

Business Intelligence Intermediate

Xccelerate - Data Science Immersive

Agenda

BI week 1 Revision

- > BI Foundation
- > Excel

BI week 2 - Unit 1

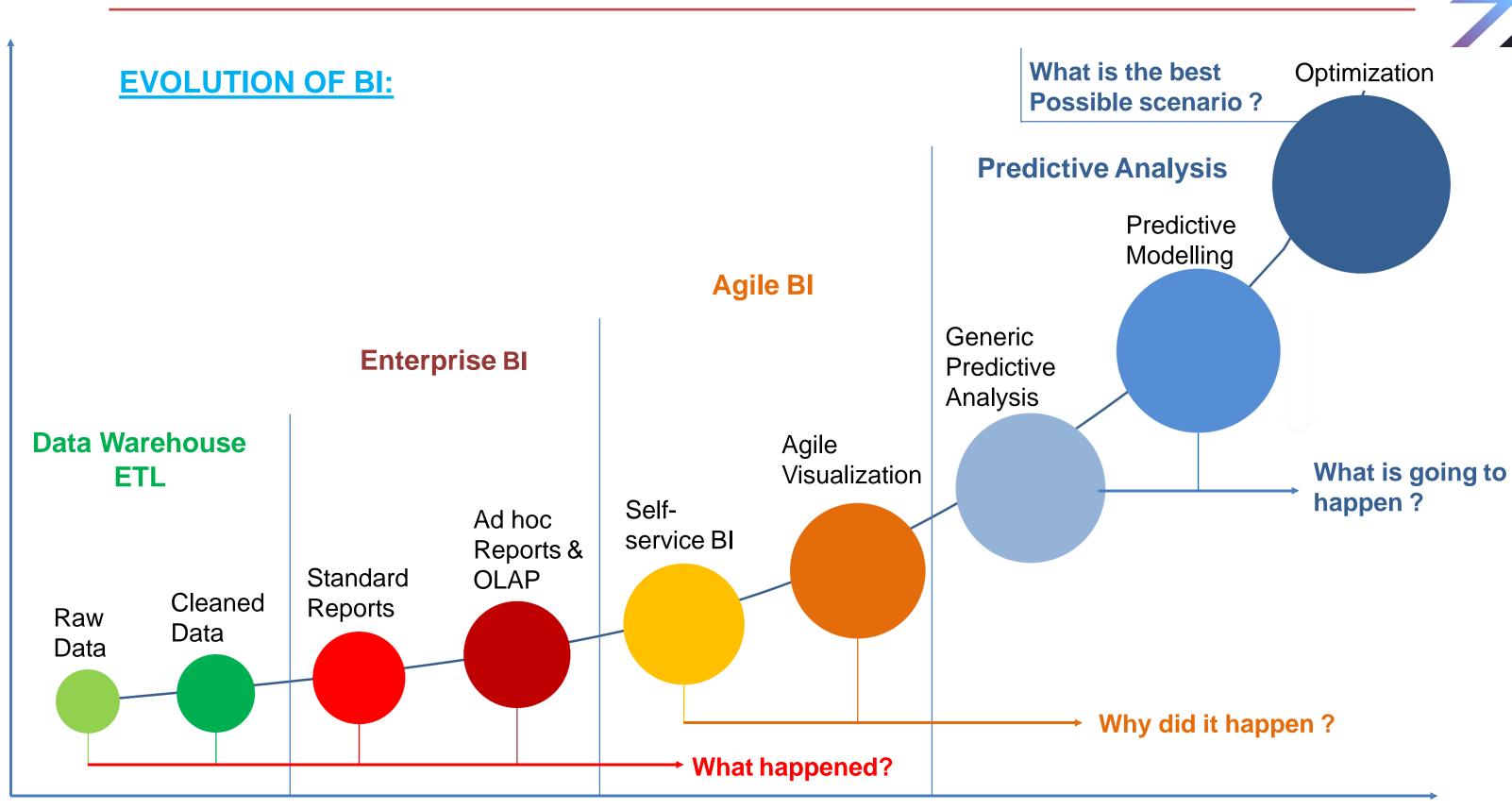
- > Tableau Interface
- Walkthrough exercises

WHAT IS BI?

- Business Intelligence is an umbrella term for a set of:
- methods,
- processes,
- technologies, and
- Tools

That helps Organizations to convert data into information, information into knowledge, and knowledge into plans of action that drives the organization for its improvement

 Technologies for gathering, storing, analyzing and providing access to data to help enterprise users make better business decisions.





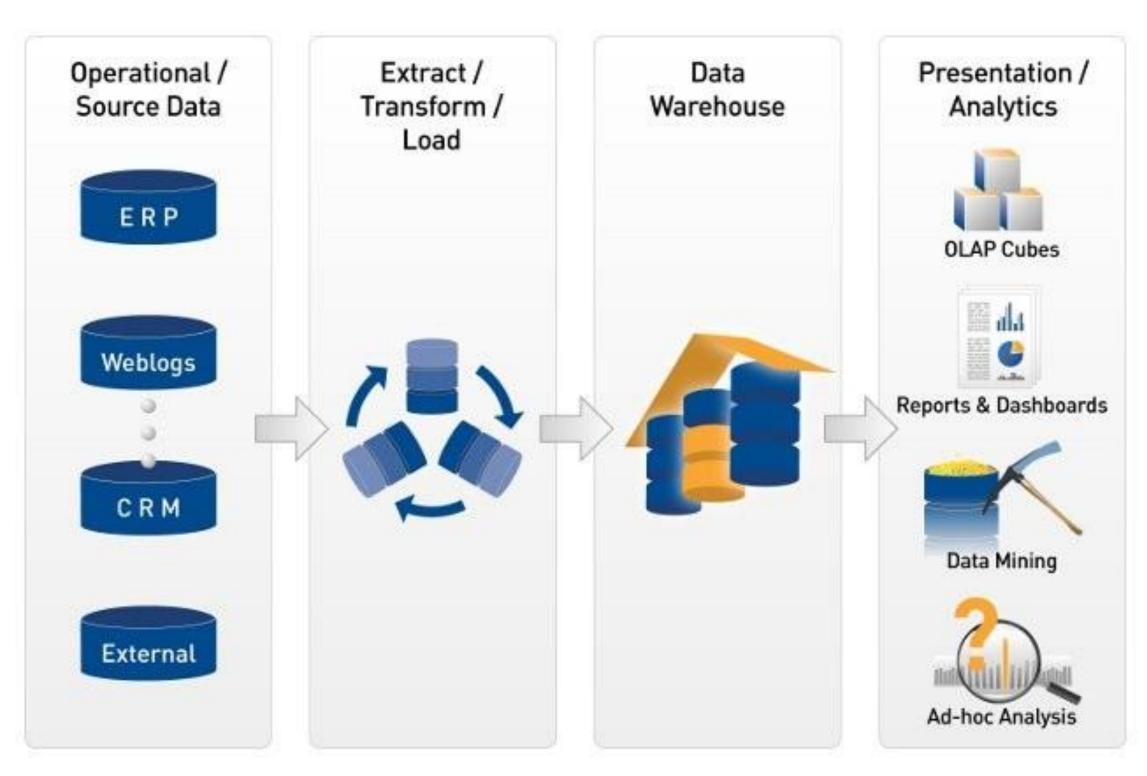
WHY USING BI?

The results of BI give both employees and managers the power to:

- accelerate and improve decision-making
- increase operational efficiency
- pinpoint new revenue potentials,
- identify market trends,
- report genuine KPIs and
- identify new business opportunities.



COMPONENTS OF A BI SOLUTION:





BI - ANALYSIS TECHNIQUES

- Data mining- exploring a large amount of data and finding useful patterns.
- **Process mining** relates data to process analysis and help in improving business process management.
- Complex event Processing- to find meaningful events and responding them quickly. An event may be a post, text messages, reports or any kind of data.
- Descriptive Analysis- To describe the events that already has happened.
- Predictive Analysis- Predicting future outcomes and trends
- Reporting- Ad hoc and real-time.
- Online Analytical Processing (OLAP)-multi-dimensional analysis of business data.
- Text analytics/text mining-deriving information from text.



BI TOOLS:

- Business intelligence (BI) tools are types of application software that collect and process large amounts of unstructured data from internal and external systems.
- **BI** tools provide a way of amassing data to find information primarily through queries. These tools also help prepare data for analysis so that you can create reports, dashboards and data visualisations.
- Reports
- Data Visualization
- Dashboards



BI AND DATA SCIENCE:

	Business Intelligence	Data Science
Data analysis	Yes	Yes
Statistics	Yes	Yes
Visualization	Yes	Yes
Data Sources	Usually SQL, often Data Warehouse	Less Structured (logs, cloud data, SQL, noSQL, text)
Tools	Statistics, Visualization	Statistics, Machine Learning, Graph Analysis, NLP
Focus	Mainly Present and Past, can be Future	Future
Method	Analytic: KPIs / Report / Visualizations	Scientific: Answer / Self-learned
Applicability	Historic, possible confounding factors	Future, correcting for influences

The two fields are closely related. In some ways, Data Science is an evolution of BI

Advanced functionality

Better Strategic decisions

Goal



BI WEEK 2

Tableau Data visualization Data Analysis

Goals of this week:

- Get a good understanding of TABLEAU Public
- Build visualizations to answer specific business-related questions
- Enhance your knowledge of Data Cleaning / Interpretation
- Perform Data Analytics with clean Data
- Work on your soft skills by presenting your findings/key insights

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BI WEEK 2

UNIT 1:

- > Tableau Presentation
- Tableau Interface Overview
- > Tableau Functionalities
- Walkthrough Exercises

Tableau in a nutshell





Let's start with a quick revision of what we have learned on TABLEAU

- Software company headquartered in Seattle, Washington, US that produces Data Visualization products focused on Business Intelligence.
- Tableau is primarily a drag-and-drop software
- Tableau products query relational databases,
 OLAP cubes, cloud databases and spreadsheets
 to generate a number of interactive visualizations.

