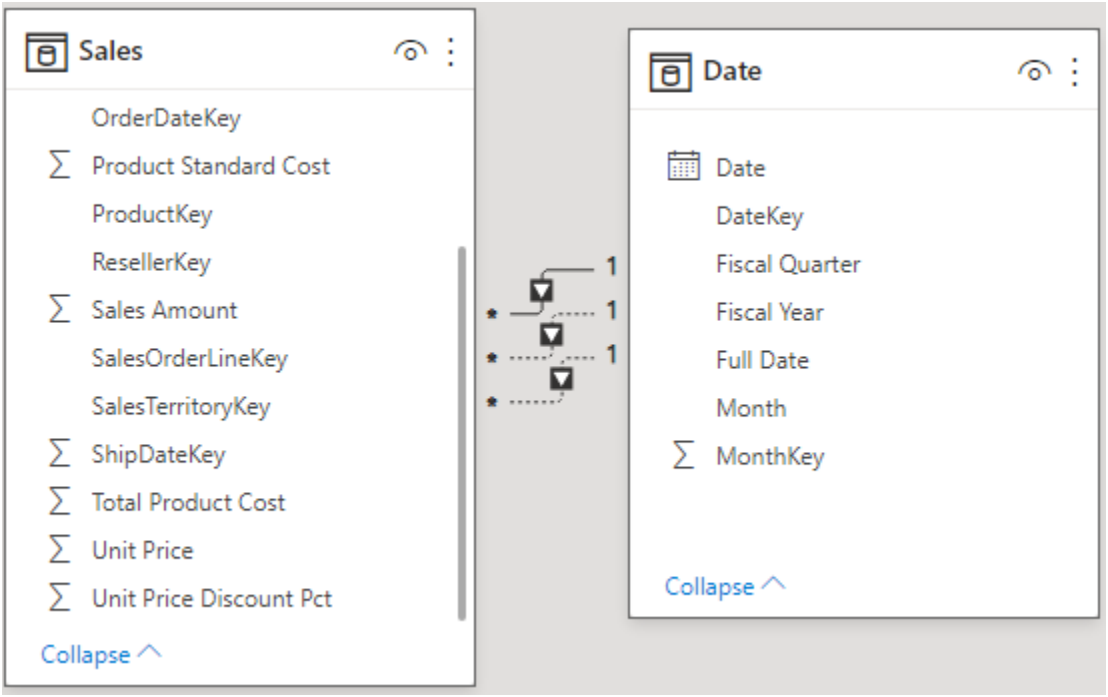
If you look closely, you notice that all Dimension tables are related to the Fact with a Relationship, except for the Date table. Let’s add some relationships to Date now. Drag the DateKey from the Date table to OrderDateKey on the Sales table. You've created a so-called "one-to-many" relationship from Date to Sales, as indicated by the 1 and the asterisk * (many) at the two ends of the line.

The relationship is "one-to-many" because we have one or more Sales orders for a given Date. If each date had only one Sales order, the relationship would be "one-to-one". The little arrow in the middle of the line indicates the "cross-filtering direction." It indicates that you can use values from the Date table to filter the Sales table, so the relationship allows you to analyze when a Sales order was placed.



The Sales table contains more information about dates related to Sales orders, such as Due Date and Ship Date. Let's add two more relationships to the Date table by dragging:

- DateKey to DueDateKey
- DateKey to ShipDateKey



You notice that the first relationship, on OrderDateKey, is active, shown by the continuous line. The other two are inactive, shown by the dashed lines. Power BI uses the active relationship by default to relate Sales and Date. Hence, a sum of SalesAmount is calculated by Order Date, not Due Date or Ship Date. You can influence this behavior. See Extra credit: Write a measure in DAX later in this tutorial.

Hide key columns

The typical star schema contains several keys that hold the relationships between Facts and Dimensions. Normally we don't want to use any key columns in our reports. Let's hide the key columns from view, so the Fields List shows fewer fields, and the data model is easier to use.

Go over all tables and hide any column whose name ends with *Key*:

Select the Eye icon next to the column and choose Hide in report view.

You can also select the Eye icon next to the column in the Properties pane.

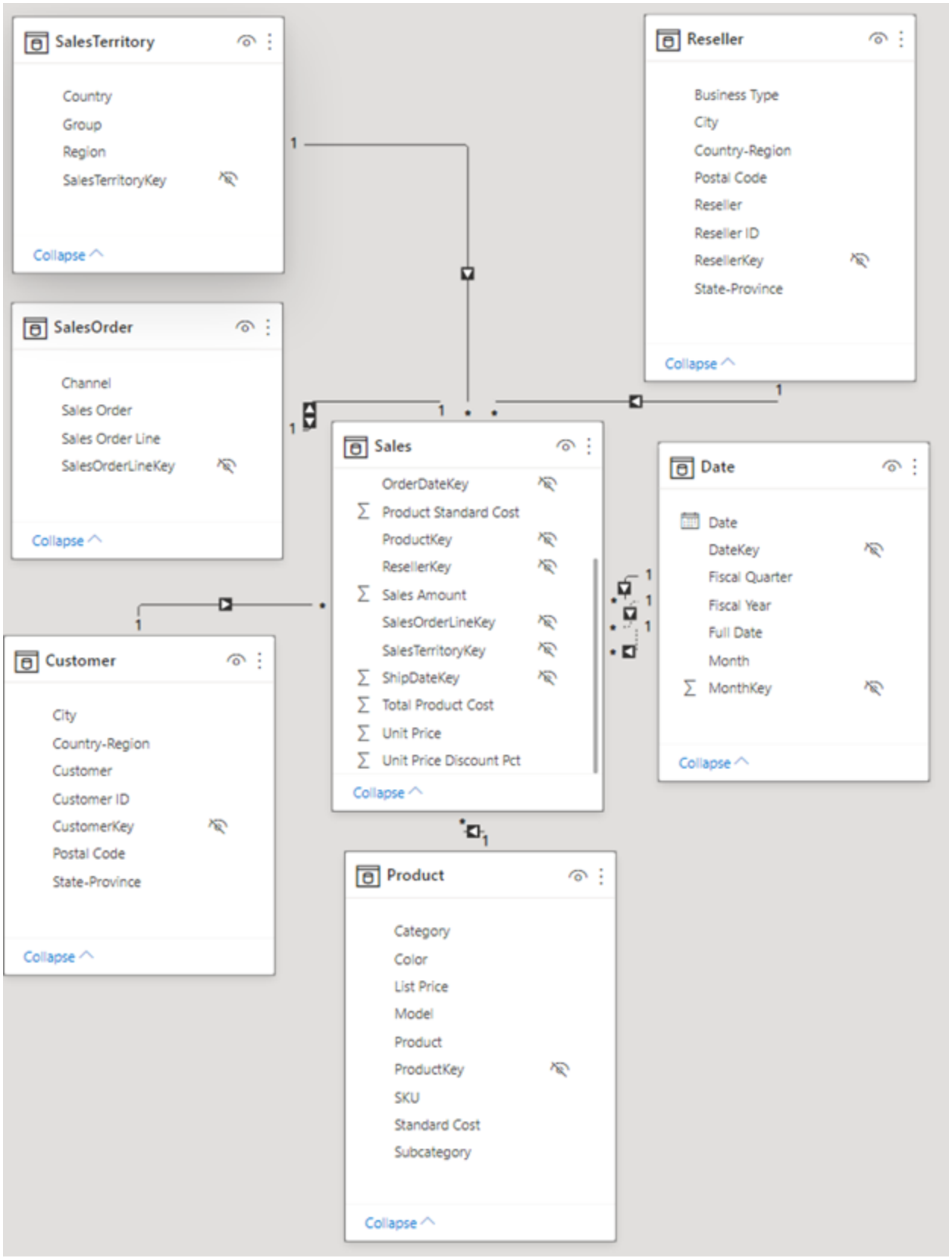
Hidden fields have this icon, an eye with a line through it.

