

PART I

DESKTOP

In this part

- **CHAPTER 1:** Creating Visual Analytics with Tableau Desktop
- **CHAPTER 2:** Connecting to Your Data
- **CHAPTER 3:** Building Your First Visualization
- **CHAPTER 4:** Creating Calculations to Enhance Data
- **CHAPTER 5:** Using Maps to Improve Insight
- **CHAPTER 6:** Developing an Ad Hoc Analysis Environment
- **CHAPTER 7:** Tips, Tricks, and Timesavers
- **CHAPTER 8:** Bringing It All Together with Dashboards
- **CHAPTER 9:** Designing for Mobile
- **CHAPTER 10:** Conveying Your Findings with Stories

CHAPTER 1

Creating Visual Analytics with Tableau Desktop

Data graphics should draw the view's attention to the sense and substance of the data, not to something else.

—EDWARD R. TUFT¹

The seeds for Tableau were planted in the early 1970s when IBM invented Structured Query Language (SQL) and later in 1981 when the spreadsheet became the killer application of the personal computer. Data creation and analysis fundamentally changed for the better. Our ability to create and store data increased exponentially.

The business intelligence (BI) industry was created with this wave, each vendor providing a product “stack” based on some variant of SQL. The pioneering companies invented foundational technologies and developed sound methods for collecting and storing data. Recently, a new generation of NoSQL² (Not Only SQL) databases are enabling web properties like Facebook to mine massive, multi-petabyte³ data streams.

Deploying these systems can take years. Data today resides in many different databases and may also need to be collected from external sources. The traditional leaders in the BI industry have created reporting tools that focus on rendering data from their proprietary products. Performing analysis and building reports with these tools require technical expertise and time. The people with the technical chops to master them are product specialists who don't always know the best way to present the information.

The scale, velocity, and scope of data today demand reporting tools that deploy quickly. They must be suitable for non-technical users to master. They should connect to a wide variety of data sources. And, the tools need to guide us to use the best techniques known for rendering the data into information.

THE SHORTCOMINGS OF TRADITIONAL INFORMATION ANALYSIS

Entities are having difficulty getting widespread usage of traditional BI tools. A recent study by the Business Application Research Center (BARC, 2009) reported adoption rates are surprisingly low.⁴

In any given BI using organization just over 8 percent of employees are actually using BI tools. Even in industries that have aggressively adopted BI tools (e.g., wholesales, banking, and retail), usage barely exceeds 11 percent.

NIGEL PENDSE, BARC

In other words, 92 percent of the people who have access to traditional BI tools don't use them. The BARC survey noted these causes:

- The tools are too difficult to learn and use.
- Technical experts were needed to create reports.
- The turnaround time for reports is too long.

Companies that have invested millions of dollars in BI systems are using spreadsheets for data analysis and reporting. When BI system reports are received, traditional tools often employ inappropriate visualization methods. Stephen Few has written several books that illuminate the problem and provide examples of data visualization techniques that adhere to best practices. Stephen also provides examples of inappropriate visualizations provided by legacy vendor tools.⁵ It turns out that the skills required to design and build database products are different from the skills needed to create dashboards that effectively communicate. The BARC study clearly indicates this IT-centric control model has failed to deliver compelling answers that attract users.

You want to make informed decisions with reliable information. You have to connect with a variety of data sources and may not know the best ways to visualize the data. Ideally, the tool used should automatically present the information using the best practices. Tableau has become a popular choice because it makes industrial-strength reporting, analysis, and discovery accessible to less-technical staff. During the last few years, information technology teams have started to embrace end-user empowerment because it provides a more efficient way to provide information, reduces request backlogs, and provides a toolset for leveraging the knowledge of constrained technical human resources.

THE BUSINESS CASE FOR VISUAL ANALYSIS

Whether your entity seeks profits or engages in non-profit activities, all enterprises use data to monitor operations and perform analysis. Insights gleaned from the reports and analyses are then used to maintain efficiency, pursue opportunity, and prevent negative outcomes. Supporting this infrastructure (from the perspective of the information consumer) are three kinds of data.

THREE KINDS OF DATA THAT EXIST IN EVERY ENTITY

Reports, analysis, and ad hoc discovery are used to express three basic kinds of data.

Known Data (Type 1)

Encompassed in daily, weekly, and monthly reports that are used for monitoring activity, these reports provide the basic context used to inform discussion and frame questions. Type 1 reports aren't intended to answer questions. Their purpose is to provide visibility of operations.

Data You Know You Need to Know (Type 2)

Once patterns and outliers emerge in type 1 data, the question that naturally follows is: Why is this happening? People need to understand the cause of the outliers so that action can be taken. Traditional reporting tools provide a good framework to answer this type of query as long as the question is anticipated in the design of the report.

Data You Don't Know You Need to Know (Type 3)

Performing analysis with data in real time while using appropriate visual analytics provides the possibility of seeing patterns and outliers that are not visible in type 1 and type 2 reports. The process of interacting with granular data yields different questions that can lead to new actionable insights. Software that enables quick, iterative analysis and reporting is becoming a necessary element of effective business information systems.

Distributing type 1 reports in a timely manner is important. This requires speedy design and build stages when a new type 1 report is created. To effectively enable types 2 and 3 analyses, the reporting tool must adapt quickly to ad hoc queries and present the data in intuitive ways.

HOW VISUAL ANALYTICS IMPROVES DECISION MAKING

Rendering data accurately is easy to achieve with Tableau, but your knowledge of the best practices enhances the clarity of the information being displayed. The next three figures illustrate how the choice of chart types can make it easier for your audience to see and understand important findings in the data. The goal of these examples is to provide sales analysis by region, product category, and product subcategory.

Figure 1-1 presents data using a grid of numbers (a text table) and pie charts. Text tables are useful for finding specific values. Pie charts are intended to show part-to-whole comparisons. The pie charts compare sales by region and product category.

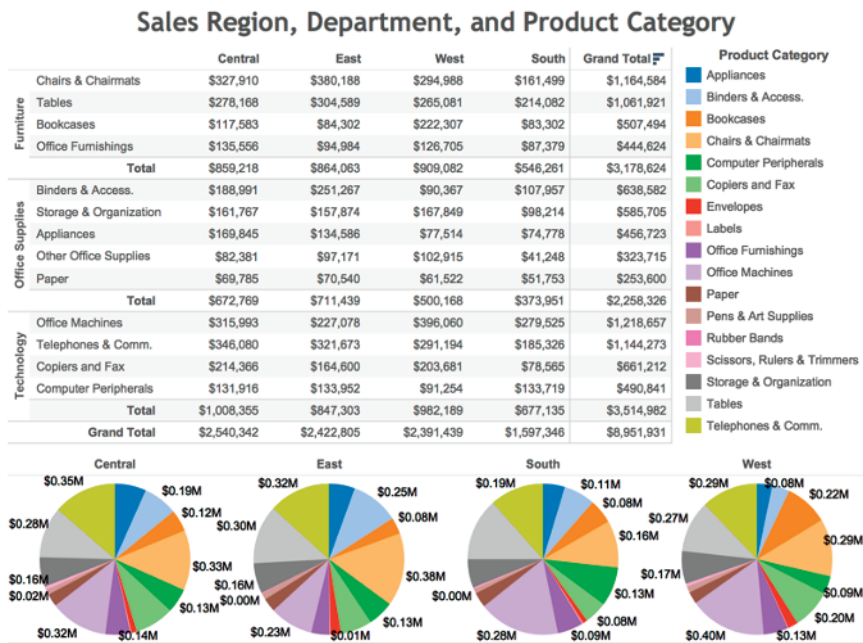


FIGURE 1-1 Sales mix analysis using a text tables and pie charts

Text tables are not the most effective way to make part-of-whole comparisons or identify outliers. Pie charts are a commonly used chart type but are one of the least effective ways to make precise comparisons. This is especially true when there are many slices that are similar in size or very small.

Figure 1-2 employs a bar chart and heat map to convey the same information. Bar charts provide a better means for making precise comparisons. The linear

presentation makes it easier to see the relative values. The heat map on the right provides total sales for each product category. The grayscale background color in the heat map highlights the high and low selling items. The blue-orange color encoding in the bar chart provides additional information on profit ratio. More importantly, this color scheme is visible to color-blind people.

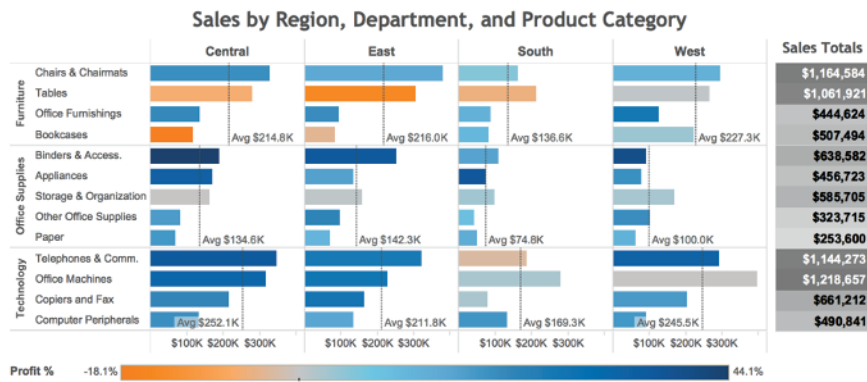


FIGURE 1-2 Sales mix analysis using a bar chart and heat map

The bar chart and heat map communicate the relative sales values more quickly while adding profit ratio information with the use of color. The reference lines provide average sales values for each region and department. One could argue that the bar chart doesn't communicate the details available in the text table, but in Figure 1-3 those details are provided via tooltips that pop out when you point your mouse at the mark of interest.