Why use Tableau?

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- Rapid results to useful information
- Easy to use for all skill levels
- Can connect to variety of data sources, including:

Local files - Excel, text, Access, CSV, JSON, etc.

Traditional databases - SQL Server, MySQL, Oracle, Postgre SQL, etc.

Cloud technologies - Amazon Aurora, EMR, Redshift, BigQuery

Big Data Technologies - Hadoop, Hive, SparkSQL

- Can create a variety of visualizations, including:
- Basic bar and line charts (temporal, box plot, etc.)
- Geospatial analysis
- Word clouds
- Treemaps
- Network analysis, etc.

These visualizations can be combined into interactive dashboards and stories.

- Can be shared easily within an Organization or published online.

Why use Tableau?

4

- Fastest growing market share in the industry
- Six years a Leader in the Gartner Magic Quadrant for Analytics and Business Intelligence



VIZQL - Rapid Views Of Data



Tableau uses a visual query language - VIZQL

- Simple drag-and-drop operations to create sophisticated analyses and visualizations
- VizQL combines query, analysis and visualization into a single framework
- Allows for rapid switching from one visualization type to another
- Built-in Query Analyzer compiles VizQL expressions automatically to SQL or MDX as needed
- Allows for VizQL to be used against almost any data source

Note: MDX (Multidimensional Expressions) is a Query language for OLAP data bases.

Tableau Architecture and Product Suite

TABLEAU ARCHITECTURE:

End user/Clients tools: Creation Tool: Storage and Mobile • Tableau Desktop Personal or publishing tool: **Tablets Professional** • Tableau Server Web browsers → Create sheets/dashboards/ → On-premise server stories/visualizations (installed at the data center of the client) Or **iPad** → Online server/cloud based, provided by Tableau company mobile Safari (license based) Android Tableau Desktop Tableau Server

Tableau Architecture and Product Suite

TABLEAU INTERNAL ARCHITECTURE:

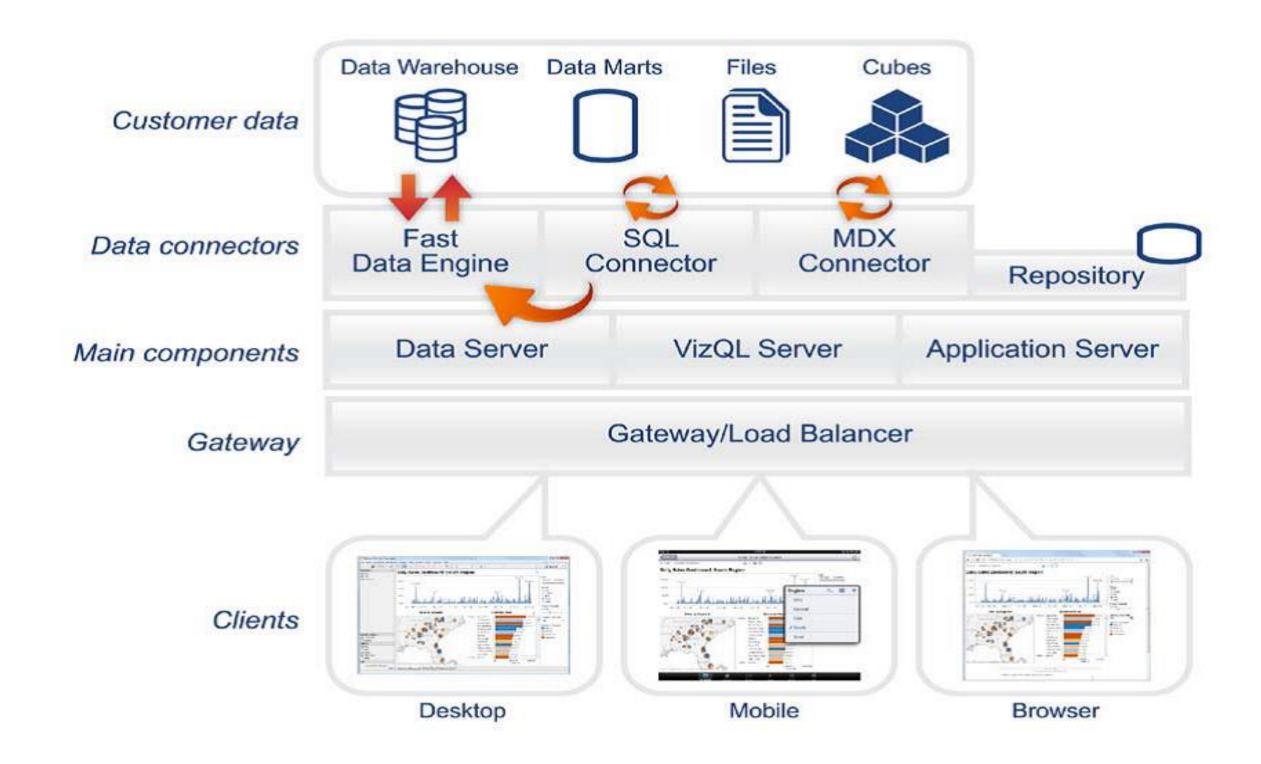


Tableau Architecture and Product Suite



TABLEAU PRODUCTS SUITE:



Tableau Desktop (Professional/Personal)

- Local client for creating visualizations/dashboards/ storylines
- -Enterprise or Personal version
- No ability to connect to Tableau Server for personal version



Tableau Mobile

- Local client for visualizing and/or creating visualizations/dashboards/ storylines
- Connect to Tableau Server or Tableau Online



Tableau Online

- Cloud version of the Tableau Server
- Eliminates the cost of infrastructure
- License based on per user
- Fully hosted by Tableau Organization



Organizations

Tableau Server Share & Create for Organizations

Tableau Server

- Privately managed
 On-Premises or Public Cloud
- License based on Named User or Core licensing



Tableau Public Create for Anyone

Tableau Public

- Non commercial cloud version of the Tableau Server
- All data published is public
- Free version



Tableau Viewer
Share
for Anyone

Tableau Viewer

- Local desktop client to view only
- -No capability to modify the workbook
- -Allows any user to open and interact with your visualizations and dashboards

TABLEAU Architecture and Product Suite



TABLEAU PRODUCTS SUITE:

2018 Product Release:

- Tableau Data Prep
- → released in May 2018
- → For data preparation workflow
- → Combine,, shape and clean your data for analysis

2018 Acquisition:

- In June 2018, Acquisition of Empirical Systems
- → a Cambridge, Massachusetts based Artificial Intelligence startup.