Hide these fields.

Table	Column
Customer	CustomerKey
Date	DateKey
	MonthKey
Product	ProductKey
Reseller	ResellerKey
Sales	CustomerKey
	DueDateKey
	OrderDateKey

	ProductKey
	ResellerKey
	SalesOrderLineKey
	SalesTerritoryKey
	ShipDateKey
SalesOrder	SalesOrderLineKey
SalesTerritory	SalesTerritoryKey

Your data model should now look like this data model, with relationships between Sales and all the other tables, and all the key fields hidden:


SalesTerritory
Country
Group
Region
SalesTerritoryKey
Collapse
Reseller
Business Type
City
Country-Region
Postal Code
Reseller
Reseller ID
ResellerKey
State-Province
Collapse
SalesOrder
Channel
Sales Order
Sales Order Line
SalesOrderLineKey
Collapse
Sales
OrderDateKey
Product Standard Cost
ProductKey
ResellerKey
Sales Amount
SalesOrderLineKey
SalesTerritoryKey
ShipDateKey
Total Product Cost
Unit Price
Unit Price Discount Pct
Collapse
Date
Date
DateKey
Fiscal Quarter
Fiscal Year
Full Date
Month
MonthKey
Collapse
Customer
City
Country-Region
Customer
Customer ID
CustomerKey
Postal Code
State-Province
Collapse
Product
Category
Color
List Price
Model
Product
ProductKey
SKU
Standard Cost
Subcategory
Collapse

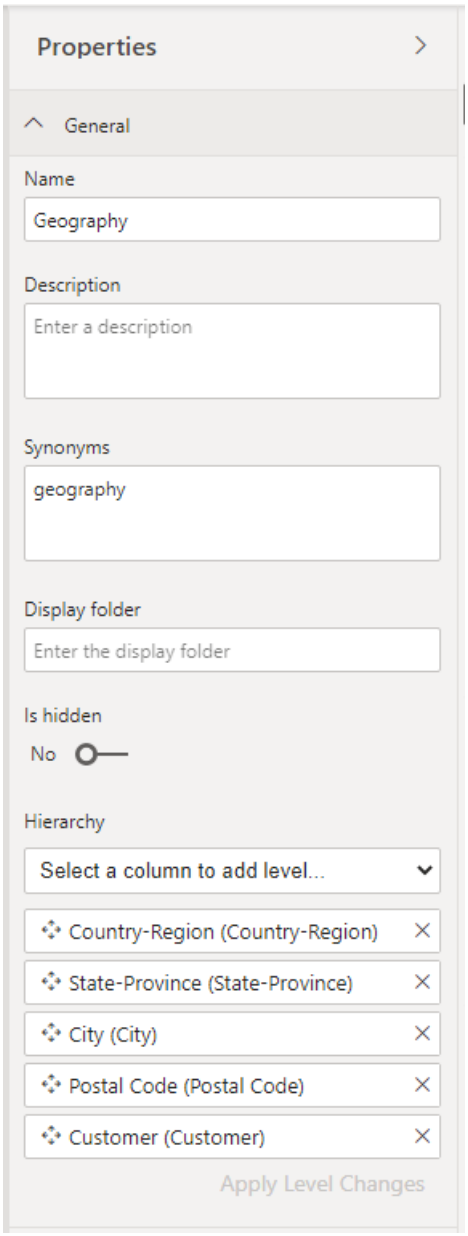
Create hierarchies

Now that our data model is easier to consume because of the hidden columns, we can add a few *hierarchies* to make the model even easier to use. Hierarchies enable easier navigation of groupings. For example, cities are in a State or Province, which is in a Country or Region.

Create the following hierarchies.

1. Right-click the highest level, or the least granular, field in the hierarchy and choose Create hierarchy.
2. In the Properties pane, set the Name of the hierarchy and set the levels.

3. Then Apply Level Changes.



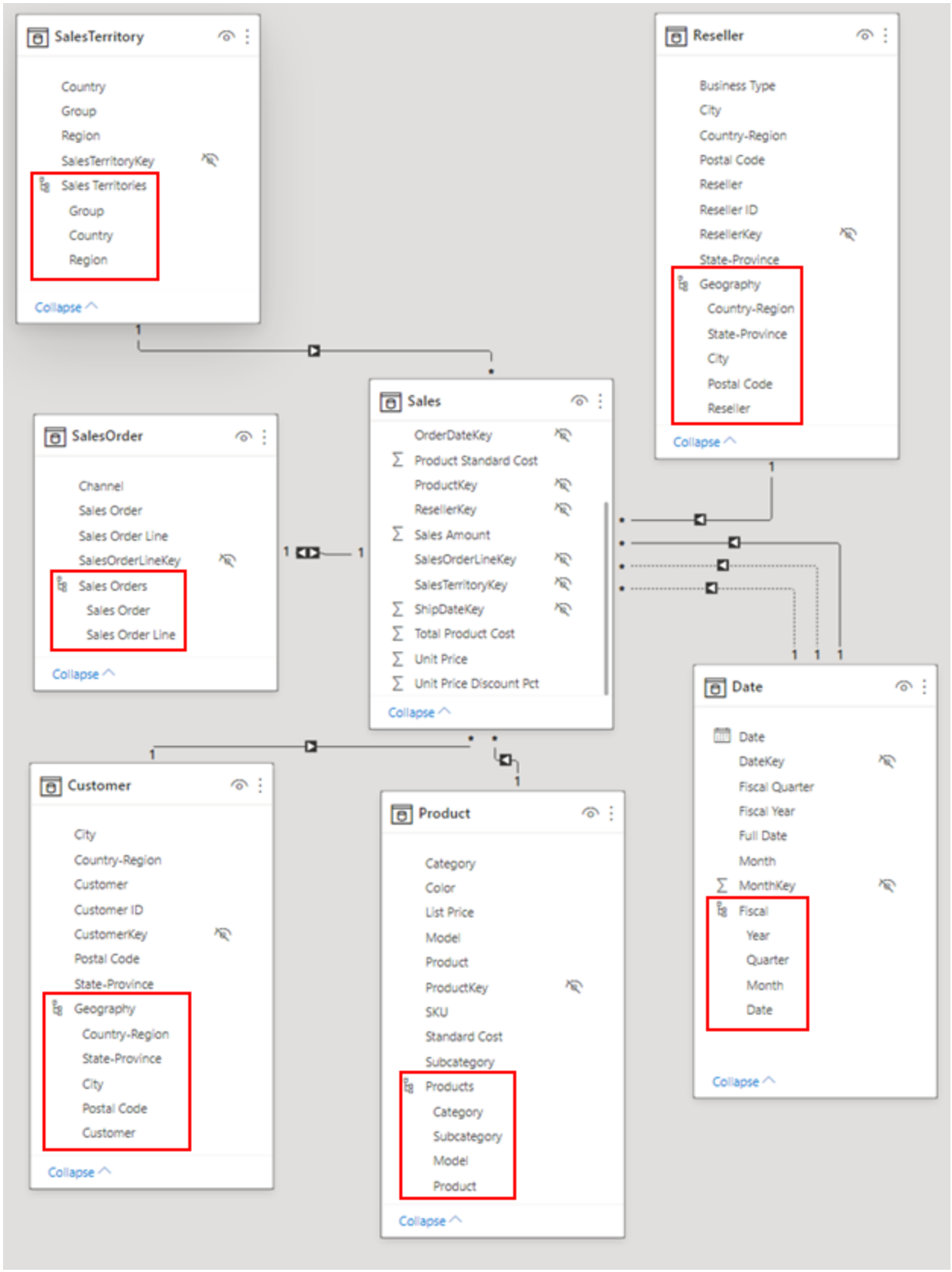
You can also rename levels in a hierarchy in the Properties pane after you add them. You'll need to rename the Year and Quarter level of the Fiscal hierarchy in the Date table.

Here are the hierarchies you need to create.