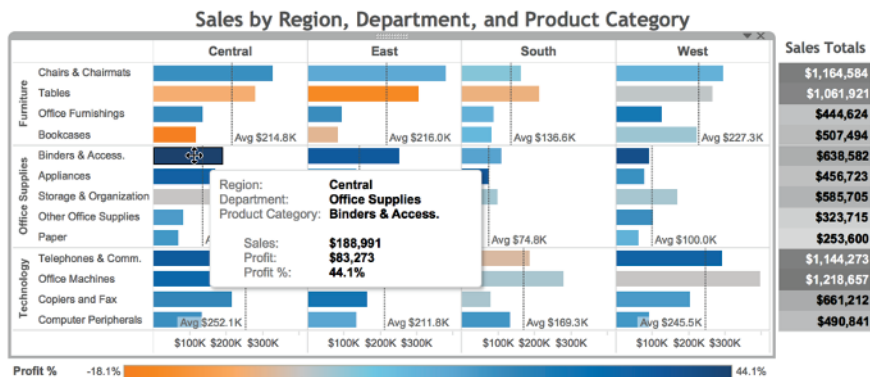


FIGURE 1-3 Tooltips provide details on demand.

Appropriate visual analytics improve decision making by highlighting the important outliers and making them easier to see. Interactive analytics make those details come to life by allowing your audience to explore areas of interest.

TURNING DATA INTO INFORMATION WITH VISUAL ANALYTICS

Data that is overly summarized loses its ability to inform. When it's too detailed, rapid interpretation of the data is compromised. Visual analytics bridges this gap by providing the right style of data visualization and detail for the situational need. The ideal analysis and reporting tool should possess the following attributes:

- **Simplicity:** Be easy for non-technical users to master.
- **Connectivity:** Seamlessly connect to a large variety of data sources.
- **Visual competence:** Provide appropriate graphics by default.
- **Sharing:** Facilitate sharing of insight.
- **Scale:** Handle large datasets.

Traditional BI reporting solutions aren't adapted for the variety of data sources available today. Analysis and reporting can't occur in these tools until the architecture is created within the proprietary product stack. Tableau Software was designed to address these needs.

ANALYSIS AS A CREATIVE PROCESS

Tableau's design encourages interaction with data because the information consumer gets immediate feedback. Tableau's CEO, Christian Chabot, talked about this in his keynote address at Tableau's 2014 customer conference in Seattle.⁶ Chabot compared data analysis to artistic expression and explained that the way artists go about creating art (through trial, error, and refinement) is informing Tableau's design.

- Encouraging experimentation
- Giving speedy feedback
- Providing an expressive environment
- Giving users control

The most impactful Tableau analyses are discovery stories. Sometimes discoveries translate into millions of dollars of improved profit for Tableau users. In Chapter 6, you'll learn proven discovery techniques that will provide some examples for you to apply, refine, and develop into your own discovery methods.

Each new release of Tableau Desktop improves its reporting, analysis, and discovery capabilities. The next section provides a brief introduction into Tableau's product line.

TABLEAU'S DESKTOP TOOLS

Tableau Desktop is the design tool for creating visual analytics and dashboards. There are two versions: Personal edition and Professional edition. Professional is more popular because it connects to a wider variety of data sources than Personal. If there isn't a connector for the specific data you need to access, you can connect to it via the Open Database (ODBC) standard.

Tableau also provides a free consumption tool called Tableau Reader.

TABLEAU DESKTOP PERSONAL EDITION

Tableau Desktop Personal edition is the entry-level design tool that connects to data sources located in a file on your personal computer. It supports data connections to Excel, Access, text files (.csv), OData, Microsoft Windows Azure Marketplace DataMarket, and Tableau Data Extract (.tde) files. You can also import workbook files from other Tableau workbooks.

PROFESSIONAL EDITION

Tableau Desktop Professional edition is similar to the Personal edition but offers a much wider range of data connections. In addition to the "In a file" options provided by the Personal edition, you have the ability to connect to a wide variety of database files. Desktop Professional connects to relational databases, columnar-analytic databases, data appliances, NoSQL data sources, web-service APIs, and other ODBC 3-compliant data sources. See Appendix B for a complete listing of connections for the Windows and Mac OS X editions.

TABLEAU FILE TYPES

You can save and share data using a variety of different file types in Tableau. The differences between each file type concerns the amount and type of information being stored in the file. Table 1-1 summarizes different Tableau file types.

When you save your work in Desktop, the default save method creates a workbook (.twb) file. If you need to share your work with people who don't have a Tableau desktop license or don't have access to the data source, you can save your work as a packaged workbook (.twbx) by using the Save As option when saving your file.

TABLE 1-1 Tableau File Types

FILE TYPE (EXTENSION)	SIZE	USE CASE	INCLUDES
Tableau Workbook (.twb)	Typically small	Tableau’s default way to save work. Normally used to save your data connection to your local or data-base data sources.	Information to visualize data. Tableau metadata. No source data.
Tableau Data Source (.tds)	Typically small	An exported data source that you may connect to frequently. Access to saved, frequently used data sources.	Metadata, including data source type, connection information, groups, sets, calculated fields, bins, and default field properties.
Tableau Data Extract (.tde)	Potentially large	Improves performance. Enables more functions. Allows for offline access.	Source data and workbook metadata as filtered and aggregated during extract.
Tableau Book Mark (.tbm)	Typically small	Sharing sheets between different workbooks.	Information to copy visualizations and the data source(s) used.
Tableau Packaged Workbook (.twbx)	Ranges from small to potentially large depending on the size of the source data	Sharing with Tableau Reader or those without access to the source data.	Extracted data and workbook information to build visualizations.
Tableau Packaged Data Source File (.tdsx)	Potentially large	Sharing with people who don’t have access to the original source files, typically via publishing to Tableau Server.	Contains all of the information in a .tds file as well as any local file data sources for those who do not have access to the local files.

Tableau Data Sources (.tds) are useful when you frequently connect to a particular data source or you have edited the metadata associated with that data source in some way (renaming or grouping fields, for example). Using saved data sources reduces the time required to connect to the data.

Tableau Data Extracts (.tde) leverage Tableau’s proprietary data engine. When you create an extract, your data is compressed. In versions prior to V8.2, if your data source is from a file (Excel, Access, text), Data Extracts add formula functions that don’t exist in those sources—including Count Distinct and Median. Beginning with V8.2, the Data Extract is no longer necessary to gain these functions because connections using the newer optimized connection create a local temporary extract automatically.

If you are publishing workbooks via Tableau Server, Data Extracts provide an effective way to separate the analytical load Tableau generates from your source database.

Tableau Packaged Data Source (.tdsx) files provide a means for publishing data extract files (.tde) or any file-based data to Tableau Server. The Data Server can then be scheduled to refresh these files at regular intervals automatically.

TABLEAU READER

Tableau Reader is a free version that allow users to consume Tableau Desktop Reports without the need for a paid license. To make files consumable by Tableau Reader, save your workbook as a Tableau Packaged Workbook (.twbx) file.

TABLEAU ONLINE HELP

I hope that while reading this book, you have Tableau Desktop running nearby and go to it often to work on examples, explore other options, and access Tableau Online Help (TOH). TOH is an excellent repository of information that is frequently updated by experienced practitioners. If something in this text isn't making sense to you, try searching the TOH for another perspective on the topic.

INTRODUCING THE TABLEAU DESKTOP WORKSPACE

This book is intended as a supplement (not a replacement) for Tableau's online manual. If you are running Tableau Desktop while you are reading, you should try pressing the F1 key in Windows or Shift+Command+? on the Mac and take a look at the online manual. Go to the Tableau Help menu and select the Watch Training Videos option. This will take you to Tableau's training and tutorials website. Watch the introductory video and review the numerous training videos that are sorted by topic. Most of them range from 3 to 20 minutes in length. Using the training videos in combination with this book will jumpstart your Tableau learning and deepen your understanding of more advanced skills.

In the remainder of this chapter, you learn the basics of Tableau's workflow and user interface.

NEW WORKSPACE DESIGN

Tableau Desktop Version 8.2 and earlier versions included a Start page that contained a workspace for connecting to data sources, saving data sources, and saving frequently used workbooks. The Start page also included links to videos and sample workbooks.

The Start page in Tableau Desktop Version 9 has been improved to include more links to training and idea resources. Tableau has also made it easier to search the growing number of data sources that you can access. All of the examples in this text reflect Version 9. The figures were created using an iMac or MacBook Pro unless specifically noted otherwise.

For those readers using the Windows version, the menus, functions, and location of controls are virtually identical. The only differences relate to the ways that Windows and OS X handle menu positioning and keyboard shortcuts. A detailed explanation of the differences between the two operating systems is outside the scope of this text. The biggest difference between the Windows and Mac editions relates to the number of connectors available. The Windows edition has more connectors at this time. See Appendix B for a complete list of connections.

Go to Appendix C to see a complete listing of Windows and Mac keyboard shortcuts. You can also search the Tableau manual to find the latest list of keyboard shortcuts.