The Goal: Integrate the startup technology into the Tableau platform

Build visualizations in a few clicks

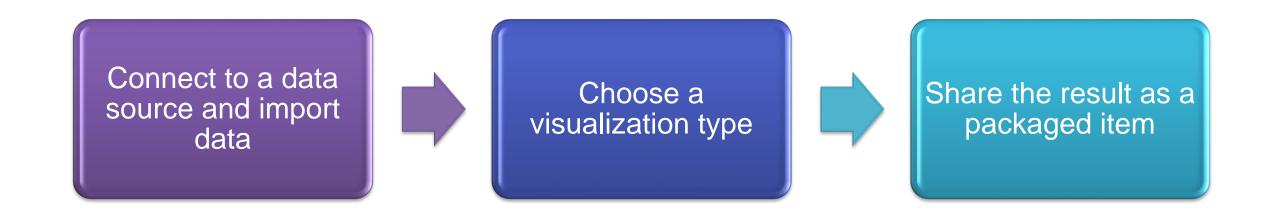




Tableau Public – Interface Overview

Choose a connection or existing worksheet

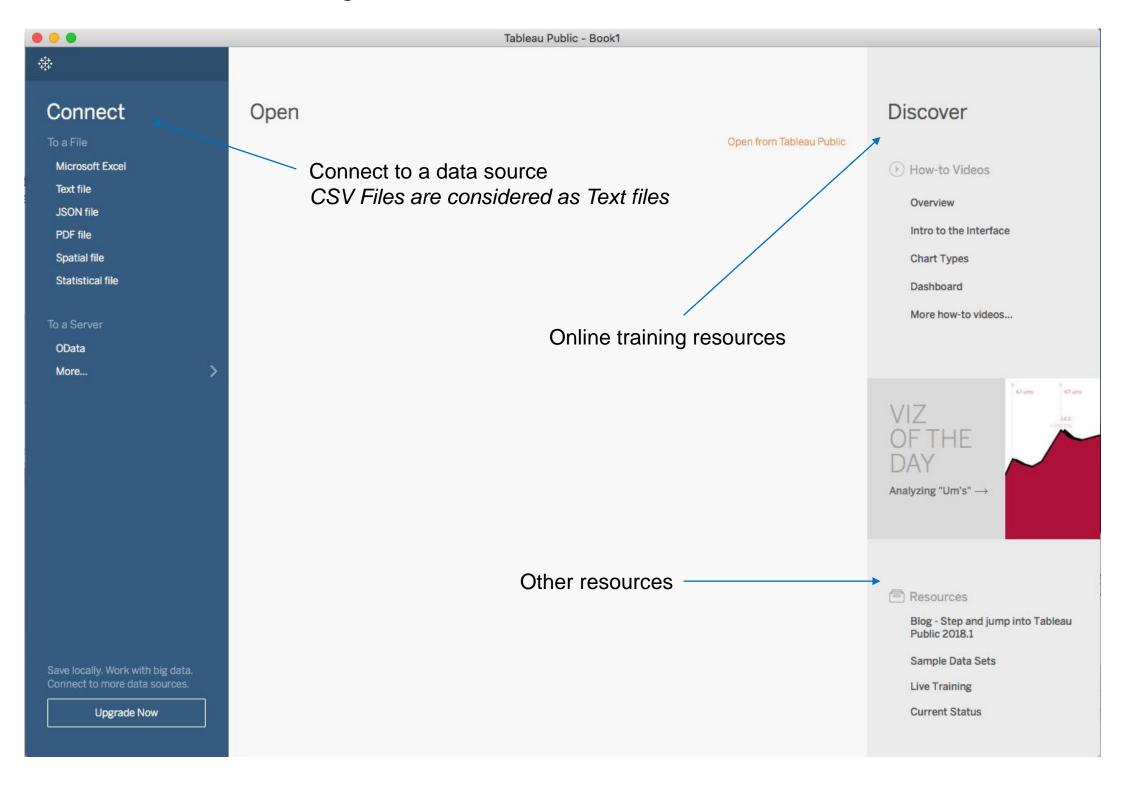
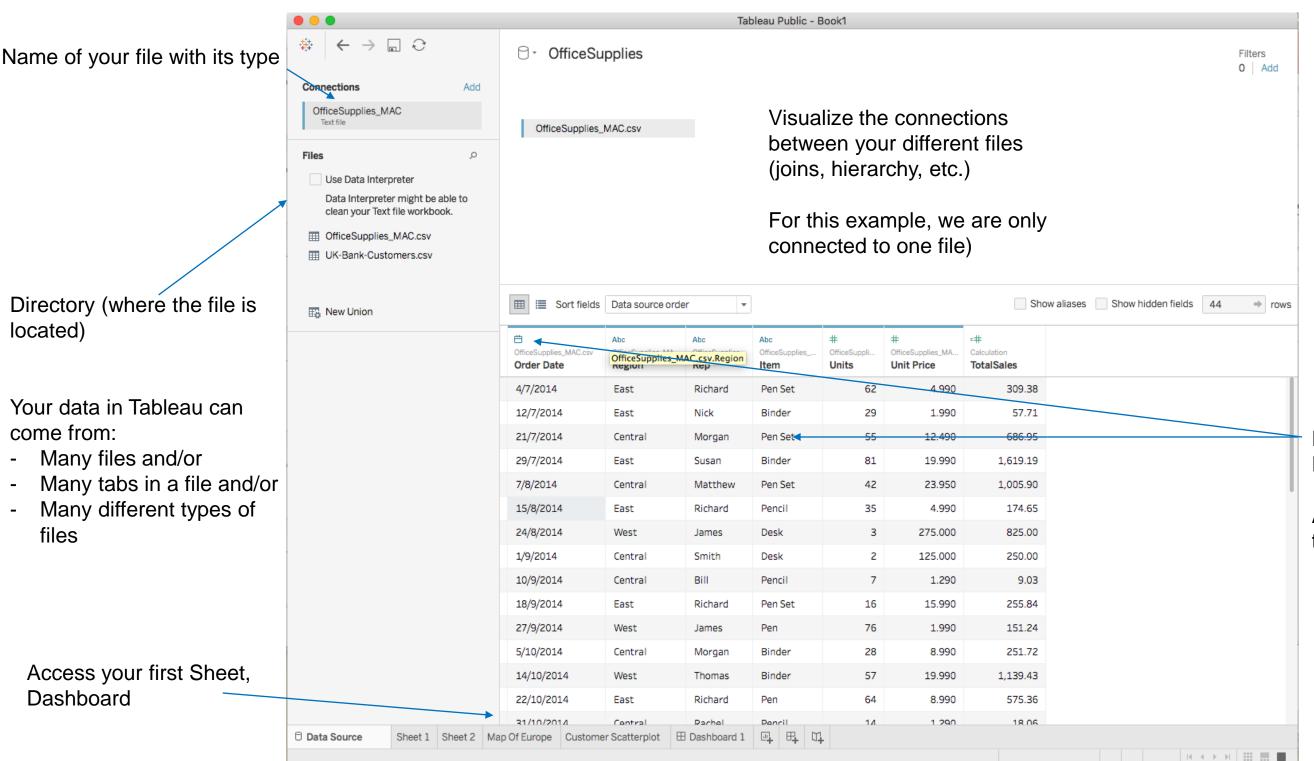


Tableau Public - Connection Manager

- Connection Manager for this data source (here a CSV file)
- Data can be added, changed, and connected through this Connection Manager Window



Preview of your file.
Rows and columns of your file

Automatic identification of your data types (dates, Text, numerical...)

Tableau Public - Connection Manager

Format Meta Data

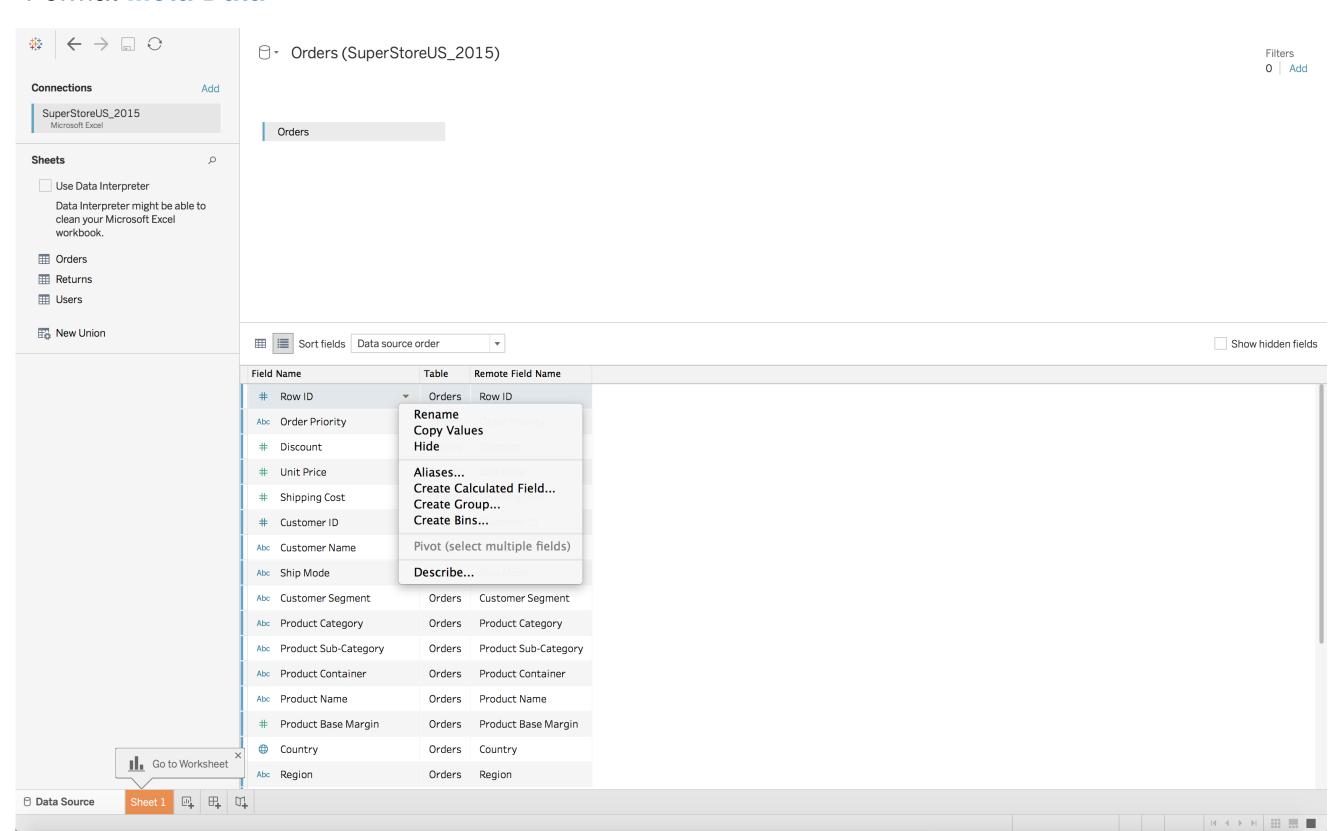
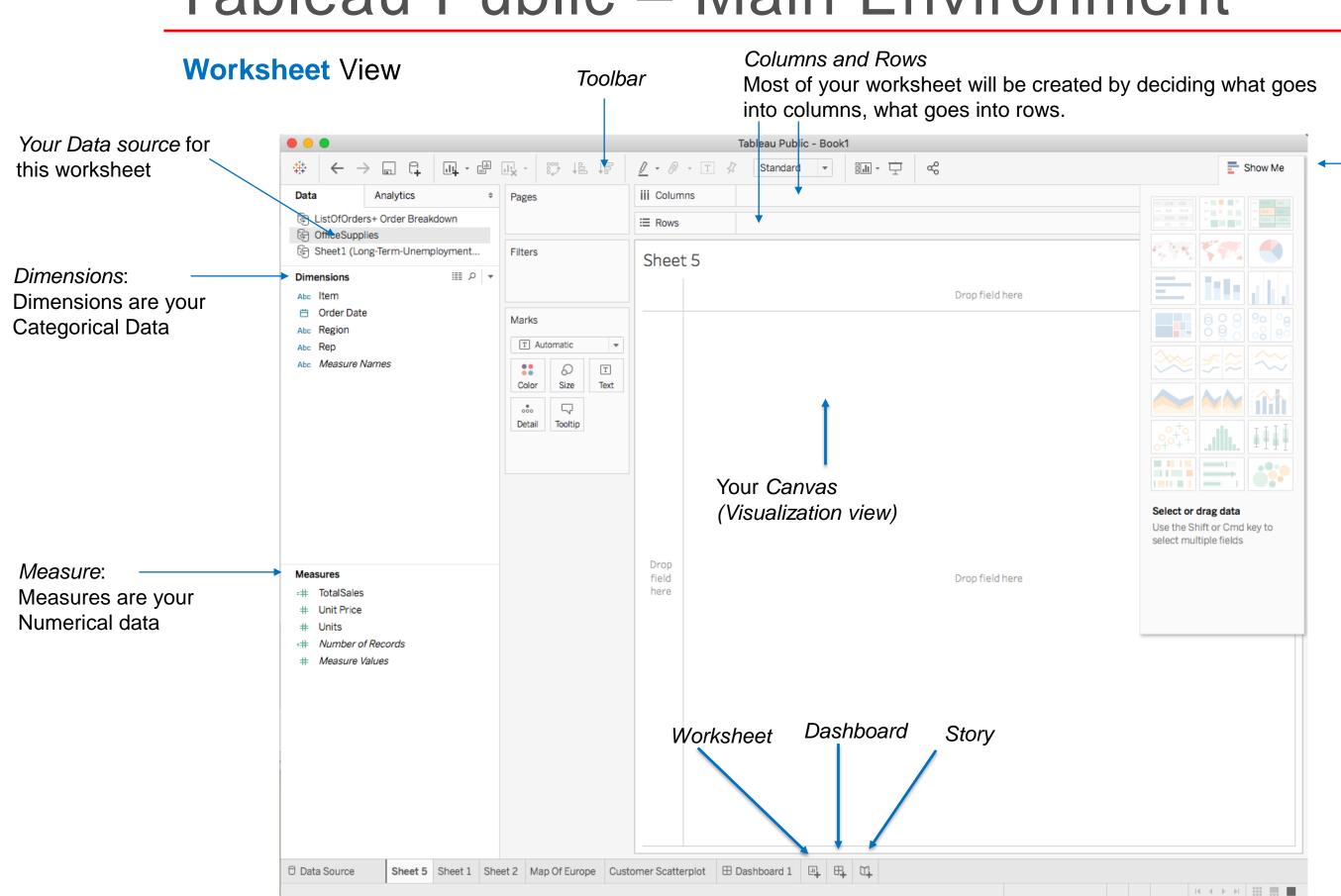