Table	Hierarchy name	Levels
Customer	Geography	Country-Region
		State-Province
		City
		Postal Code
		Customer
Date	Fiscal	Year (Fiscal Year)
		Quarter (Fiscal Quarter)
		Month
		Date
Product	Products	Category
		Subcategory

		Model
		Product
Reseller	Geography	Country-Region
		State-Province
		City
		Postal Code
		Reseller
SalesOrder	Sales Orders	Sales Order
		Sales Order Line
SalesTerritory	Sales Territories	Group
		Country
		Region

Your data model should now look like the following data model. It has the same tables, but each dimension table contains a hierarchy:


SalesTerritory
Country
Group
Region
SalesTerritoryKey
Sales Territories
Group
Country
Region
Collapse
Reseller
Business Type
City
Country-Region
Postal Code
Reseller
Reseller ID
ResellerKey
State-Province
Geography
Country-Region
State-Province
City
Postal Code
Reseller
Collapse
Sales
OrderDateKey
Product Standard Cost
ProductKey
ResellerKey
Sales Amount
SalesOrderLineKey
SalesTerritoryKey
ShipDateKey
Total Product Cost
Unit Price
Unit Price Discount Pct
Collapse
SalesOrder
Channel
Sales Order
Sales Order Line
SalesOrderLineKey
Sales Orders
Sales Order
Sales Order Line
Collapse
Customer
City
Country-Region
Customer
Customer ID
CustomerKey
Postal Code
State-Province
Geography
Country-Region
State-Province
City
Postal Code
Customer
Collapse
Product
Category
Color
List Price
Model
Product
ProductKey
SKU
Standard Cost
Subcategory
Products
Category
Subcategory
Model
Product
Collapse
Date
Date
DateKey
Fiscal Quarter
Fiscal Year
Full Date
Month
MonthKey
Fiscal
Year
Quarter
Month
Date
Collapse
1
1
1
1
1
1
1
1
1
1

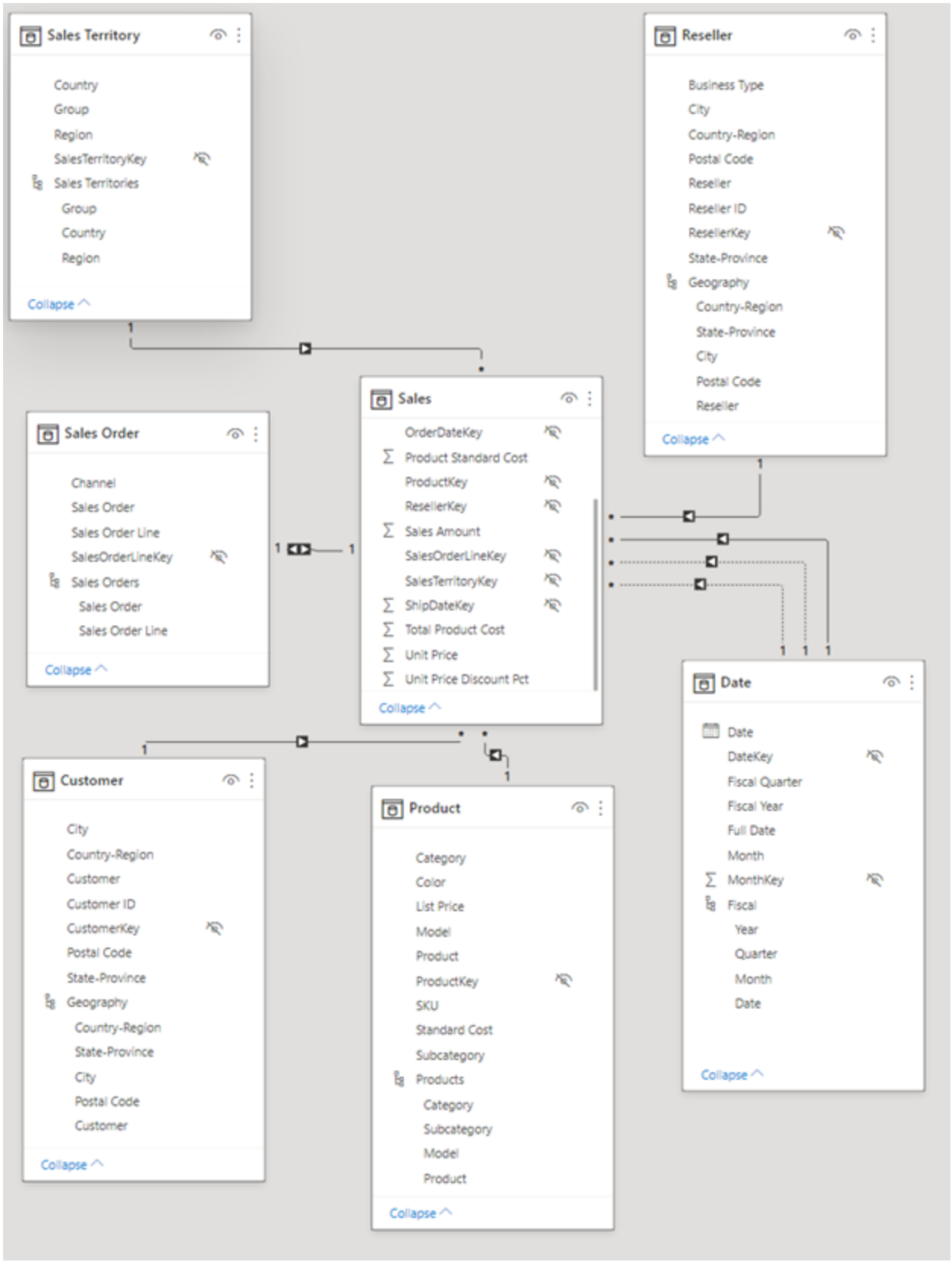
Rename tables

To finish modeling, let's rename the following tables in the Properties pane:

Old table name	New table name
SalesTerritory	Sales Territory
SalesOrder	Sales Order

This step is necessary because Excel table names can't contain spaces.

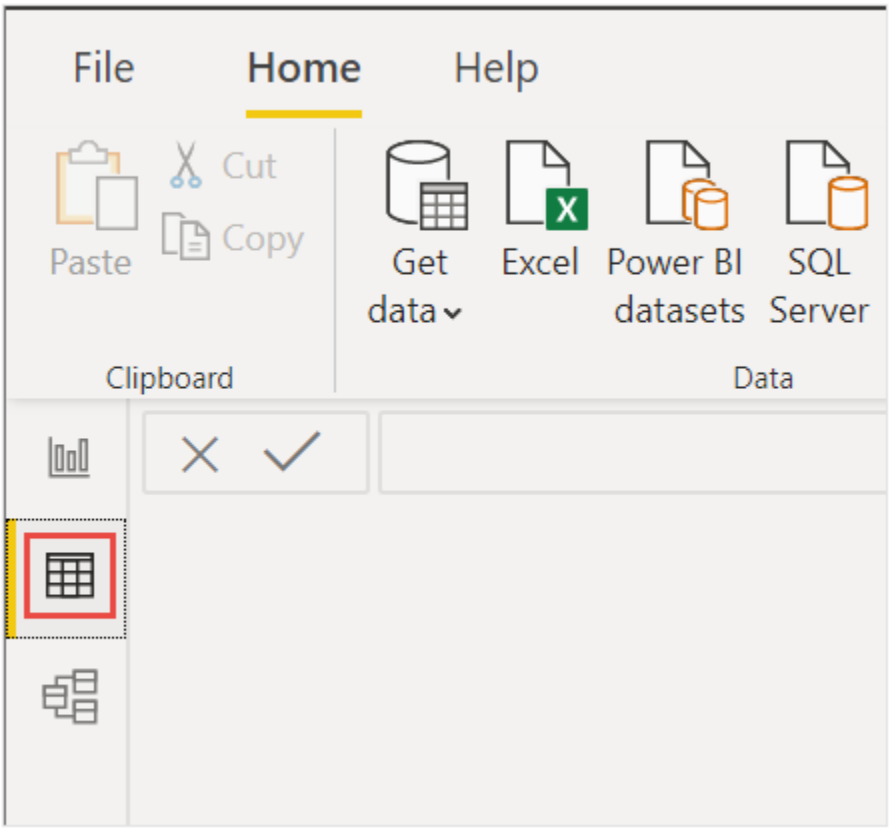
Now your final data model is ready.