USING THE START PAGE CONTROLS EFFECTIVELY

If you are accustomed to working with spreadsheets or other analysis tools, learning Tableau's desktop environment will be a breeze. If you have no familiarity with database terminology or spreadsheets, you can still be using Tableau effectively within a few hours.

Tableau's Start page has been redesigned in Version 9 to provide more convenient access to your data, workbooks, and learning resources for new users. The new design of the Start page should also be more appealing to experienced users because it provides convenient access to Tableau's web content and to interesting public content features such as the Tableau Public Viz of the Week.

THE START PAGE

Open Tableau and you are presented with the Start page displayed in Figure 1-4.

Clicking the small tableau logo displayed in the upper left allows you to toggle between the Start page and the Tableau sheet workspace. Think of the Start page as the control center and the sheet workspace as your building environment. The Start page is divided into three sections from left to right.

- Connect pane
- Open pane
- Discover pane

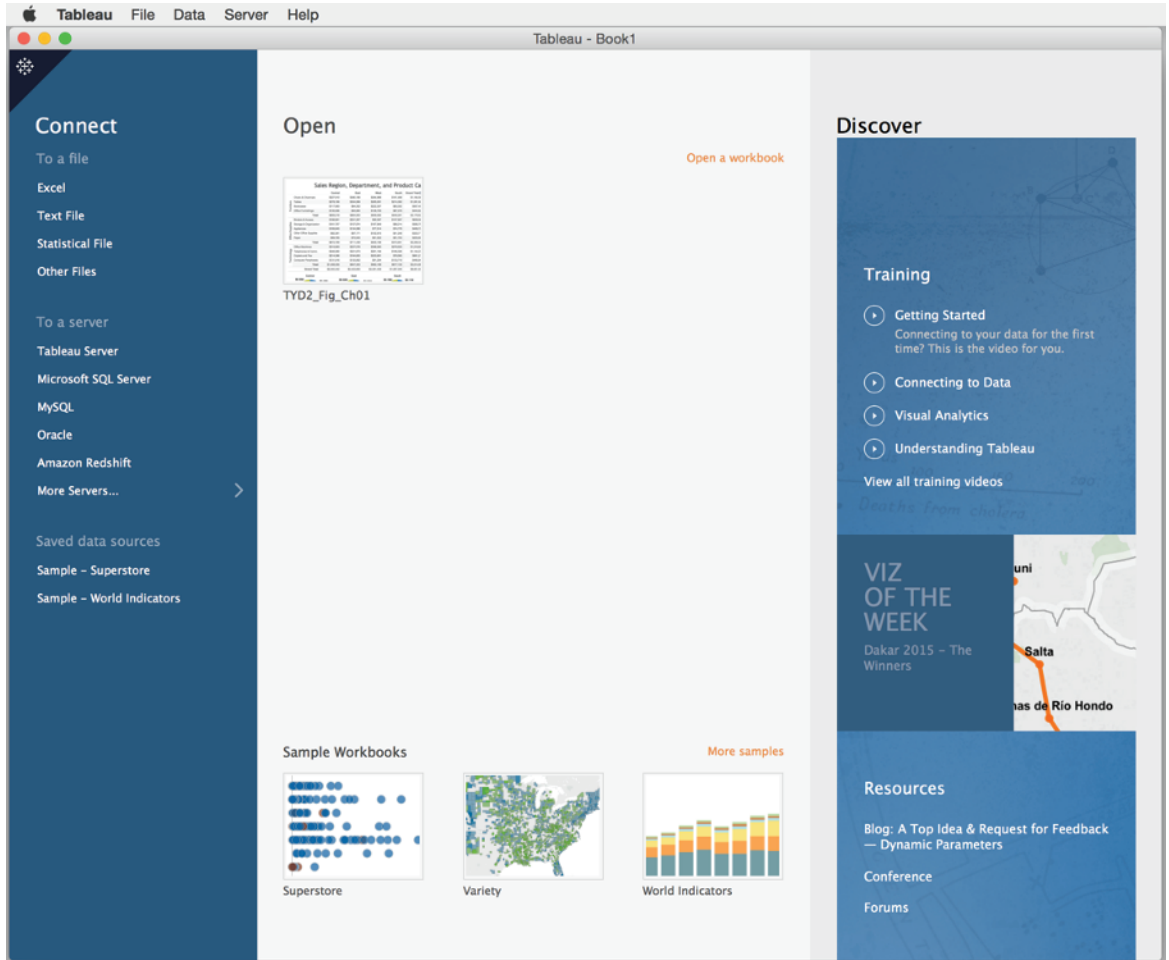


FIGURE 1-4 Tableau Start page

In the Connect pane, you connect to several kinds of data sources. The Open pane in the center of the screen displays your nine most recently opened workbooks. It also provides options for connecting to your work files or to sample workbooks provided by Tableau. The Discover pane provides links to training videos, the Tableau Public Viz of the Week, and other links including Tableau's blog, company news, and the popular Tableau user forum.

If you want to follow along in Tableau, select and open one of the saved data sources that are provided. Alternatively, go to this book's companion website (see Appendix F for the address), download the Chapter 1 sample file, and use

the File menu option in the Start page to open the sample workbook. This will allow you to see the actual sheets used to create the figures in this chapter.

The Connect Pane

The Connect pane provides convenient access to data stored in files on your computer, data stored in databases, and sample data sources provided by Tableau, as well as to frequently used data sources that you have saved for easy access.

In a File

Look on the top-left side of the Start page right below the Connect heading. This area includes options for connecting files available to you, including Microsoft Excel, Microsoft Access (Windows only), Statistical files, and Text files.

To a Server

You must be using Tableau Desktop Professional to have access to the To a Server connections. If you are using Tableau Desktop Personal edition, you can't connect to data sources in this area. If you are using Tableau Desktop Professional, you should see five connections, starting with Tableau Server. At the bottom of this group of connections is an additional option to connect with more server data sources. Clicking "more servers" will expose more server connection types to a variety of databases and web services.

The order in which server connections appear in this area will change depending on which server connections you use most frequently. In Figure 1-4, Google Big Query appears just below Tableau Server because I've been using that data source recently. The order that connections appear on your connection pane will be different.

Saved Data Sources

At the bottom of the Connect Pane displayed in Figure 1-4 is the Saved data sources area. Tableau allows you to save frequently used data source connections here. This is a big time-saver because you don't have to enter all the connection and security information every time you need to access the saved connections for items that reside in a database on a server. It also provides a convenient way for you to access the files that you use often on your personal computer.

Tableau populates this area with sample data sources that you can use for learning. Any connection that appears has been saved to a folder called My Tableau Repository. This folder is created when you install Tableau Desktop. Don't worry about the details of how these work right now. Be confident that

files or connections you choose to save will appear in this area. You learn to connect to and save data sources in Chapter 2.

The Open Pane

If you've just installed Tableau Desktop, the white space to the right of the Connect pane will be empty on your screen. This area is used to display your most recently opened workbooks. In Figure 1-4, there are two workbook images. These are workbooks on my laptop that includes the sheets used to create the content for this chapter and another workbook created from a Google BigQuery database. If you have made any workbooks, they should appear in this space. Once you start building workbooks, you will continuously cycle through the last nine workbooks in this space. You can also pin frequently used workbooks to this area.

Pin or Delete a Workbook from the Save Workbooks Area

In Figure 1-5, you see the options for pinning workbooks to this area or deleting workbooks from the Connect page. When you want to pin or unpin a workbook, hover your mouse pointer over the blue pin icon in the image of the workbook you want to pin, as you can see on the left workbook displayed in Figure 1-5. Clicking the blue pin will keep the workbook displayed in this space. Clicking that blue pin again will unpin the workbook and allow more recent work to displace it in the space.

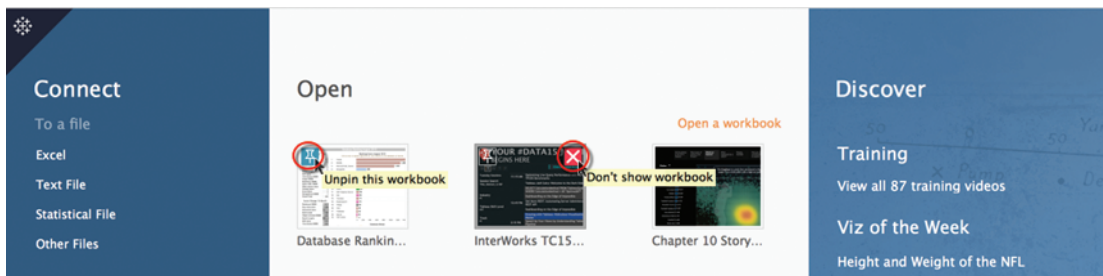


FIGURE 1-5 Pin a workbook to the Start page.

To see how to remove a workbook from this space, look at the right image in Figure 1-5. Hovering your mouse pointer over the red X button and clicking that deletes the workbook image from this area. This will not delete the workbook for your hard disk—only the image in the workbook Open pane.

Sample Workbooks

At the bottom of the Open pane in Figure 1-4, you will find the Sample Workbooks area. These are workbooks that are included with Tableau when you install Desktop. They were created by Tableau as a learning resource.

More Samples

Clicking the More samples link at the bottom right of the Open pane shown in Figure 1-4 will take you to a Tableau web page that includes more dashboards and workbooks that you can download and explore. This is a great way to get ideas for your own work.