Tableau Public - Main Environment



Type of Charts/Graphs

Tableau Public – Main Environment

Worksheet View: Tableau Taxonomy

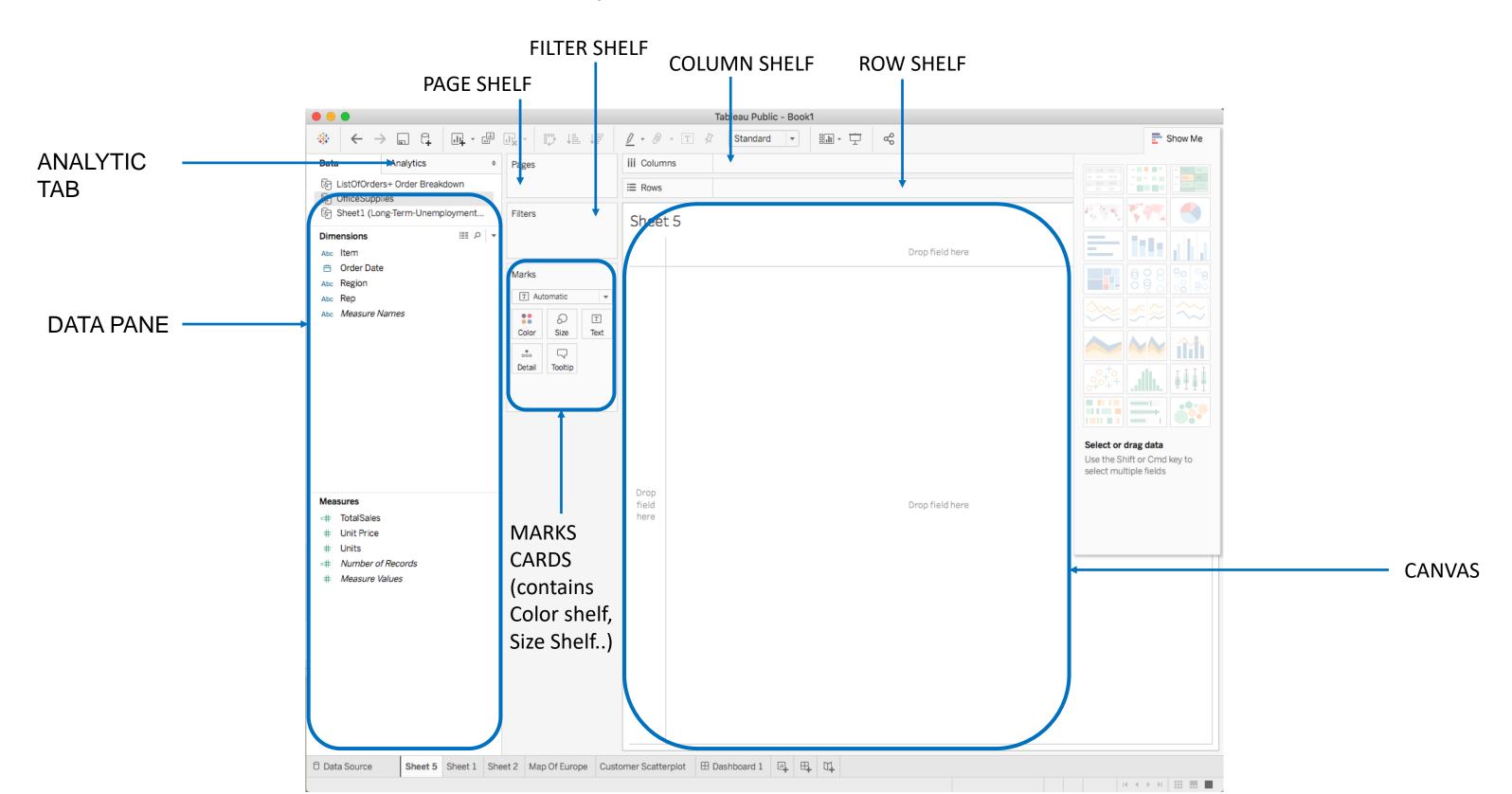


Tableau Public - Main Environment



Change between **Data source**, **Worksheets**, **Dashboards** and **Story** using the tab at the bottom.

Use **Show Me** to help you create different Charts and Graphs.

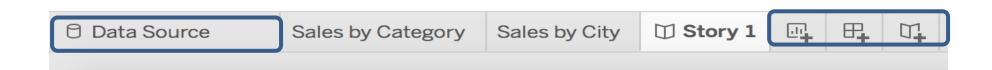




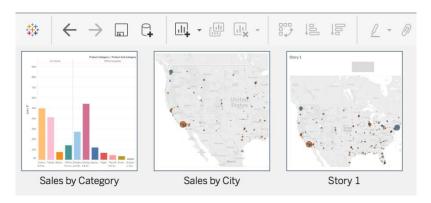
Tableau Public – Main Environment



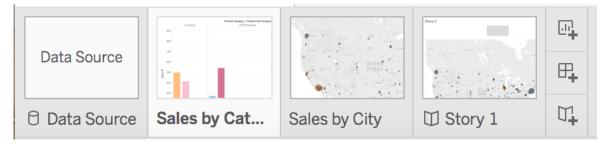
Change between views quickly (bottom right):



- Sheet Sorter



- Film Strip



- Tabs



Tableau Public – Particularities



About Workbook and Worksheets:

- Each workbook can contain worksheet and dashboards
- Worksheet is where you build visualizations based on your data, by dragging and dropping fields into shelves and cards
- A dashboard is a consolidated display of many worksheets and related information in a single place. It is used to compare and monitor a variety of data simultaneously. The different data views are displayed all at once.
- A story is a sequence of visualizations that work together to convey information. You can create stories to tell a data narrative, provide context, demonstrate how decisions relate to outcomes, or to simply make a compelling case.

Tableau Public – Particularities

Data Roles in Tableau:

Tableau divides the data in two main types: dimensions and measures.

<u>Dimensions</u> are usually those fields that cannot be aggregated (Qualitative, Categorical variables)

Measures, as its name suggests, are those fields that can be measured, aggregated, or used for mathematical operations.

Dimension fields are usually used for row or column headings; measures are usually used for plotting or giving values to the sizes of markers.

When you import the data for the first time, Tableau determines whether to consider a field as a dimension or a measure. This determination involves considering fields with all text (nominal or other text) values and fields with numeric values.

- Dimensions examples: Gender: Male & Female / Region / Marital Status
- Measures examples: Age / Income / Credit score

Dimensions are represented in blue in Tableau, whereas Measures are represented in green.