Sales Territory
Country
Group
Region
SalesTerritoryKey
Sales Territories
Group
Country
Region
Collapse
Reseller
Business Type
City
Country-Region
Postal Code
Reseller
Reseller ID
ResellerKey
State-Province
Geography
Country-Region
State-Province
City
Postal Code
Reseller
Collapse
Sales Order
Channel
Sales Order
Sales Order Line
SalesOrderLineKey
Sales Orders
Sales Order
Sales Order Line
Collapse
Sales
OrderDateKey
Product Standard Cost
ProductKey
ResellerKey
Sales Amount
SalesOrderLineKey
SalesTerritoryKey
ShipDateKey
Total Product Cost
Unit Price
Unit Price Discount Pct
Collapse
Date
Date
DateKey
Fiscal Quarter
Fiscal Year
Full Date
Month
MonthKey
Fiscal
Year
Quarter
Month
Date
Collapse
Customer
City
Country-Region
Customer
Customer ID
CustomerKey
Postal Code
State-Province
Geography
Country-Region
State-Province
City
Postal Code
Customer
Collapse
Product
Category
Color
List Price
Model
Product
ProductKey
SKU
Standard Cost
Subcategory
Products
Category
Subcategory
Model
Product
Collapse

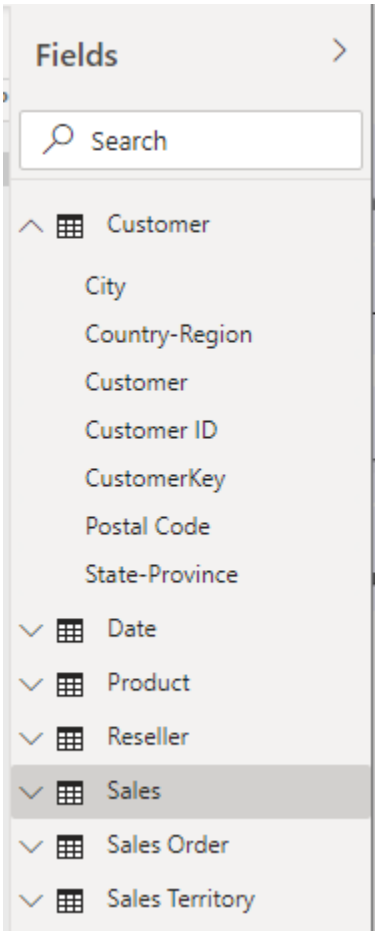
Write a measure in DAX

Writing *measures* in the DAX formula language is super powerful for data modeling. For now, let's write a basic measure that calculates the total sales amount by due date on the sales order instead of the default order date. This measure uses the USERELATIONSHIP function to activate the relationship between Sales and Date on DueDate for the context of the measure. It then uses CALCULATE to sum the Sales Amount in that context.

1. Select Data View on the left.



2. Select the Sales table in the Fields list.



3. On the Home ribbon, select New Measure.
4. Select or type this measure to calculate the total sales amount by due date on the sales order instead of the default order date:

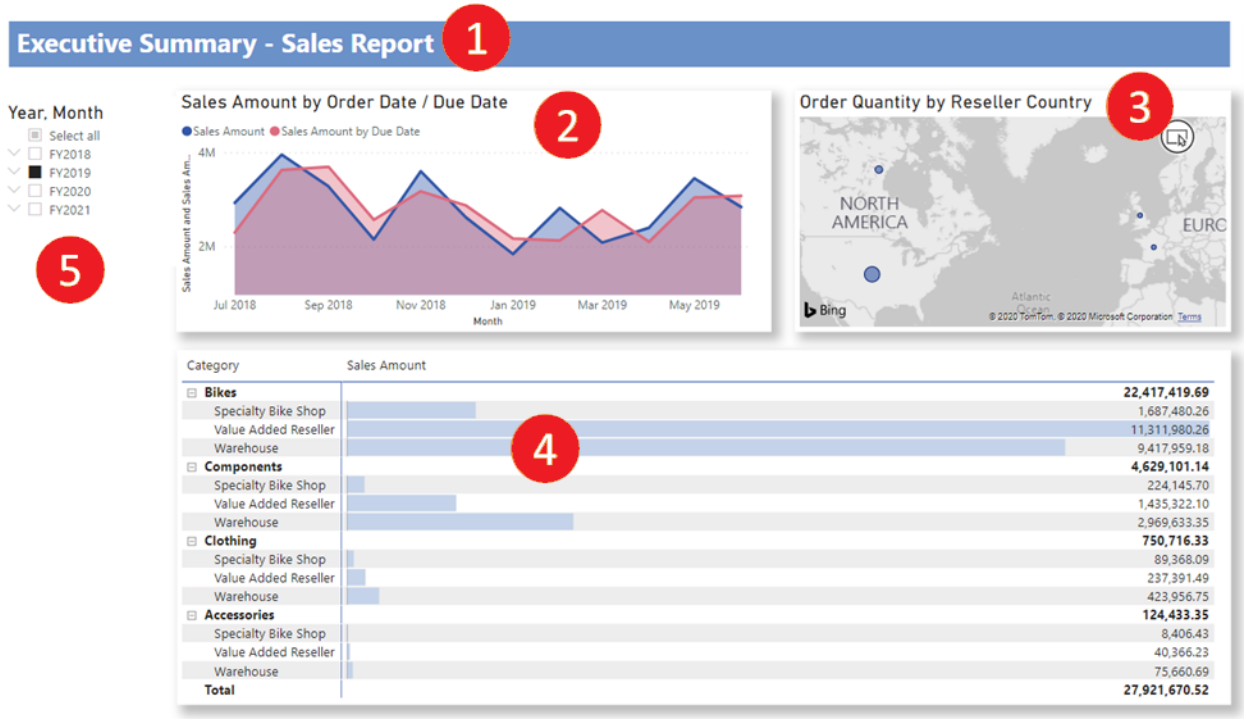
```
Sales Amount by Due Date = CALCULATE(SUM(Sales[Sales Amount]),
USERELATIONSHIP(Sales[DueDateKey],'Date'[DateKey]))
```

5. Select the check mark to commit.

Build your report

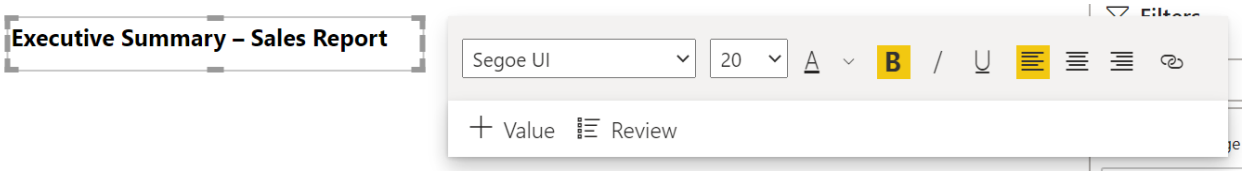
Now that you've modeled your data, it's time to create your report. Go to Report View. In the Fields pane on the right, you see the fields in the data model you created.

Let’s build the final report, one visual at a time.



Visual 1: Add a title

1. On the Insert ribbon, select Text Box. Type "Executive Summary – Sales Report".
2. Select the text you typed. Set the font size to 20 and Bold.