The Discover Pane

On the right side of the Start page, you will find online learning resources that are provided by Tableau Software. This pane is divided into three sections: Training, Viz of the Week, and Resources.

Training (View All)

The most popular training videos are displayed in this space. Clicking the (view all) option will take you to Tableau's training and tutorials website that includes links to all of Tableau's training resources. These include a large library of free On-Demand training videos, a schedule of upcoming live web training sessions that are also free, and a schedule of Tableau's Public training classes, which are fee-based. In addition, you will find links to quick-start guides, starter kits, knowledge base articles, and other learning resources. The content in this area continues to change and expand.

Viz of the Week

Tableau offers a free hosting service that allows data nerds who also blog to share visualizations. This service is called Tableau Public. The Viz of the Week is selected from the best examples provided by the Tableau Public user community. Clicking the Viz of the Week takes you to the Tableau Public website and the winning visualization. Normally Tableau provides a link to the website or blog that the dashboard appeared. You can also download the workbook to your computer for further analysis. This is a great way to learn.

Resources

At the bottom of the Discover pane, you'll find links to recent Tableau blog posts, Tableau news, the Tableau Conference website, and the excellent Tableau community forums. One of the best aspects of the Tableau world is the community of users who share technique. As Tableau's website has grown in size and scope, it can be challenging to find what you need. The Resources area

provides shortcuts to these resources right from your desktop. Keep in mind that you need a live Internet connection to access these files.

Now that you've learned about Tableau's Start page, it's time to dive into some data. In the next section, you learn about Tableau's primary connection and analysis environment—the sheet workspace.

THE TABLEAU DESKTOP WORKSPACE

Figure 1-6 contains a sheet view of a connection to one of the sample files that ships with Tableau Desktop: the Sample-Superstore Sales-Excel dataset. Tableau updates these sample files often. Once again, the companion website (see Appendix F) includes a zip file containing the workbooks used to create the examples in this book. If you want to follow along with these examples, download the file for Chapter 1.

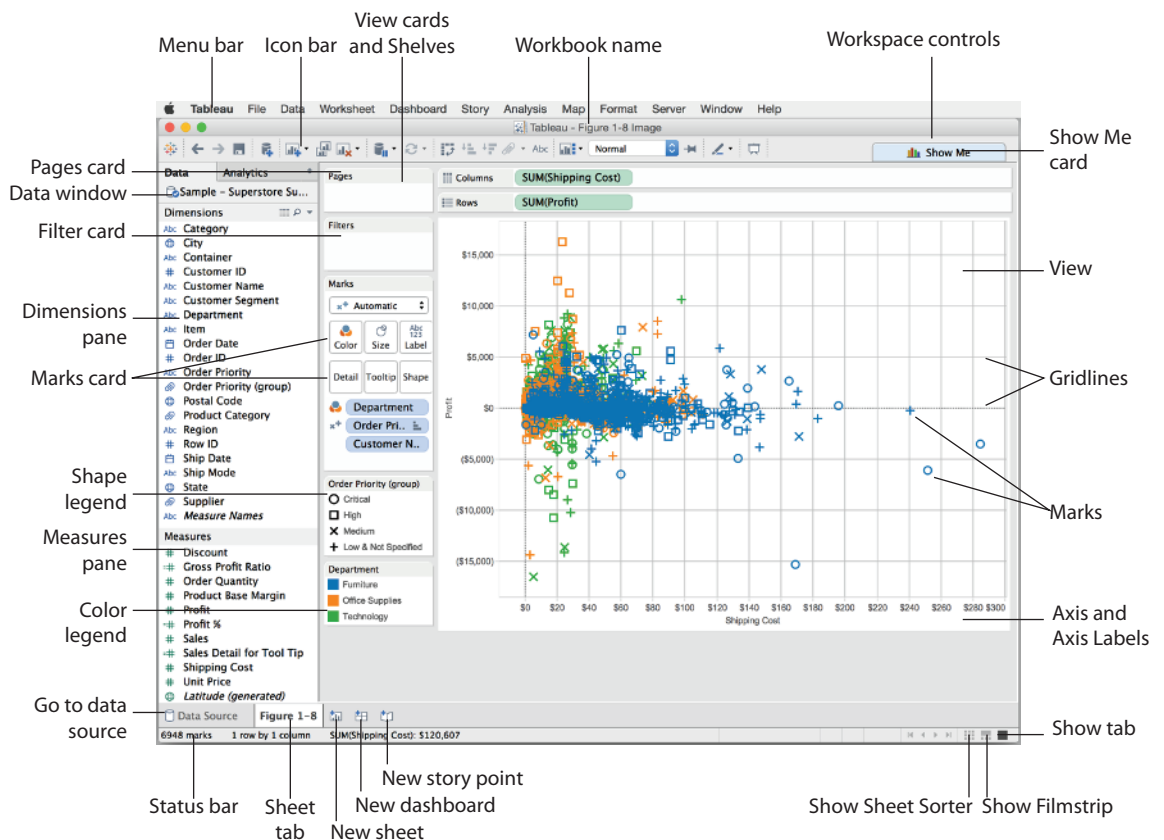


FIGURE 1-6 Tableau Desktop sheet workspace

The sheet workspace is where you build views. Tableau Desktop also has a dedicated workspace for dashboard building, which is covered in Chapter 8, and for creating stories, which is covered in Chapter 10. Figure 1-6 shows a sheet containing a scatter plot. The Superstore dataset includes sales data for a retail business.

You can open as many connections as you want in Tableau by clicking the home icon to open the Connect page. There are a several other ways you can establish a data connection, as you will learn in Chapter 2. The remainder of Chapter 1 covers the different parts of the workspace displayed in Figure 1-6.

The toolbar areas at the top of the sheet view contain the menu bar, the icon bar, and the Show Me button.

The Sheet Sorter

At the bottom right of the workspace in Figure 1-6 are three icons. The left-most icon in the group is a cluster of nine squares. Clicking the Show Sheet Sorter icon will display all of the contents of the workbook. Figure 1-7 shows the Sheet Sorter view.

The Sheet Sorter resembles a PowerPoint slide desk sorter view. In the Sheet Sorter, you can reorder worksheets, dashboards, and stories by dragging the images to the desired position. Double-clicking any image in the Sheet Sorter will open that view.

You can also use the Sheet Sorter to preload the contents of your workbook into memory. This is particularly helpful if you are using Tableau to give a live presentation. By preloading everything into memory, transitions between each sheet, dashboard, or story will be immediate. Preload all the workbook contents into memory by right-clicking while pointing anywhere in the Sheet Sorter and selecting the Refresh All Thumbnails option.

Show Filmstrip and Show Tabs Icons

Tableau normally displays tabs at the bottom of the workspace, but you can change that presentation. Immediately to the right of the slide sorter icon in Figure 1-6 are two additional icons—Show Filmstrip and Show Tabs. With these icons, you can toggle between each type of display. Figure 1-8 shows the Filmstrip and Tab displays.

The upper part of Figure 1-8 is the Tab view. On the bottom is the Filmstrip view. Experiment with each method to see how the presentation of the sheets changes. If you hover your mouse over the tabs, an image of the sheet contents is displayed as well.