Tableau Public – Particularities

Data Types in Tableau:

Icon	Data type
Abc	Text (string) values
	Date values
₽	Date & Time values
#	Numerical values
T F	Boolean values (relational only)
⊕	Geographic values (used with maps)
<u>@*</u>	Cluster Group

- Sometimes Tableau may misidentify a data type (ex: a field that contains a date may be identified as an integer rather than a date)
- To change the data type in Tableau, right-click the field in the Data Pane, select Change Data Type, and then select the appropriate data type.

Tableau Worksheet Example

Add measures and dimensions to your shelves and cards to create your visualization

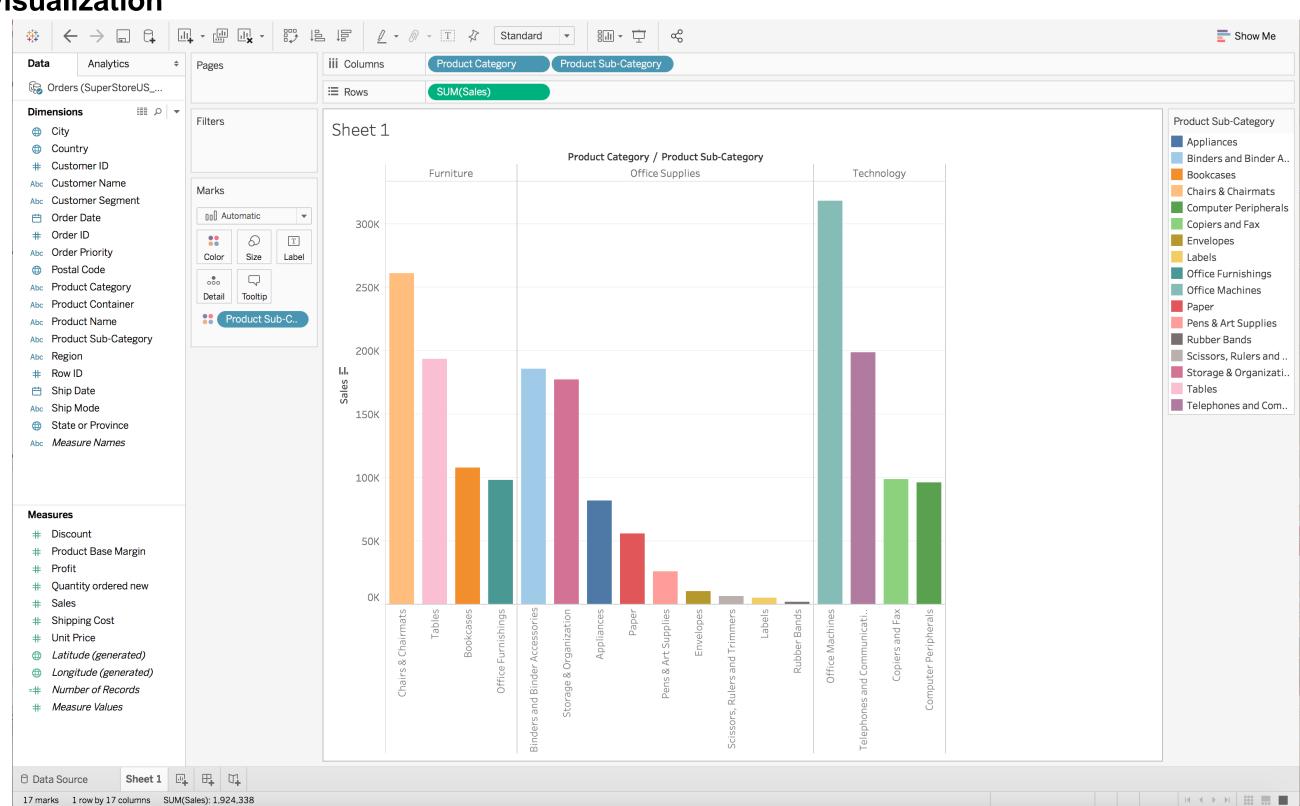


Tableau Dashboard Example

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Use the Dashboard TAB to organize multiple worksheets together

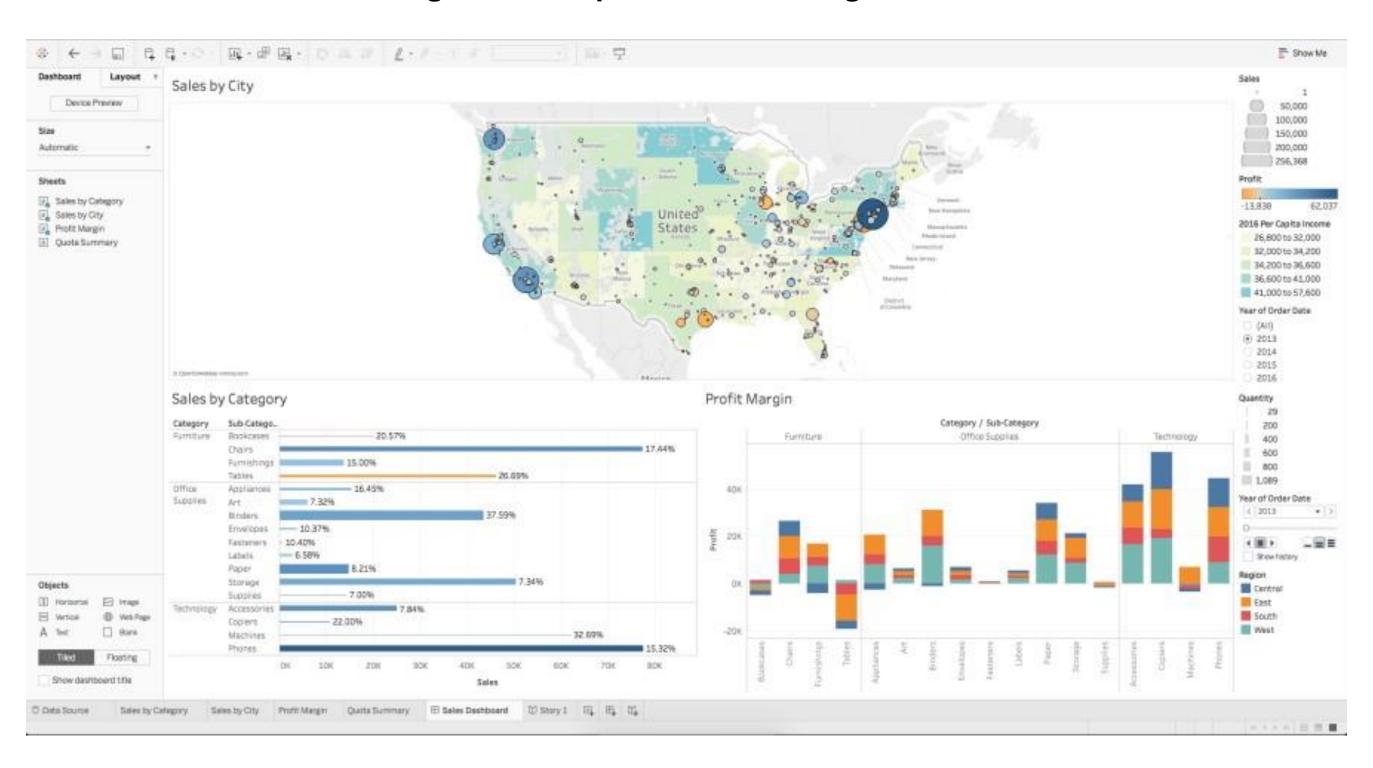


Tableau StoryBoard Example

Use Story Board to present a unified view of your analysis.

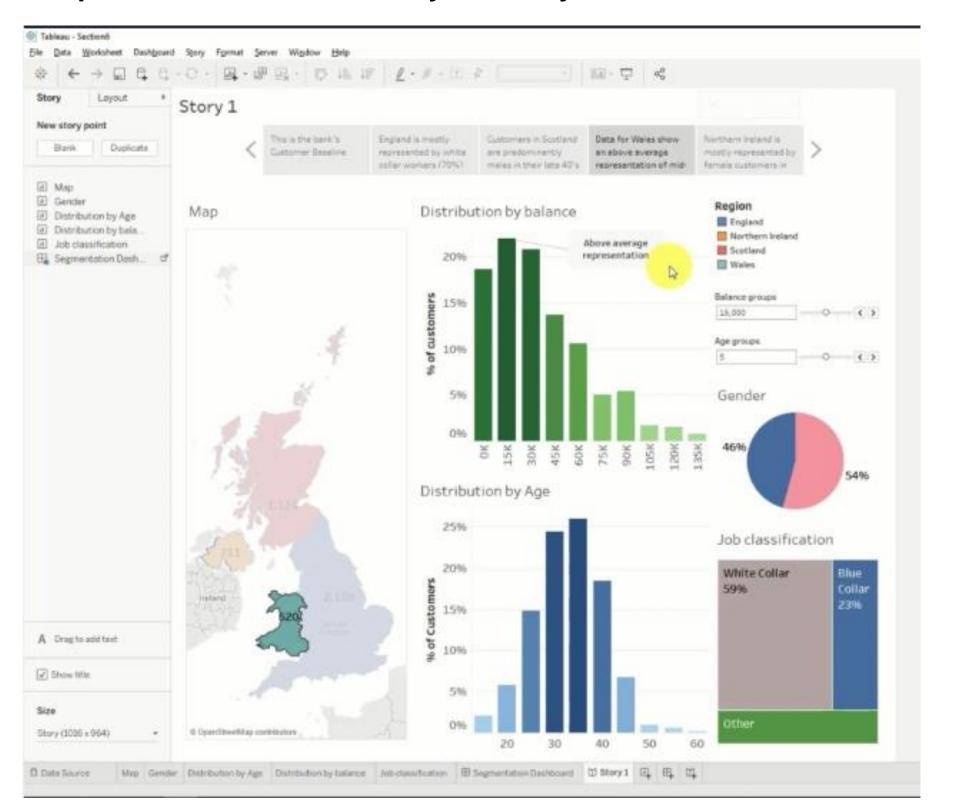


Tableau Desktop- File types:



Tableau File types and use cases:

Workbook (.twb): Workbooks hold worksheets, dashboards and stories.