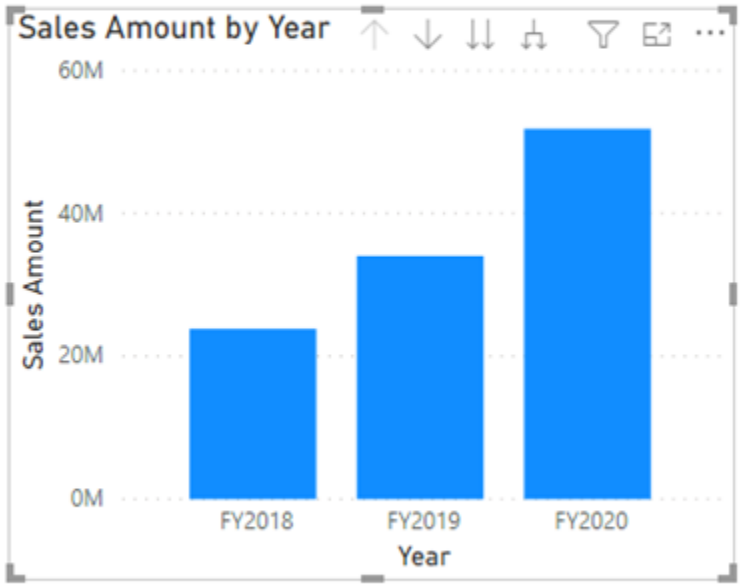


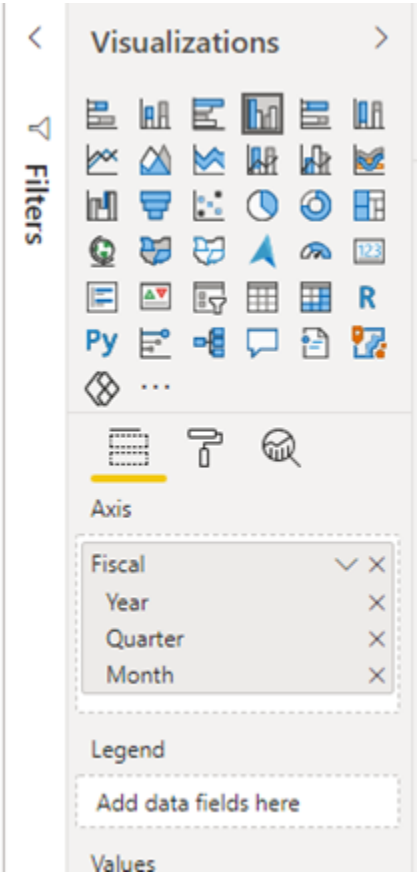
3. In the Visualizations pane, toggle the Background to Off.
4. Resize the box to fit on one line.

Visual 2: Sales Amount by Date

Next you create a line chart to see which month and year had the highest sales amount.

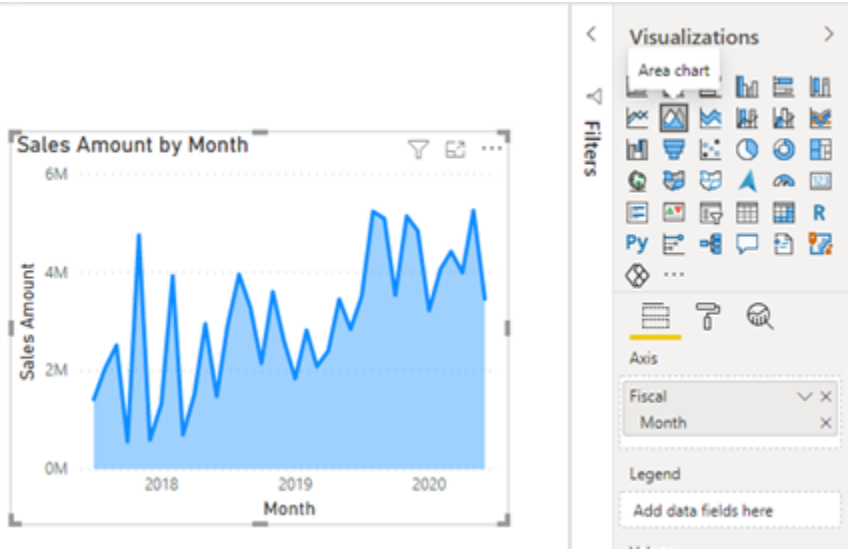
1. From the Fields pane, drag the Sales Amount field from the Sales table to a blank area on the report canvas. By default, Power BI displays a column chart with one column, Sales Amount.
2. Drag the Month field from the Fiscal hierarchy in the Date table and drop it on the column chart.



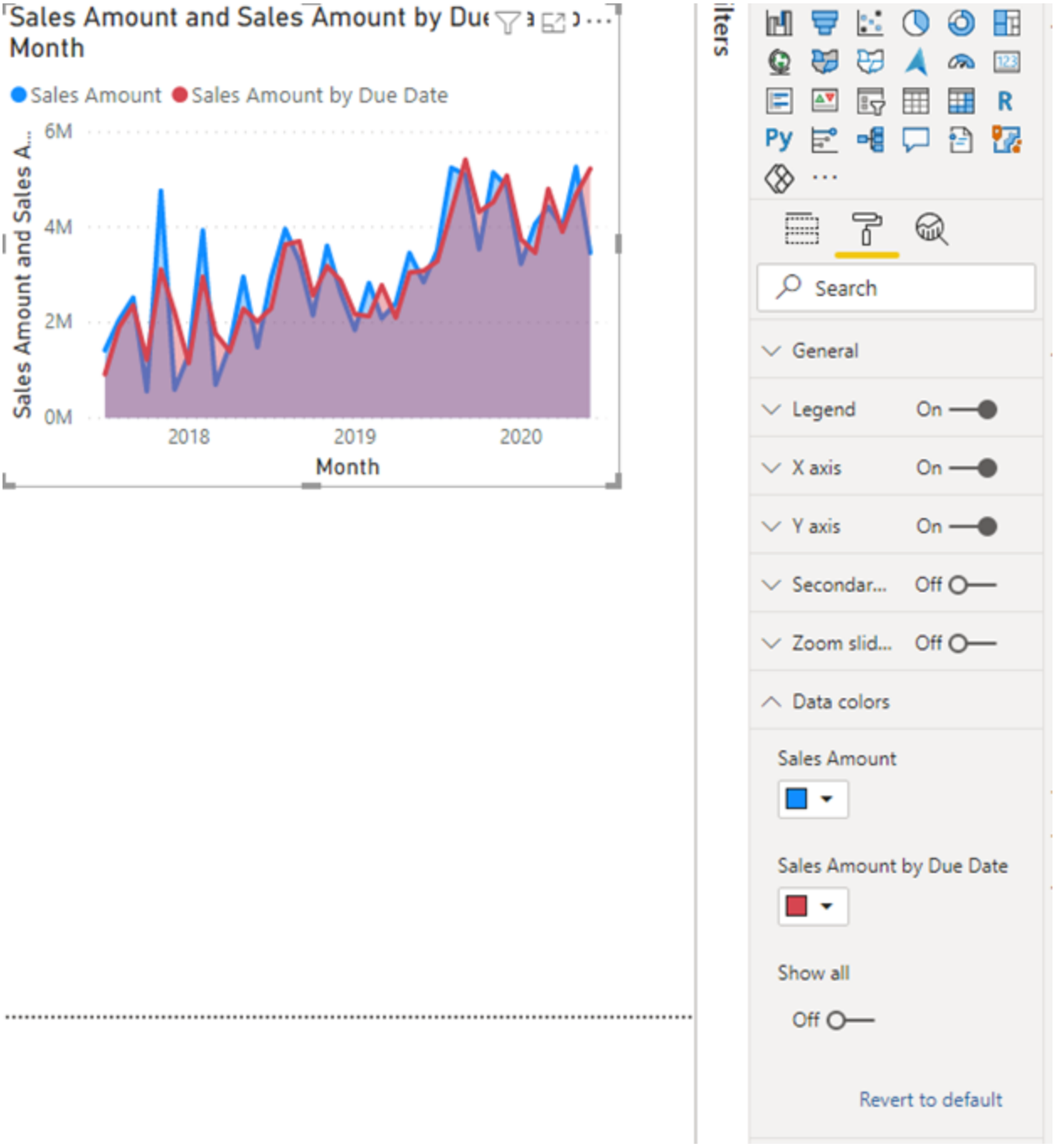


3. In the Fields section of the Visualizations pane, remove the Year and Quarter fields:

4. In the Visualizations pane, change the visualization type to Area Chart.



5. If you added the DAX measure in the extra credit above, add it to Values as well.
6. Open the Format pane, open Data colors and change the color of Sales Amount by Due Date to a more contrasting color, such as red.