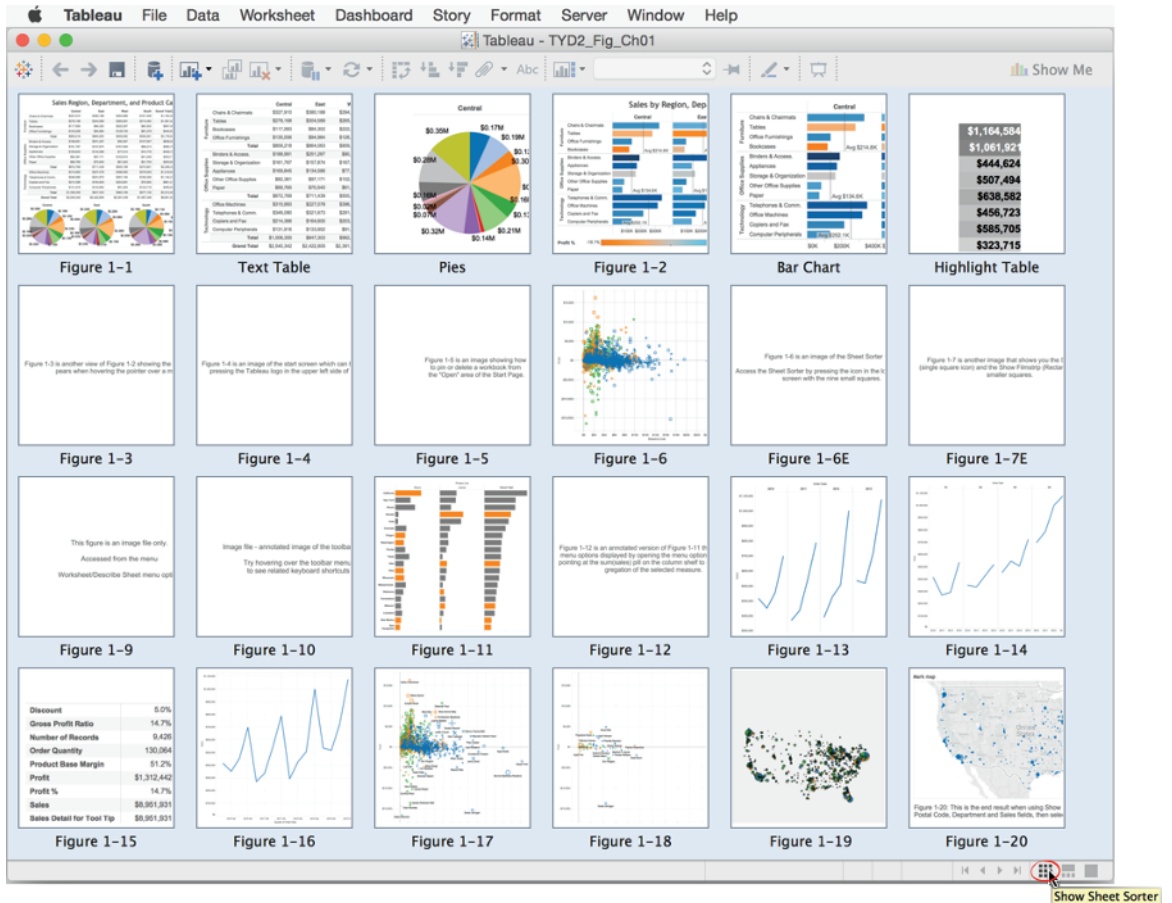


FIGURE 1-7 The Sheet Sorter

Return to the Start page by clicking the Tableau logo icon you see in Figure 1-8 in the upper-left side of the workspace. Note that you can also refresh all thumbnails to preload every sheet from the Filmstrip, just as in the Sheet Sorter.

Right-clicking a tab for the Filmstrip icon exposes a context-specific menu option relating to the tab. Notice that you can color-encode tabs from this menu, duplicate the tab, or export the sheet to create a new workbook. Try experimenting with the other menu options exposed when you do this. You'll find that right-clicking any object in Tableau always exposes context-specific menu options.

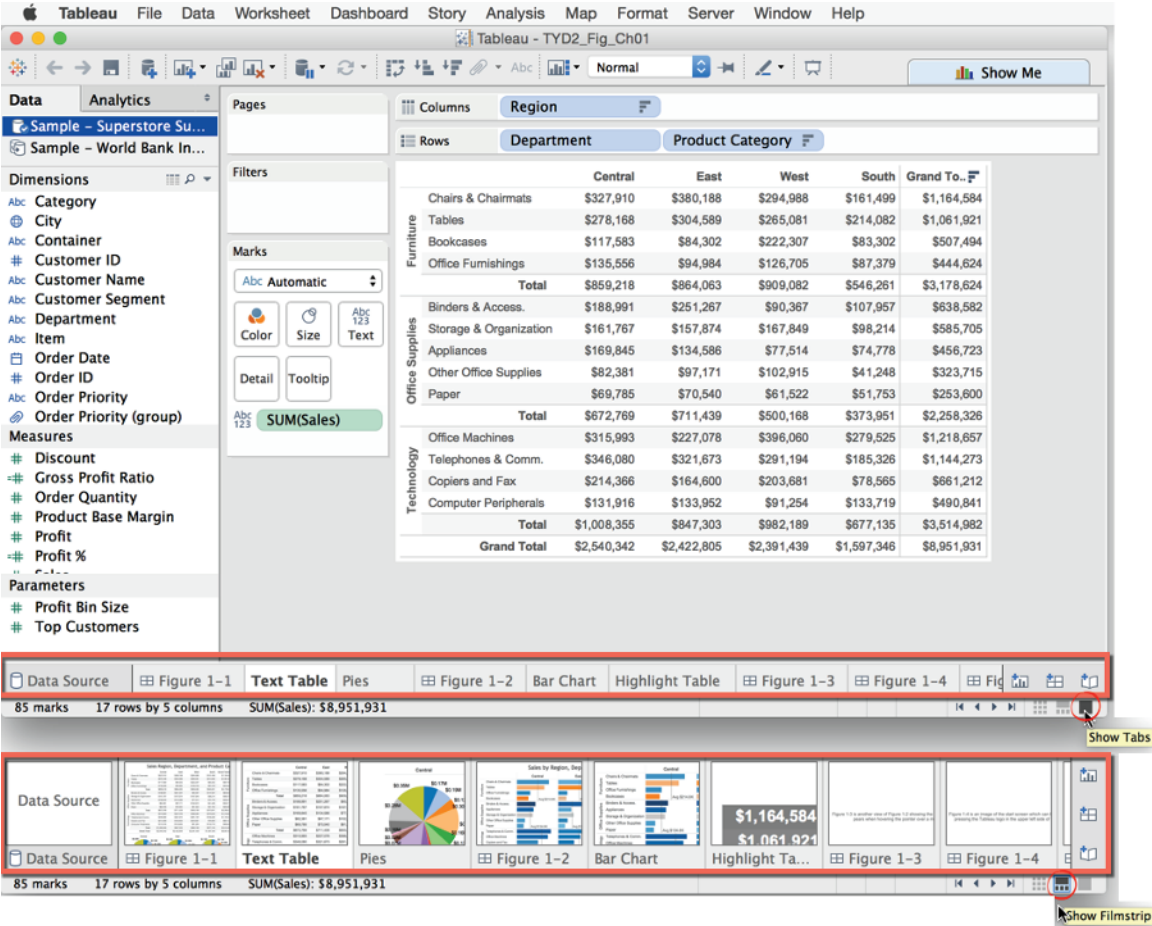


FIGURE 1-8 Show Tabs and Show Filmstrip

What You Need to Know About the Toolbar Menu

At the very top of the sheet workspace in Figure 1-6 is the menu. Once again, the appearance of the menu is slightly different on Windows and the Mac, but both Desktop editions contain the same menu options.

As Tableau Desktop has matured, many options that used to be accessible only from the menu have migrated closer to the workspace. Described in the following sections are those options that are accessed primarily or only via the main menu. The text that follows ignores the menu items that are more easily accomplished with other methods or that are very rarely utilized. You

can find more details regarding the toolbar in Tableau's online manual found in the Help menu.⁷

File Menu

Like any Windows program, the File menu contains New, Open, Save, and Save As functions. The Export Packaged Workbook option allows you to create a packaged workbook (.twbx) quickly. Saving your workbook this way eliminates a couple of clicks versus the more commonly used File/Save As method.

The most frequently used feature found in this menu is the Print to PDF option (a Print menu option on the Mac). This allows you to export your worksheet or dashboard in PDF form. If you can't remember where Tableau places files or you want to change the default file-save location, use the Repository Location menu option to review and change it.

Data Menu

The Paste Data option is handy in a couple of ways. You can use this if you find some interesting tabular data on a website that you want to analyze with Tableau. Highlight and copy the data from the website and then use the Paste Data option to input it into Tableau. Once pasted, Tableau will copy the data from the Windows clipboard and add a data source in the data window.

The Tableau Data Server menu allows you to refresh and append data sources that you have published to Tableau Server. Details related to these features are covered in Chapter 12.

The Edit Relationships menu option is used in data blending. This menu option is necessary if the field names in two different data sources are not identical. It allows you to specifically define the related fields. Chapter 2 covers details related to data blending.

The Replace Data Source is most typically used when you are working with spreadsheet data sources (and the spreadsheet name has been changed) you need to direct Tableau to the new version of the spreadsheet. This feature isn't limited to spreadsheets; it also works for database sources.

Worksheet Menu

Several frequently used features exist in this menu. The Export option allows you to export your worksheet as an image, in an Excel text tables, or to an Access database file. The Actions and Tooltip menu options are covered in detail in Chapter 8. Figure 1-9 shows an example of the output from the Describe Sheet menu option.