Bookmark (.tbm): Bookmarks contain a single sheet and are an easy way to share your work.

Packaged workbook (.twbx): Archive containing a workbook along with all data sources and files. Best way to share your work with those who don't have access to the data.

Data extract files (.tde): Local copy of a subset or entire data source that you can use to share data, work offline and improve database performance.

Data source files(.tds): Shortcut for quickly connecting to data sources that you use often.

Packaged data source (.tdsx): Archive containing a data source file along with any related files.

To know more about File types along with their proper use cases, you can check the following link: https://www.concentra.co.uk/blog/quick-guide-tableau-file-types-features-and-use-cases

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Tableau Public - Walkthrough Exercises





Now that we have an understanding of the Tableau Interface, let's practice and create our first visualizations and analysis.

Walkthrough Exercises:

Exercise 1:

Let's Create our First Bar Chart!!

Agenda:

- Connecting Tableau to a Data File CSV
- Navigating Tableau Public Interface
- Creating Calculated Fields
- Adding Colors
- Adding labels and formatting

Walkthrough Exercises



Exercise 1:

Connect Tableau to the following data source provided by your instructor: Bl_Intermediate_Unit1_Ex1_Sales-Performance.csv

Question:

It's end of financial year so this means time for annual bonuses!

Our store operates in 3 regions and only the top performing employee of each region qualifies for a bonus.

Find out which three employees are eligible to get a bonus for this year.

Employees performances are measured on total value of sales (\$). Hint: Create a calculated field (Units*Unit Price)

What are Calculated Fields?

- Calculated Fields:
- → Custom variables that you create from fields provided in the data
- → When your data source doesn't contain all the fields you need, add new ones as calculated fields
- → This saves them as part of the data source
- → Create calculated fields by using the calculation editor or by double clicking a field on a shelf
- Formulas make up calculated fields
- → Formulas can contain Functions, Fields, Operators, Parameters, or Comments
- → Calculation editor provides color coding based on the field added

- Functions: Light Blue

- Fields: Orange

- Operators: Black

- Parameters: Purple

- Comments: Green

Formatting Visualizations

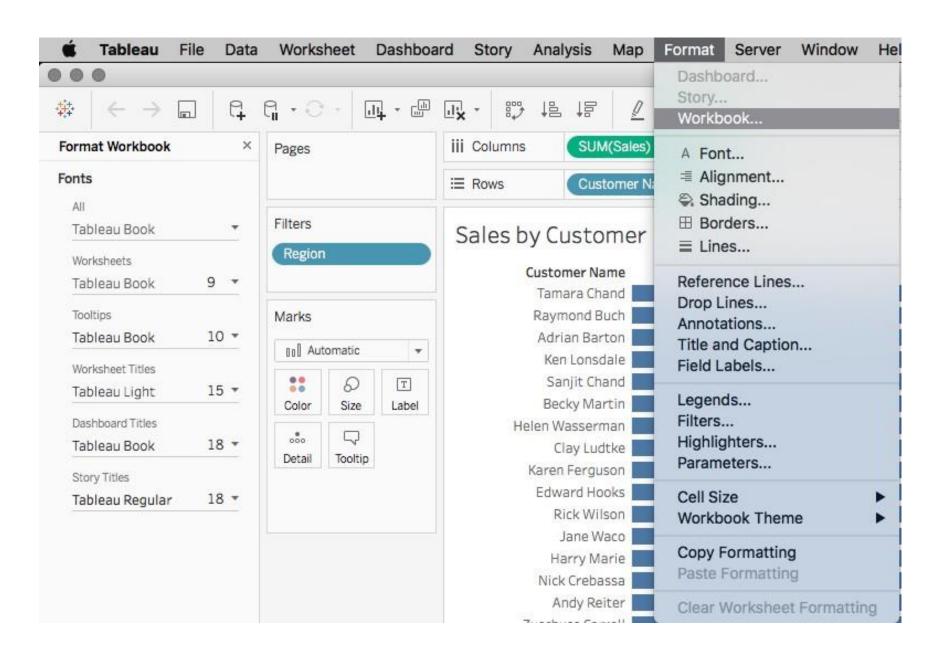
- Tableau allows for extensive formatting of your views
- Formatting can be for an entire worksheet or down to the individual parts
- Formatting can include changing:
 - Fonts
 - Alignment
 - Shading
 - Borders
 - Lines
- Tableau 10 offers new formatting options
- Updated color palettes
- New font, "Tableau Book" which is easier to read on all screens types including mobile
- Updated color palettes including new ones
- First new color palette changes since Tableau 1.5



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Formatting Visualizations

- Tableau 10 offers new formatting options
- Format an entire workbook at once



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Formatting Visualizations

• When you open the format pane it replaces the data pane

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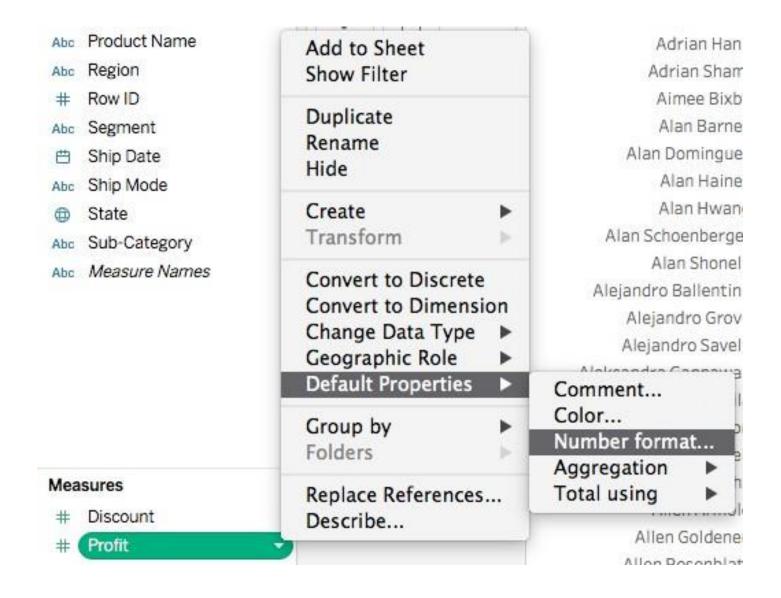
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Formatting Visualizations

- While formatting can happen at the worksheet level, many times you will want to format down to specific parts
- Right click a specific part to format:
 - Fields
 - Numbers
 - Legends
 - Filters
 - Titles and Captions
 - Tooltips
 - Null Values
 - Reference Lines, Bands, and Boxes

Formatting Visualizations

Default formatting can be set in the data pane by right clicking a measure or dimension







Walkthrough Exercises:

Exercise 2:

Times series, aggregation, and filters

Agenda:

- Working with Time Series
- Understanding Aggregation, Granularity, and Level of Details
- Creating an Area Chart and learning about Highlighting
- Adding a Filter

Walkthrough Exercises

Exercise 2:

Connect Tableau to the following data source provided by your instructor: Bl_Intermediate_Unit1_Ex2_Long-Term-Unemployment-US.xlsx

Question:

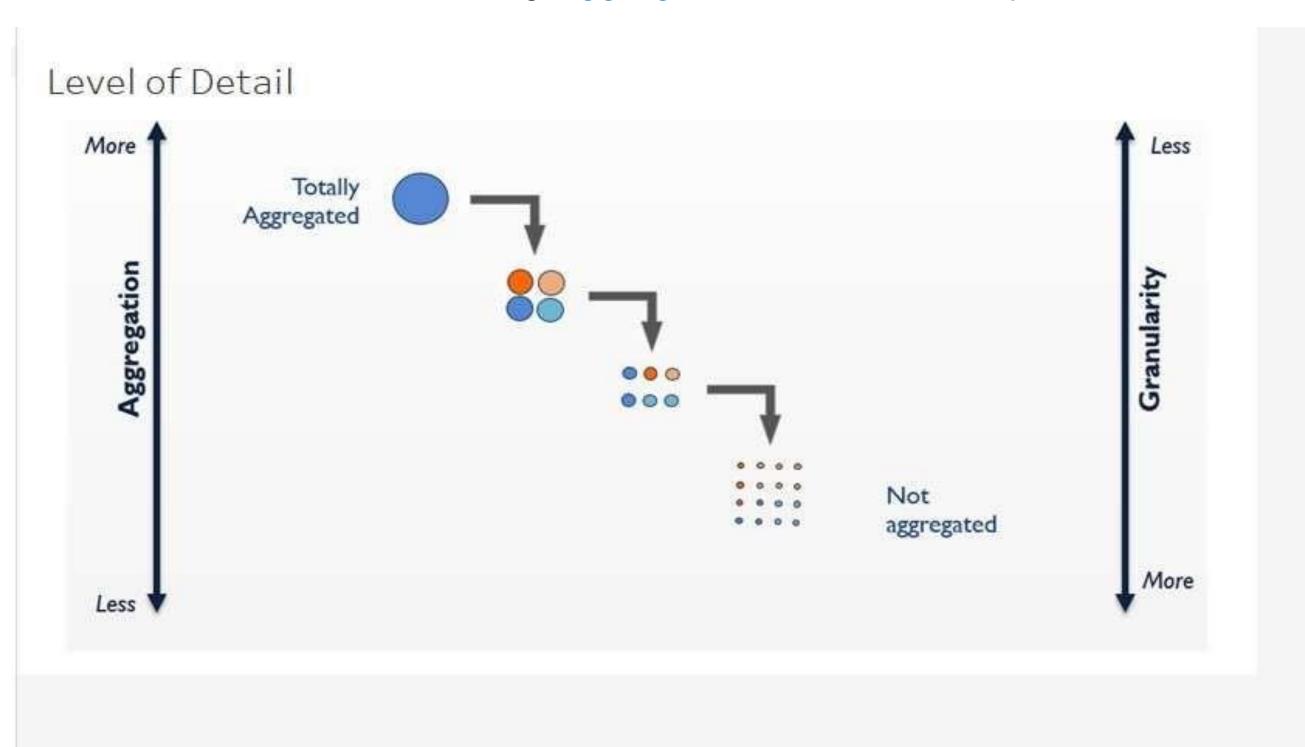
Instructions:

→ Create an Area chart showing the Unemployment Rate in US for your period of time (2005 to 2014).

→ Filter your chart by age and Gender.

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Understanding Aggregation and Granularity:





Adding a simple Filter to your visualization:

- Filtering results allow you to focus on particulars aspect of your data
- Filter by dragging data fields from the source to the Filters box
- Both quick filters or advanced filters can be created by right clicking an item on a shelf
- The filter dialog box will reflect the data type chosen
- The filtered item will show on the Filter card:



Walkthrough Exercises:



Exercise 2

Review:

- 1) Difference between Area Chart and Line chart: An Area chart stacks up values of different categories on top of each other whereas a line chart visualizes them separately
- 2) In Tableau, values are always aggregated at the level of granularity of the worksheet
- 3) Blue fields are Dimensions (treated as Categorical values), Green fields are Measures (treated as numerical values)





UNIT 1: PRACTICE MAKES PERFECT

In this section, we will practice Tableau functionalities and build different types of visualizations.

This section is intended to give you more experience with Tableau by going along multiple small exercises.



All the following exercises uses the same data source:

Bl_Intermediate_global_superstore_2016.xlsx

Exercise 1:

Build a simple Text worksheet

- Under Dimensions click and drag Order Date into Columns. This will display Order Date (By Year).
- Under Dimensions click and drag Country into Rows. This will display a list of Countries.
- Under Measures click on Sales and drag onto the Text Button within the Marks Panel You will now see Sales by Country and by Year.



Exercise 2: Exploring Different Marks

Keep the same worksheet build in Exercise 1. Looking at it, we have selected our dimensions and put them into the columns and rows.

We then decided to Mark our data by displaying the Sum(Sales) measure as text. Let us try a different type of mark.

Drag Sales into the Color Mark.

The color of the Mark will change based on SUM(Sales).

- Change the Mark Type in the selector box to from Automatic to Text.
- Drag Sales onto Size.

The size of the Text Marks will change based on SUM(Sales).

- Create a calculated field Profit Ration (Profit/Sales)
- Drag Profit, Profit Ratio and Quantity into the Tooltip.

Hover over any of the items to see that Profit, Profit Ratio and Quantity now appear.

If you sort your rows, you should now be looking at a Data Visualisation where you can immediately see which Year and Country have the highest Sales. Tableau is not just about displaying data but rather producing rapid insights.



Exercise 3: Extra Credit

- Click on the Color Button in the Marks Panel and explore the various options.
- Click on Tooltip in the Marks Panel and modify the Tooltip Text.
- Click on the Size Button in the Marks Panel and explore the various options.
- Change the Marks Type and see what results you have.
- Right Click on the any item in the Tableau Canvas and select Format. Explore options.
- Right Click on the Year and explore Sorting options.

Exercise 4: Filtering

Filtering your data is essential to ensure you only see the information you require as well as easing the burden on the source systems. There is no valid reason to query the entire database when you only want values for the current week. Let us explore how you can filter data within Tableau.

- Create a new Worksheet
- Double Click on the tab (or right click) to change the name of the Worksheets:

Sheet 1 → Total Sales Value by Year and Country.

Sheet 2 → Product Sales by Month.

- In Product Sales by Month Worksheet drag Order Date into the Columns, Product into Rows, Sales into the Text Mark.
- Right Click the YEAR(Order Date) in the columns and select Month Notice that month appears two times in the menu.

Tableau allows you to either choose to display the actual values (Green) or the date parts (Blue). Try both options and check out the differences in results. In this exercise choose the date part option.

Click and Drag the Order Date into the Filters Panel.

In the prompt box select the Years (it will be blue for discrete).

Select 2014 and click Ok.

Exercise 5: Quick Filters

You can always change your filter value by Right Clicking the item in the Filter Panel but we would like to make our Worksheets more dynamic.

Go to the same worksheet as Exercise 4.

- In the Product Sales by Month drag Country to the Filter Panel.
- When prompted select on Use all and click Ok.
- In the Filters Panel, right click on YEAR(Order Date) and select Show Quick Filter.
- Do the Same for Country.
- In the Country Quick Filter, hover around the top right of this box and click on the Down Caret and select Single Value (Dropdown).
- In the Country Quick Filter, hover around the top right of this box and click on the Down Caret, go down to Customize and uncheck the Show "All" Values.
- Explore the various options for the YEAR(Order Date) Quick Filter.



Exercise 6: Quick Filters Multiple Sheets

A Workbook can consist of many different Worksheets. If you want a filter that has been applied to one worksheet to be applied to all Worksheets you can do this by performing the following:

- Create a New Worksheet.
- Create a Two Worksheets with the EU Superstore. Time to get creative.
- Add some items into the Filters Panel.
- Right Click on the pill in the Filters Panel and go down to Apply to Worksheets.
- Explore the three options available:
- → Apply to All Using This Data Source
- → Selected Sheets
- →Only This Worksheet (by Default)

NOTE: This is especially useful when putting several Worksheets together on a Dashboard and allowing a single Quick Filter to be applied to all visible Worksheets.



Exercise 7: Table Calculation - Running Total

As well as creating and using items from your Data Source you can also make use of Tableau Calculations that perform calculations based on the fields placed on the canvas.

For example you can create a calculation that measures the growth of a value over time quickly and simply with Tableau.

- Create a new Worksheet
- Put Order Date into the Columns
- Set the Order Date to Continuous and by Months.
- Double Click Sales to bring this into our visualization.
- Click on Show Me and select a Line Graph.
- Keep your finger on Control and click and drag SUM(Sales) in the Rows slightly to the Right to create a copy.
- Right Click on the copy of SUM(Sales) and go down to Quick Table Calculations and select Running Total.

Exercise 8: Heat Map

To take a more visual approach to showing data than what we might typically see in a crosstab, let's consider a heat map. A heat map is a great way to compare categories using color and size. In this, you can compare two different measures.

Create a Heat map to show performance by region for the different product line of our fictional company.

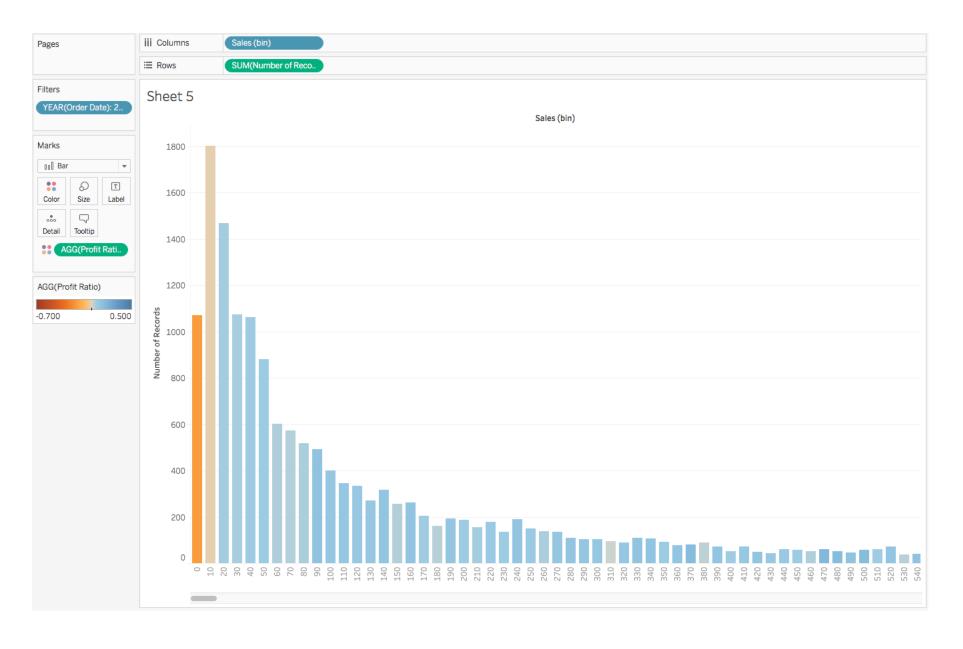
Create a filter by region to look at only the Top 5 regions by Sum of Sales.