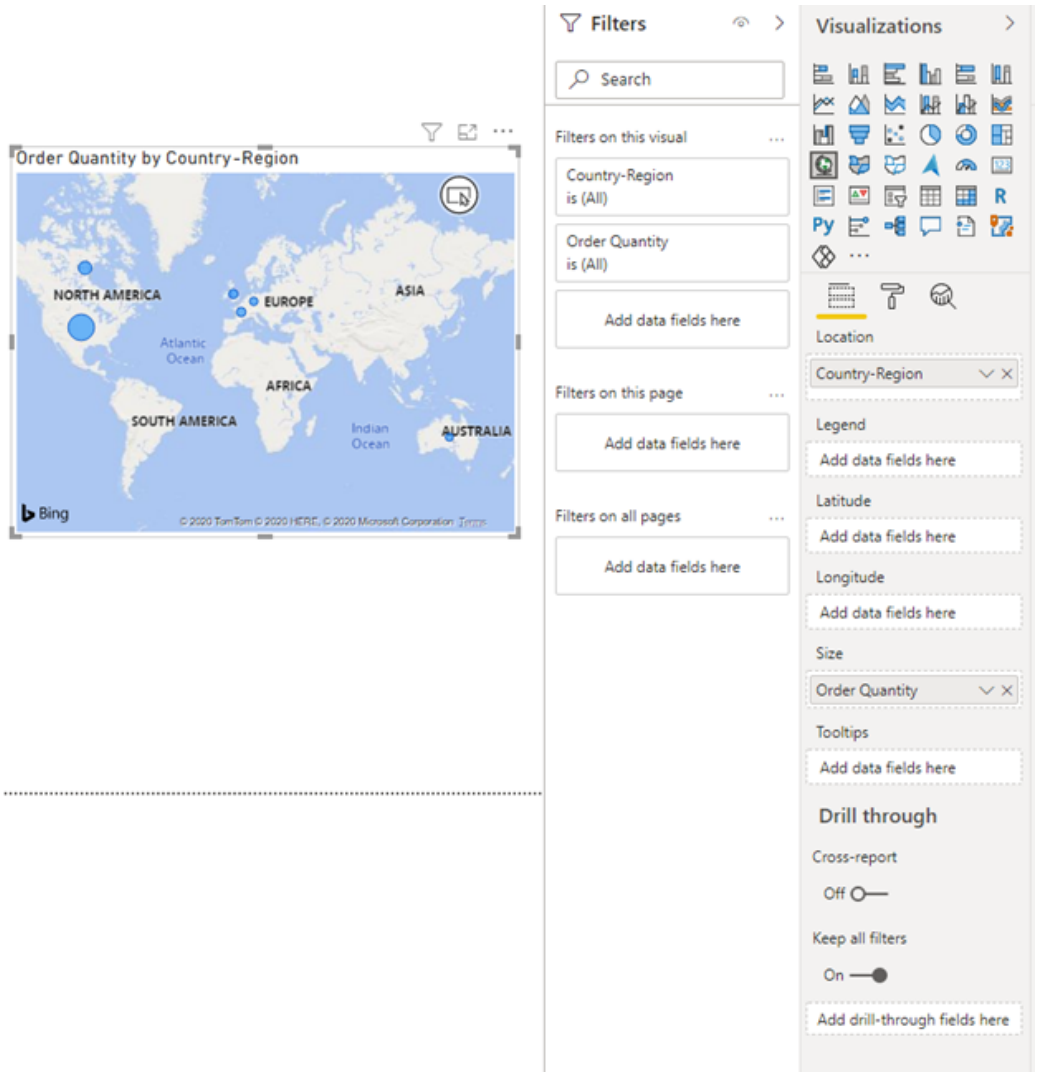


As you can see, Sales Amount by Due Date trails slightly behind Sales Amount. This proves that it uses the relationship between the Sales and Date tables that uses DueDateKey.

Visual 3: Order Quantity by Reseller Country

Now we'll create a map to see in which Country the Resellers have the highest Order Quantity Amount.

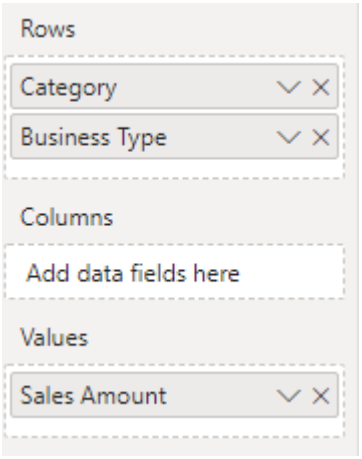
1. From the Fields pane, drag the Country-Region field from the Reseller table to a blank area on your report canvas. Power BI creates a map.
2. Drag the Order Quantity field from the Sales table and drop it on the map. Make sure Country-Region is in the Location well and Order Quantity in the Size well.



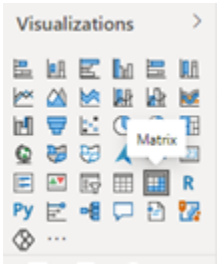
Visual 4: Sales Amount by Product Category and Reseller Business type

Next we create a column chart to investigate which products are sold by what type of reseller business.

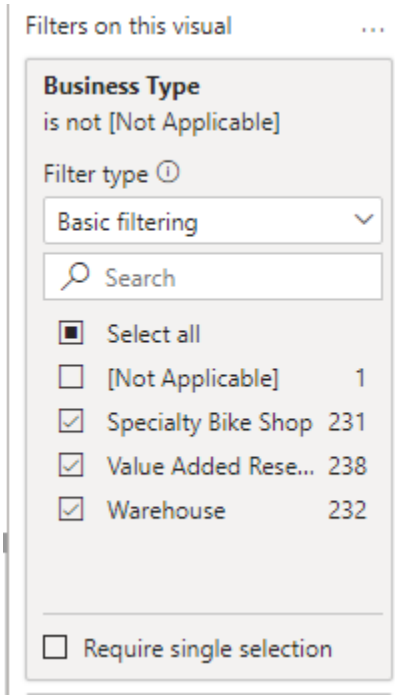
1. Drag the two charts you've created to be side by side in the top half of the canvas. Save some room on the left side of the canvas.
2. Select a blank area in the lower half of your report canvas.
3. In the Fields pane, select Sales Amount from Sales, Product Category from Product, and Business Type from Reseller.



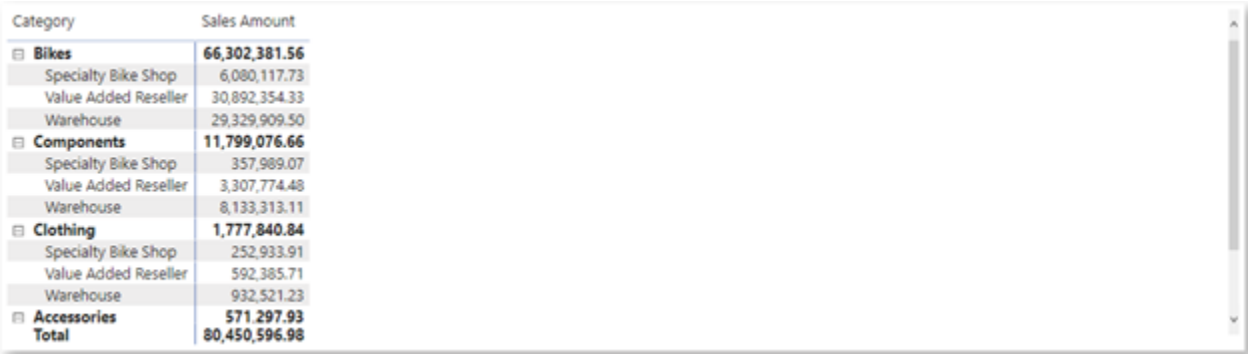
Power BI automatically creates a clustered column chart. Change the visualization to a Matrix:



4. With the matrix still selected, in the Filters pane, under Business Type, Select all, then clear the [Not Applicable] box.