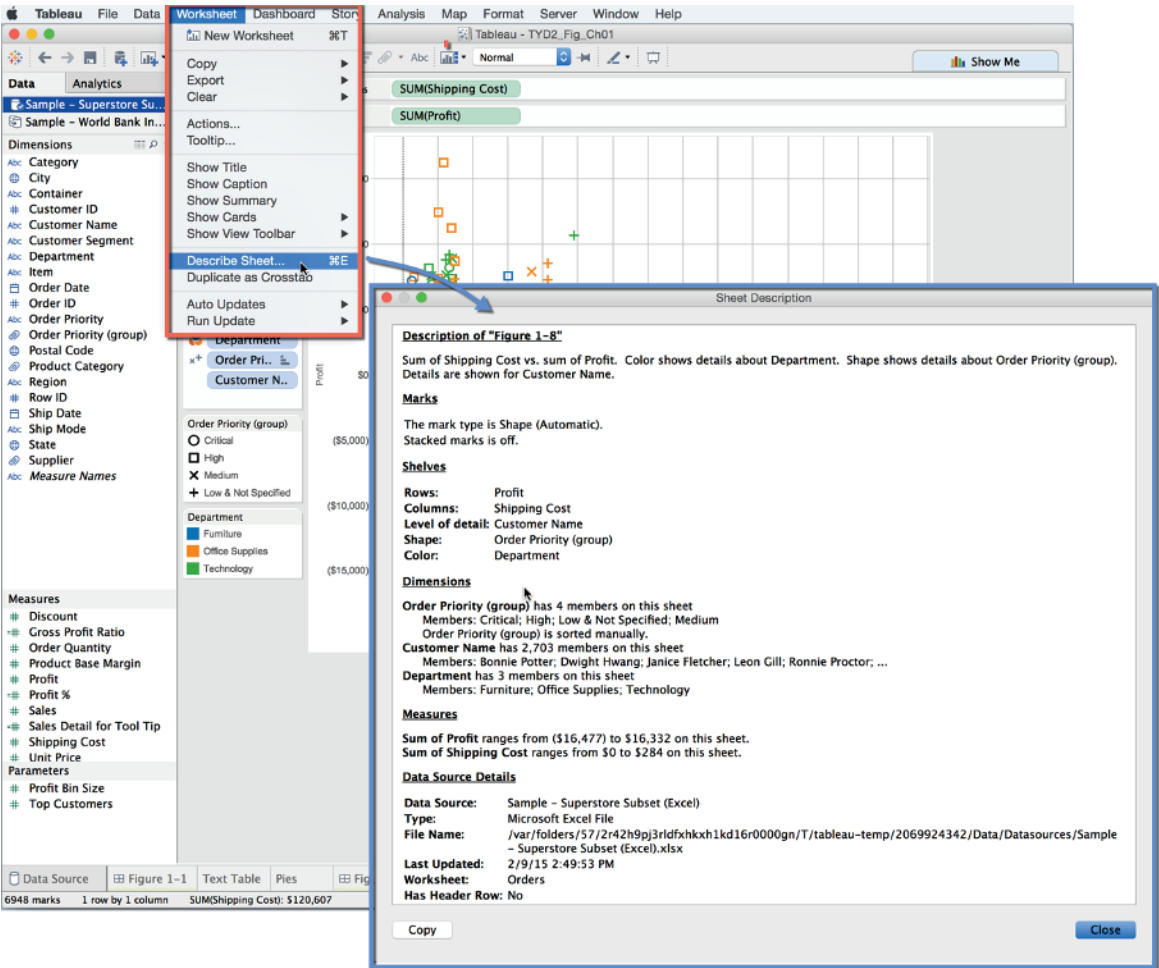


FIGURE 1-9 Describe Sheet output

Using the Describe Sheet menu option creates a summary of the sheet metadata that displays summarized information about the sheet contents and source data. Notice that you can copy the output from Describe Sheet and paste it into another application.

Dashboard Menu

The Action menu is a very useful feature that is reached from both the Dashboard menu and the Worksheet menu. Chapter 8 covers the three types of actions in detail.

Story Menu

The Story menu is one way you can start a Story Point view. This feature is covered in detail in Chapter 10.

Analysis Menu

As your skills grow, you'll venture to this menu to access the Aggregate Measures and Stack Marks options. These switches allow you to adjust default Tableau behaviors that are useful if you need to build non-standard chart types. You'll build an example in Chapter 7 that requires the use of these options. The Create Calculated Field and Edit Calculated Field options are used to make new dimensions or measures that don't exist in your data source.

Tableau Desktop Version 9 offers many new features related to calculated values and table calculations. Chapter 4 has been significantly revised to show the new ways you can create calculated values and table calculations.

Map Menu

The Map menu includes options for Background Maps, Background Images, Geocoding, Edit Locations, Map Legends, Map Layers and Map Options.

The Background Maps option is used to alter the base map type that is being used in your sheet view. The None menu option removes the map image from the background but still plots the marks using latitude and longitude for the placement of the data marks. Use the Offline option if you don't have access to the Internet but still want to look at the map view. The offline maps are less-detailed than Tableau's online maps. Select the Tableau Classic map option if you want to add census data to your maps via color-encoded polygon shapes.

Geocoding is used to import custom locations to Tableau. For example, you may want to plot your company office locations on a map. The Edit locations option is used to correct locations in your data that Tableau doesn't automatically recognize. For example, you may have a misspelled city or state name. Selecting the Map Options exposes the Map Options window that will float over the map. The options contained in that menu allow you to control whether the user can pan and zoom, show the map search control or show the view toolbar.

All these options and more are covered in Chapter 5.

Format Menu

You may not use this menu very often because pointing at anything in your workbook and right-clicking gets you to a context-specific formatting menu more quickly. On rare occasions, you may need to alter the cell size in a text table. Do that from the Cell Size menu option. Or, if you don't like the default

workbook theme, use the Workbook Theme menu option to select one of the other two options. You learn many tips and tricks about formatting in Chapters 7 and 8.

Server Menu

Use this menu if you need to log in and publish work to Tableau Server. The Sign In menu option is used to enter your server address and security credentials. The Switch User and Switch to Self menu options are used for simulating the login credentials of another user to see how a dashboard or workbook will appear for them. Create New User Filter is used to create filters that will hide information from view that you have included in the data source. Chapter 11 covers these options in detail.

The section in Chapter 11 on options for securing reports describes how to use the menu option to create user filters. This provides row-level security by using a dimension to filter out data from view.

If you are using Tableau Desktop to build dashboards for fun or for a blog post, use the Tableau Public menu. To use this service, you must sign up for a free Tableau Public account. The menu options here allow you to save and manage workbooks saved to your Tableau Public account.

Window Menu

The Presentation Mode option removes all design tools from view, making your worksheet or dashboard data stand out. If you want to share a single sheet with someone else, use the Bookmark/Create Bookmark option to save a .tbn file that you can share with another Tableau user. I never use the rest of the menu options in this menu because there are easier ways to accomplish the same things, as discussed throughout this book.

Help Menu

The top section of this menu includes menu options that access Tableau's online manual, training videos, and sample workbooks. All of these options are accessed from the Start page covered earlier in this chapter. Use the Choose Language option to change the default language that Tableau Desktop uses to display text in menus, windows, cards, and content. This also changes how Tableau expresses geographic names in maps and for map search. After you select the new language, Tableau will prompt you to restart Tableau Desktop to effect the desired language change.

The most important feature in the Help menu is contained in the Setting and Performance menu option. The Start Performance Recording option tells Tableau to collect key performance metrics about your workbook. Stopping

the performance recording causes Tableau to build a Tableau dashboard of your Tableau workbook performance. This is a critical feature that is covered in detail in Chapters 8 and 12.

If you need to find your product key, the Manage Product Key menu option will display it. Finally, the About Tableau menu option (Windows only) displays the Tableau version that you are running. If you are using a Mac, this information is located in the Tableau menu option. This information is particularly important if your company is running multiple versions of Tableau. You can install multiple releases of Tableau on your computer, but because different versions are not backward compatible, you should confirm that you are using the correct release before you start creating new analysis.

Understanding the Toolbar Icons

The toolbar displayed in Figure 1-10 makes the most commonly needed functions conveniently accessible. The section headings that follow match the pop-ups that occur in Tableau when you point at the icon.

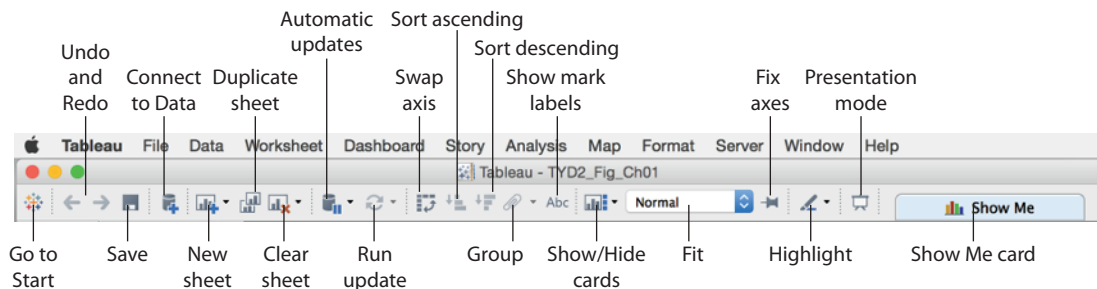


FIGURE 1-10 *Toolbar icons*

Start

Clicking the small Tableau logo on the left side of the toolbar toggles you between the Start page and the workspace.

Undo/Redo

Undo reverses the most recent action in the workbook. Redo repeats the last action you reversed. Use Undo to step back in time to the beginning of your work session in Tableau Desktop. Redo allows you to step forward through your session. If you don't like what you see onscreen, use Undo to go back in time and try again.

Save

Click Save to save changes made in your workbook.

Add New Datasource

This option opens the Connect page where you can create a new connection or open a saved connection from your repository.

New Worksheet, Dashboard or Story

This option creates a new sheet, dashboard, or story in your workbook. You can also add these by right-clicking a Tab or Filmstrip view at the bottom of the work area. In addition, you can add these by clicking the related icons next to the tab or at the bottom of the work area. See the bottom of the view pane in Figure 1-6.

Duplicate Sheet

Make an exact copy of your current sheet. This is handy if you want to experiment with different ways of viewing data without altering the view contained in the original sheet.

Clear Sheet

This option clears the current sheet. Use the drop-down options to clear formatting, manual sizing, axis ranges, filters, sorts, or context temporary files.

Automatic Updates

Use this option to stop auto-updating the view when changes are made. Use the drop-down menu to pause updates for the entire sheet or for quick filters. Suspending auto-updating can be very helpful when you are connected to slow data sources. By suspending updates, you can place many fields into the workspace without delay. Then use the Run Update icon to update the view when you are ready to see the results.

Run Update

When you suspend auto-updates, click the Run Update icon to see the results of your work.