Exercise 9: Histogram

A histogram is a visual representation of the distribution of data

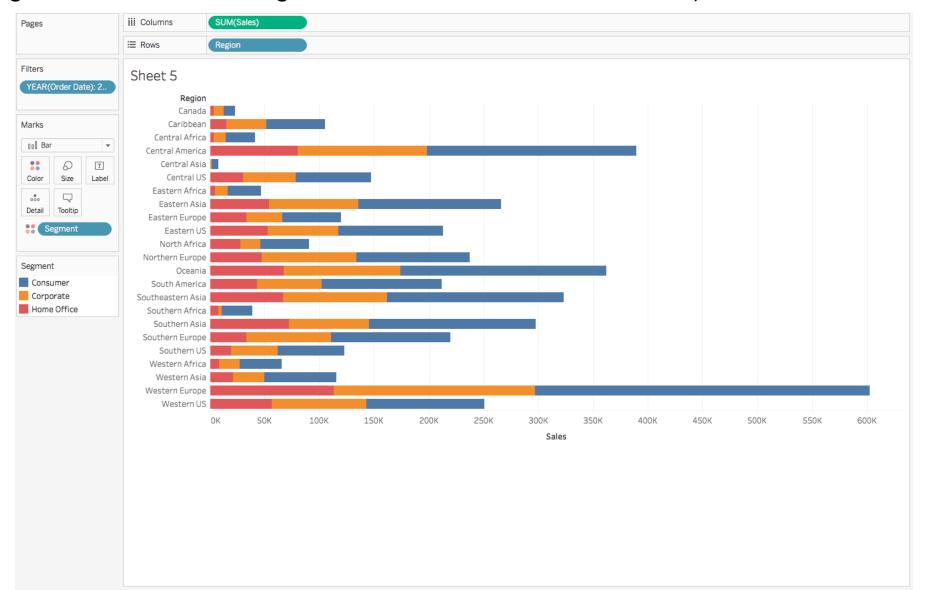
Create a histogram that breaks down individual sales into bins of 10\$ increments. Add a quick filter to look only at the 2015 year and add a calculated field (profit ratio) on your color mark.



Exercise 10: Create a Stacked bar chart

The stacked bar chart is great for adding another level of detail inside of a horizontal bar chart. You can do this by adding another dimension to your horizontal bar chart that will further divide the measure into sub-groups. The sub-groups are then color-coded on each bar as illustrated in the example below.

The example below shows sales volume by region with a further division of sales by customer segment (by adding the Customer Segment field to the Color shelf)





Exercise 11: Create Tree maps

Tree Maps are very powerful visualizations, particularly for illustrating hierarchical (tree-structured) data and part-to-whole relationships. Because of their visual nature, treemapping is ideal for showing hundreds or even thousands of items in a single visualization simultaneously.

The example provided shows a tree map visualization examining sales (size) and profit (color) of product categories by department at the country level.

The most profitable nodes are dark blue. The non-profitable segments are grouped in orange.

There are thousands of marks in this visualization, but your eyes are automatically attracted to the orange islands in a sea of blue.

The larger the orange mark, the more concerning it is for the business. That's because these areas are generating sufficient sales but still aren't making money.

→ Recreate this visualization on your own.



4

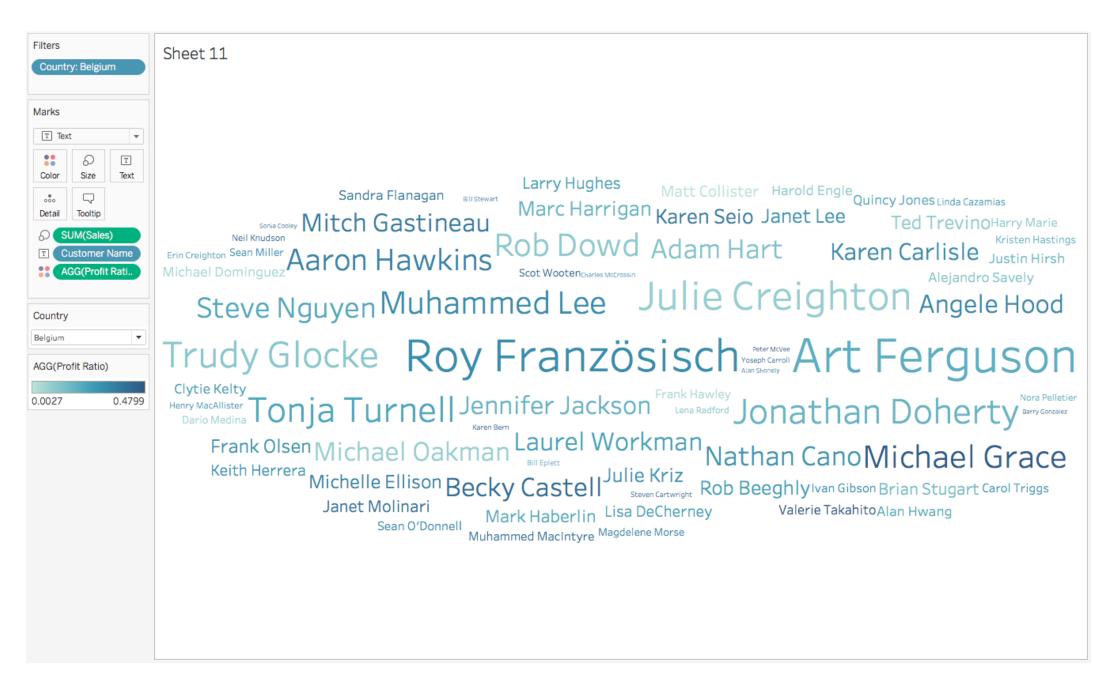
Exercise 12: A BIT OF FUN _ WORLD CLOUD

Visualize the name of your most profitable customers by Country.

Instructions:

- 1- Drag and drop the Customerdimension to the Marks Text Area
- 2- Next, drag and drop the Sales measure to the Mark size area.
- 3- Create a new calculated field name it Profit Ratio, (SUM[Profit]/SUM[Sales])
- 4-Now, drag the newly created field Profit Ratio in the Marks Color Area.

If needed, change the Mark Type from Automatic(Bar), to Text.
5- Add the Country Dimension in the filter Shelve, click on show filter.
6- Select Single Value Dropdown from your newly created filter.



ET VOILA...

Exercise 13: Box-and-Whisker Plot

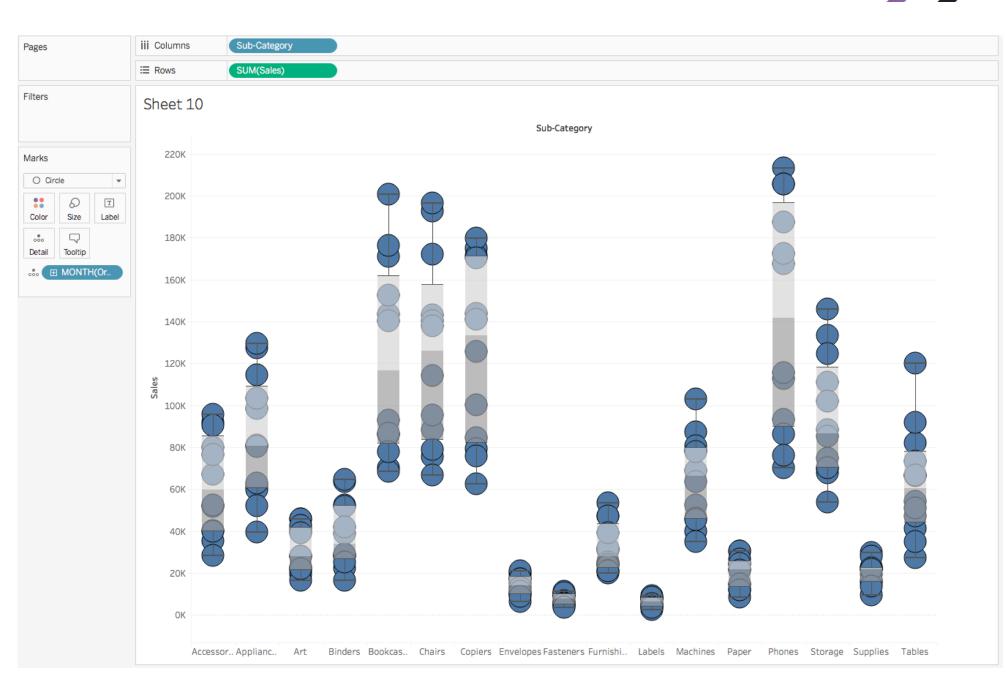
The Box-and-Whisker Plot, or Box Plot, is another effective visualization choice for illustrating distributions.

They work particularly well when you want to compare the distributions across two different dimension members side-by-side, where one set of dimension members make up the X-axis, and the other dimension member is used as the visualization's level of detail.

As you can see, each set of circles corresponds to the dimension members on the X-axis for the Sub-Category dimension. The level of detail, or most granular level of the analysis, is Month of Order Date.

Since the level of detail is month of order date, each Sub-Category column has 12 circles, one for each month of the year.

In short, this visualization is showing how the distribution of monthly sales vary between product sub-categories.





Exercise 14: Chart Type – Circle View

The circle view is another powerful visualization for comparative analysis. The example has quite a bit of information packed into a single visualization. First, you can see that we are examining the sales figures for each product category.

The circles are colored by Region and are sized by SUM(Profit).

The larger the circle, the more profit that Region generates for that product category.

We created a Filter to look at the top 3 Regions.

Instruction:

Recreate this Chart type for your own practice.