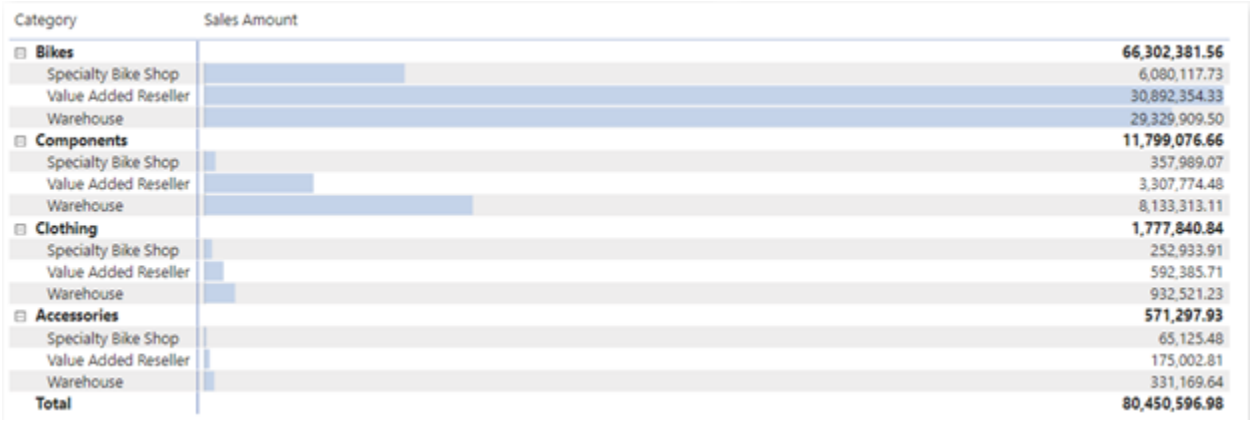
5. Drag the matrix so it's wide enough to fill the space under the two upper charts.



Category	Sales Amount
Bikes	**66,302,381.56**
Specialty Bike Shop	6,080,117.73
Value Added Reseller	30,892,354.33
Warehouse	29,329,909.50
Components	**11,799,076.66**
Specialty Bike Shop	357,989.07
Value Added Reseller	3,307,774.48
Warehouse	8,133,313.11
Clothing	**1,777,840.84**
Specialty Bike Shop	252,933.91
Value Added Reseller	592,385.71
Warehouse	932,521.23
Accessories	**571,297.93**
Total	**80,450,596.98**

6. In the Formatting pane for the matrix, open the Conditional formatting section and turn on Data bars. Select Advanced controls and set a lighter color for the positive bar. Select OK.

7. Increase the width of the Sales Amount column so it covers the whole area by dragging the matrix.



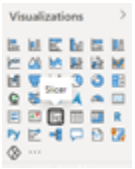
Category	Sales Amount
Bikes	**66,302,381.56**
Specialty Bike Shop	6,080,117.73
Value Added Reseller	30,892,354.33
Warehouse	29,329,909.50
Components	**11,799,076.66**
Specialty Bike Shop	357,989.07
Value Added Reseller	3,307,774.48
Warehouse	8,133,313.11
Clothing	**1,777,840.84**
Specialty Bike Shop	252,933.91
Value Added Reseller	592,385.71
Warehouse	932,521.23
Accessories	**571,297.93**
Specialty Bike Shop	65,125.48
Value Added Reseller	175,002.81
Warehouse	331,169.64
Total	**80,450,596.98**

It looks like Bikes have a higher Sales Amount overall and the Value Added Resellers sell the most, closely followed by Warehouses. For Components, the Warehouses sell more than the Value Added Resellers.

Visual 5: Fiscal calendar slicer

Slicers are a valuable tool for filtering the visuals on a report page to a specific selection. In this case, we can create a slicer to narrow in on performance for each month, quarter, and year.

1. In the Fields pane, select the Fiscal hierarchy from the Date table and drag it to the blank area on the left of the canvas.
2. In the Visualizations pane, choose Slicer.



3. In the Fields section of the Visualizations pane, remove Quarter and Date so only Year and Month are left.

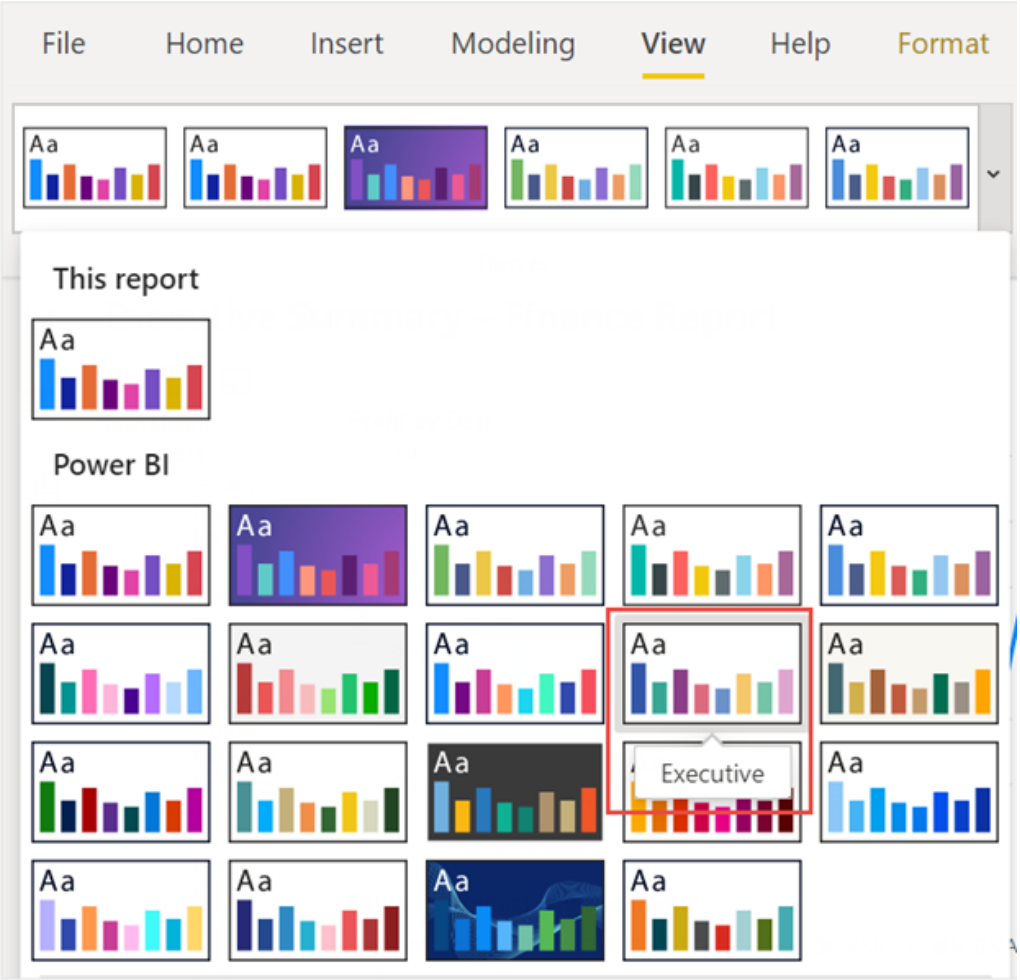
Now if your manager asks to see data only for a specific month, you can use the slicer to switch between years or specific months in each year.