Swap

This icon swaps the fields on the row and column shelves. This will pivot the orientation of your view vertically or horizontally.

Sort Ascending and Sort Descending

These icons allow you to change the order that data is presented based on measures contained in the view. Ascending sorts from smallest to largest values. Descending sorts from largest to smallest values. These sorts persist only during the work session and do not override default sorting defined in the view.

Group Members

Use this feature to create a group by combining selected values. When multiple dimensions are selected, use the drop-down menu to specify whether to group on a specific dimension or across all dimensions.

Show Mark Labels

This option enables you to switch between showing and not showing labels. As you become more experienced with Tableau Desktop, you will find more flexible ways to display marks in your view by using the Marks Card Label option.

Show/Hide Cards

You can reset what cards are included in your sheet view, including title, caption, summary, legends, quick filter, parameters, map legends, the column shelf, the row shelf, pages shelf, measure values shelf, current page, and the marks card.

Fit

You can specify how the view should be sized within the view. Normal is the default viewing option and uses the least amount of screen real estate possible to fully display all of the marks. This may result in vertical or horizontal scroll bars. Fit Width, Fit Height, and Fit Entire View allow you to force Tableau to display the view without scrolling within the specified fit orientation.

Fix Axes

This icon toggles between a locked axis that shows a specific range and a dynamic axis that adjusts the range based on the minimum and maximum values in the view. Tableau's default is to use the dynamic range option, which is the best if you are presenting dynamically changing data. The Fix Axes option should be used with care. It is most appropriately used with static data where the values are known.

Highlight

Highlight turns on highlighting for the selected sheet. Use the option on the drop-down menu to define how values will be highlighted. For example, if

you want to highlight based on a specific combination of fields, select the specific fields you want Tableau to combine for highlighting the view. This is particularly helpful when displaying your data in a scatter plot if you want to highlight based on a combination of dimensions.

Presentation Mode

This option toggles the view between Presentation mode and normal work mode. Presentation mode removes all design tools from view so that your audience can focus on the information being presented.

Show Me

This displays alternative ways to look at data. The types of charts available are dependent on the fields already in the view as well as any selections you have made in the data window. Chapter 3 covers this feature in detail.

The Data Window, Data Types, and Aggregation

When you connect Tableau to a data source, it is expressed in the data window. You can connect to as many different data sources as you want in a single workbook. The small icons associated with data connections provide additional details about the nature of the connection. Figure 1-11 shows a workbook with three different data connections.

There are subtle visual clues regarding the exact state of each connection. The blue check mark icon next to the Coffee Chain (Access) data connection indicates that it is the primary active connection for the sheet. The related icon shows two cans with an arrow and a blue check mark. This denotes that the connection is a data extract. A single can without an arrow denotes a direct connection to the data source.

Note the blue highlight on the Sample – Coffee Chain data source. The highlighting is used only when multiple data sources have been connected to the workbook and indicates which data source fields are on display in the dimensions and measure areas.

For example, clicking the Sample – Superstore Subset data source would cause that data source to be highlighted in blue and its related dimensions and measures to be displayed. And orange highlight would appear on the left of the Dimensions and Measures windows along with a small link icon next to any fields that the two data sources have in common. This is used to indicate the potential for data blending, which is covered in Chapter 2.

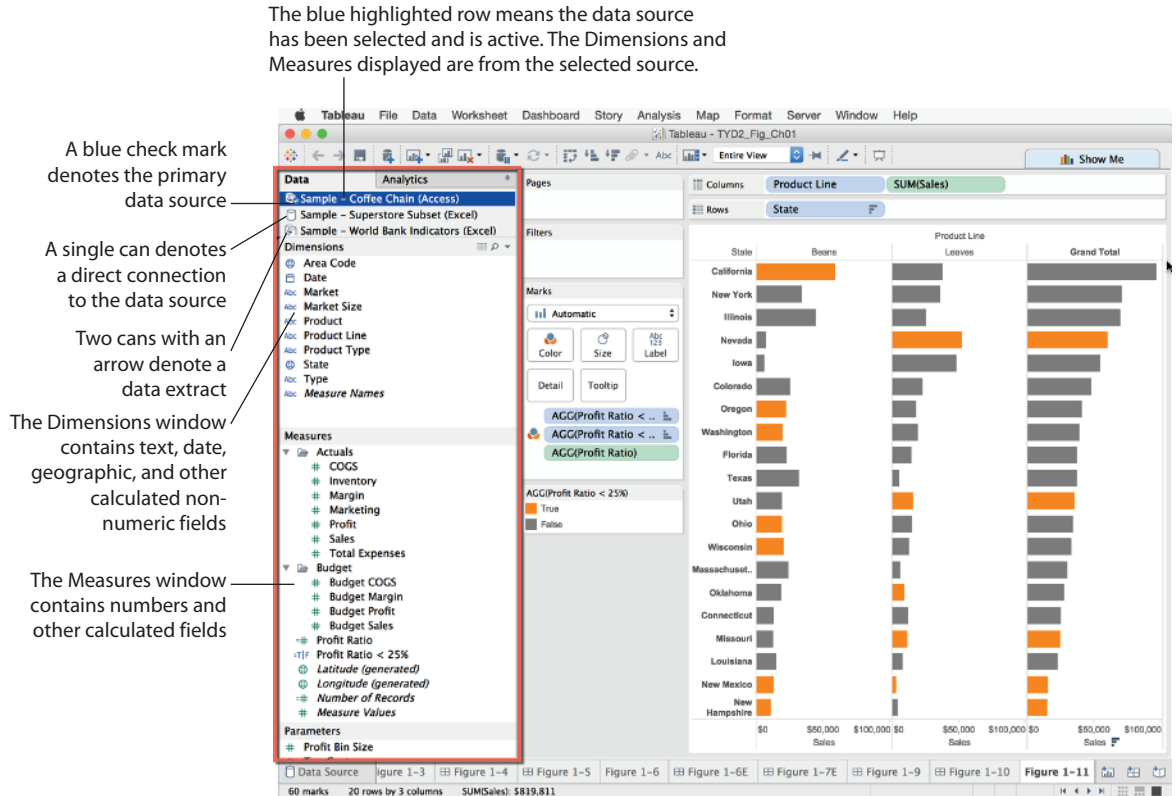


FIGURE 1-11 Data window

The Superstore subset (Excel) data connection is a direct connection. This is indicated by the single can icon. The World Bank Indicators (Excel) data source at the bottom of the data window is another data extract, denoted by the icon with two small cans and the arrow. Data extract files copy and compress data from any data source into Tableau's proprietary data engine. Sometimes the compression and performance improvement with extracts can be significant.

When you create data connections, Tableau will evaluate the fields and place them on the dimensions and measures shelves automatically. Tableau normally gets the fields placed correctly. If a field is placed in an area you don't prefer, simply drag the field to the location you desire.

For example, if you connect to a spreadsheet that contains a customer identification number, that field may be placed into the Measures pane. You may want that to be a dimension in your workbook. Dragging a customer identification number from the Measures pane into the worksheet would result in the field

being summed. If that field was dragged from the dimension shelf, the customer identification number would behave like a dimension and be expressed in a column or row the same way product line and state are expressed in Figure 1-11.

Data Types

Tableau expresses fields and assigns data types automatically. If the data type is assigned by the data source, Tableau will use that data type. If the data source doesn't specifically assign a data type, Tableau will assign one. Tableau supports the following data types:

- Text values
- Date values
- Date and time values
- Numerical values
- Geographic values (latitude and longitude used for maps)
- Boolean values (true/false conditions)

Focus on the icons next to the fields contained in the Dimensions and Measures shelves in Figure 1-11. These icons denote specific data types. Small globes are geographic features; calendars are dates. A calendar with a clock is a date/time field. Numeric values have pound signs, and text fields are denoted by "abc" icons. Boolean fields have "T/F" icons. An equal sign (=) denotes that field is a calculated value. Explore Tableau's manual for more examples.

Aggregation

It is often useful to look at numeric values using different aggregations. Tableau supports many different aggregation types, including:

- Sum
- Average
- Median
- Count
- Count Distinct
- Minimum
- Maximum
- Percentile
- Standard Deviation

- Standard Deviation of a Population
- Variance
- Variance of a Population
- Attribute (ATTR)
- Dimension

If you aren't a statistician or database expert, refer to Tableau's manual for detailed definitions of these aggregation types. Adding fields into your visualization results in default aggregations being displayed. Tableau allows you to change the default aggregation or just alter the aggregation type for a specific view.

To change the default aggregation, right-click any numeric field and change its default by selecting the menu option (default properties/aggregation). You can also change the aggregation of a field for a specific use in a worksheet. When the term "pill" is used in this context, it means that a field that has been placed on a view card, the Rows Shelf, or a Columns Shelf. In other words, the field is being actively used in the sheet.

Figure 1-12 provides an example. By right-clicking the SUM (Sales) pill on the columns shelf and selecting the Measure (SUM) menu option, you can select any of the aggregations highlighted.