Format the report

If you want to do some light formatting on this report to add more polish, here are a few easy steps.

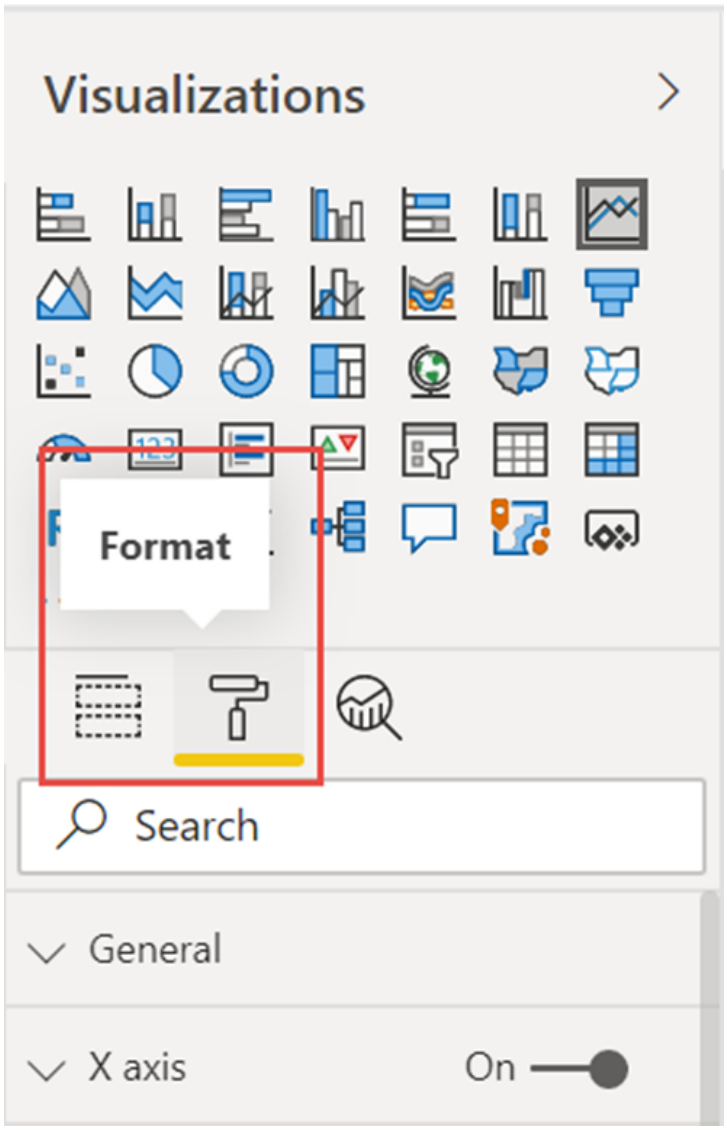
Theme

- On the View ribbon, select Themes, and change the theme to Executive.



Spruce up the visuals

Make the following changes on the Format tab in the Visualizations pane.



Visual 2, Sales Amount by Date

1. Select Visual 2, Sales Amount by Date.
2. In the Title section, if you didn't add the DAX measure, change Title text to "Sales Amount by Order Date".
   If you did add the DAX measure, change Title text to "Sales Amount by Order Date / Due Date".
3. Set Text size to 16 pt.
4. Toggle Shadow to On.

Visual 3, Order Quantity by Reseller Country

1. Select Visual 3, Order Quantity by Reseller Country.
2. In the Map styles section, change Theme to Grayscale.
3. In the Title section, change Title text to "Order Quantity by Reseller Country".
4. Set Text size to 16 pt.
5. Toggle Shadow to On.

Visual 4, Sales Amount by Product Category and Reseller Business Type

1. Select Visual 4, Sales Amount by Product Category and Reseller Business Type.
2. In the Title section, change Title text to "Sales Amount by Product Category and Reseller Business Type".
3. Set Text size to 16 pt.
4. Toggle Shadow to On.

Visual 5, Fiscal calendar slicer

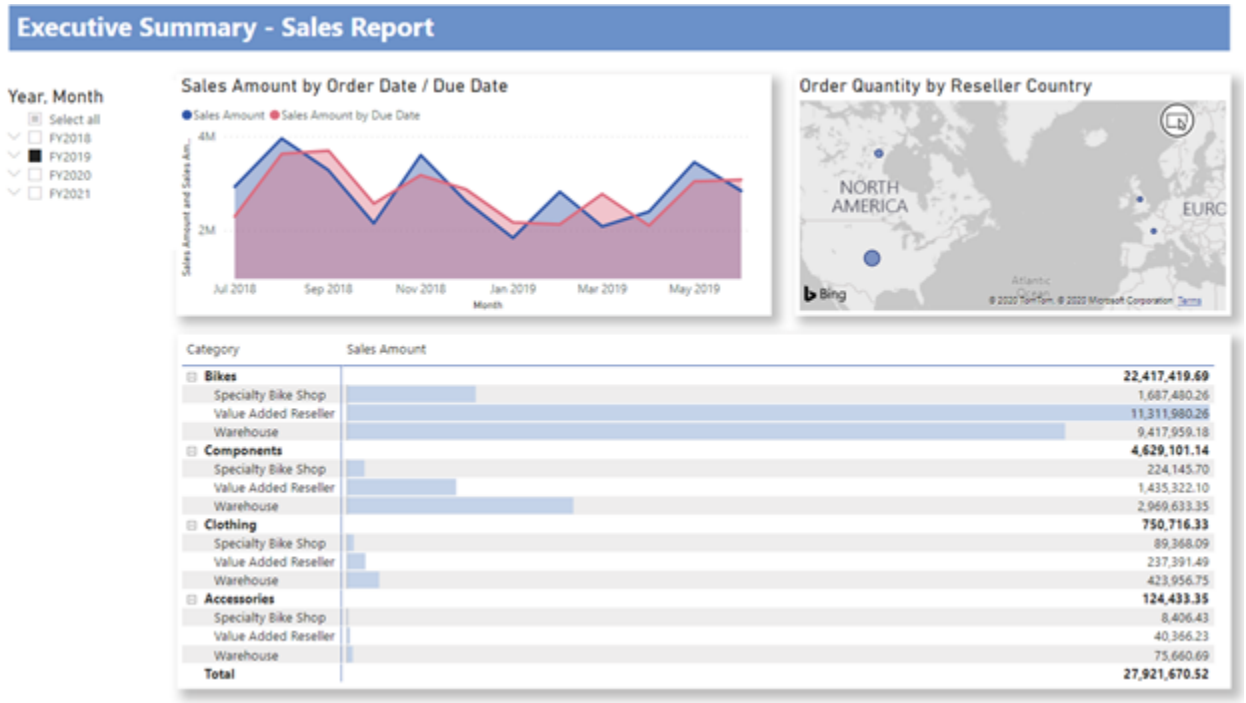
1. Select Visual 5, Fiscal calendar slicer.
2. In the Selection controls section, toggle Show "Select all" option to On.
3. In the Slicer header section, set Text size to 16 pt.

Add a background shape for the title

1. On the Insert ribbon, select Shapes > Rectangle.
2. Place it at the top of the page, and stretch it to be the width of the page and height of the title.
3. In the Format shape pane, in the Line section, change Transparency to 100%.
4. In the Fill section, change Fill color to Theme color 5 #6B91C9 (blue).
5. On the Format tab, select Send backward > Send to back.
6. Select the text in Visual 1, the title, and change Font color to White.

Finished report

Select FY2019 in the slicer.



In summary, this report answers your manager's top questions:

- Which day had the most sales in February 2019? February 25, with a sales amount of $253,915.47.
- Which country is the company seeing the most success in? In the United States, with an order quantity of 132,748.
- Which product category and reseller business types should the company continue to invest in? The company should continue to invest in the Bikes category and the Value Added Reseller and Warehouse reseller businesses.

Save your report

- On the File menu, select Save.