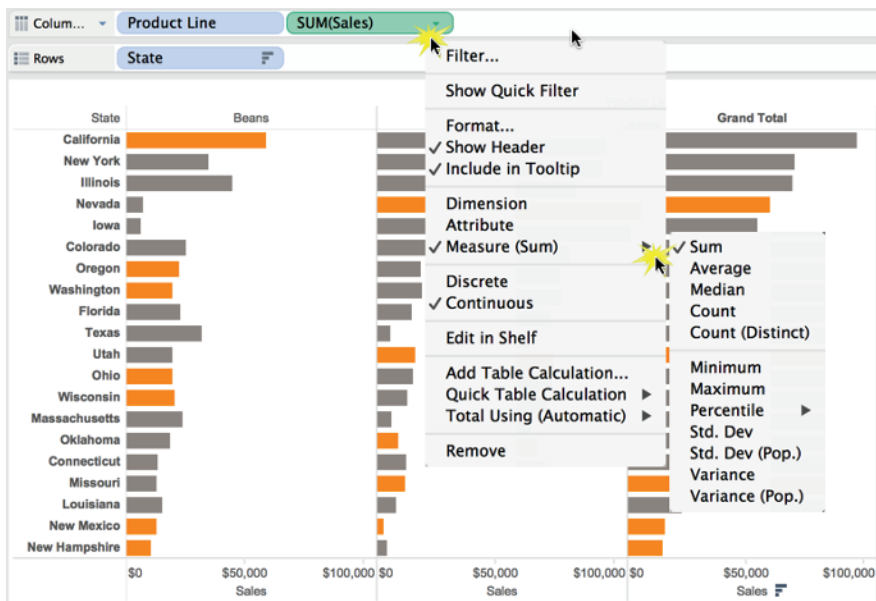


FIGURE 1-12 Changing aggregation

The data source used in Figure 1-12 is a data extract of an Access database called Coffee Chain. In Tableau Desktop versions before V9, if you are working with Excel, Access, or a text file source and you don't see the full range of expected options, run a data extract and you'll see that more aggregation options will become available. In Tableau Desktop V9, running an extract to get more aggregation types is not necessary. You will learn about aggregation in Chapter 4.

A Word About Dimension and Attribute

Most aggregates involve mathematical concepts that should be comprehensible if you don't have a statistics degree. Even if you don't understand specifically what standard deviation is, you probably appreciate that it has something to do with variation of data within a set of numbers.

The attribute aggregate (ATTR) type is best understood by looking at examples of it in use. Refer to Chapter 7 and Appendix E for examples.

Building Visualizations with the Row and Column Shelves

Row and column shelves are used to express data on the vertical and horizontal axes in the view. Dimensions and measures can be displayed in any order and on either shelf. Figure 1-13 is a basic time series chart that shows sales trends by year and then quarter.

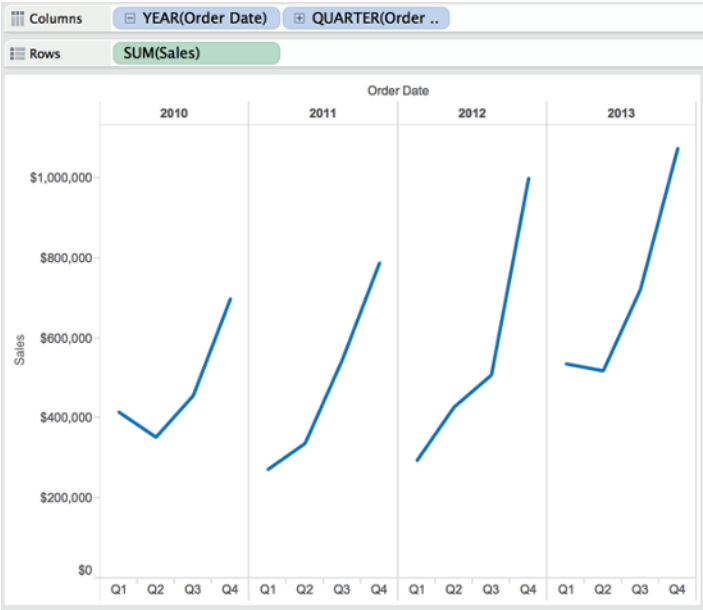


FIGURE 1-13 Time series by year, quarter

The time series has breaks in the line because time is discretely broken down by year and then quarter. Figure 1-14 displays the same data, rearranging time by showing quarter first and then year, making it easier to see how sales changed in each quarter.



FIGURE 1-14 Time series by quarter, year

Dragging the year field (pill) to the right of the quarter pill on the Columns shelf altered the context of the view making it easier to see how sales changed in each quarter over time.

Number of Records, Measure Values, and Measure Names

Tableau automatically adds three fields to every dataset:

- Number of records
- Measure names
- Measure values

Number of records is a calculated value that sums the number of rows in the data source. As mentioned earlier, field icons preceded by an equal sign are calculated values. Measure Names and Measure Values are special fields that allow you to display multiple measures on a single axis. Figure 1-15 was created

by double-clicking the Measure Names field and clicking the Swap icon on the toolbar to change the orientation of the chart.

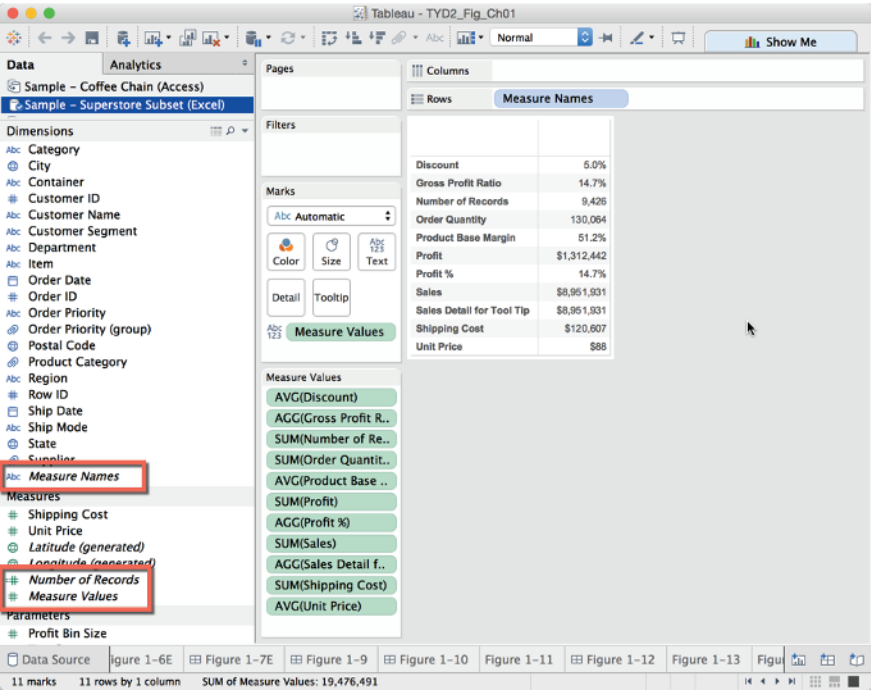


FIGURE 1-15 Measure Names, Measure Values

When the Measure Values field is used in a view, a new shelf appears that holds the pills for every measure in the dataset. Selecting Measure Names and Measure Values will automatically display all of the measures in your data source with their corresponding descriptions. You can use the Measure Names pill to filter out specific measures by right-clicking in the pill and de-selecting measures you no longer want to display on the axis.

Understanding Color in Icons and Pills

Have you noticed the color of the pills placed on shelves is either green or blue? Look at Figures 1-13 and 1-14 again. Can you guess what those colors mean? Most people think blue pills are dimensions and green pills are measures. That is a good guess, but the right answer is more subtle. Figure 1-16 displays the time series without any breaks between the years. Notice that there is only one pill on the Column Shelf and it is green.

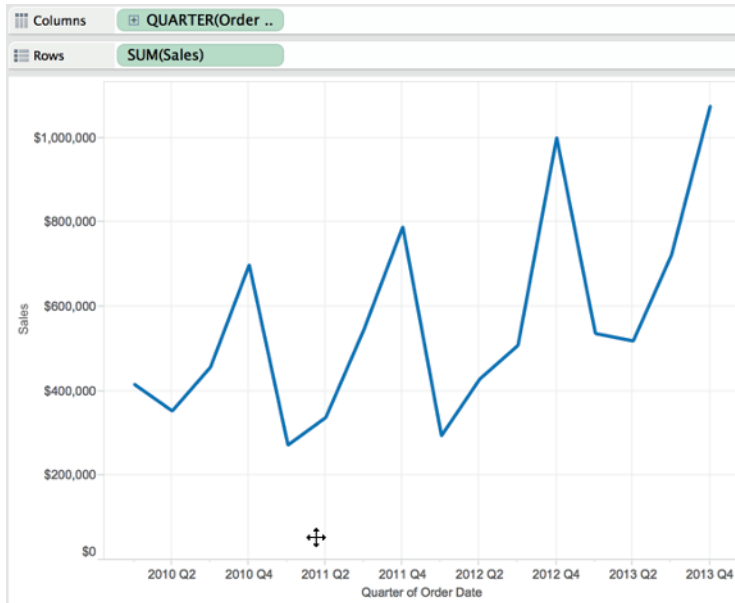


FIGURE 1-16 Time series with continuous date

Green denotes continuous and blue measures discrete. When a time dimension pill is green, the data is displayed using an unbroken, continuous line. In Figures 1-13 and 1-14, the time dimension pills are blue. Time buckets are displayed discretely by year and then quarter. Measures aren't always continuous either. Histograms convert normally continuous measures into discrete dimensions by making a new, discrete bin field from a measure. You'll see an example of a histogram in Chapter 3.

Using the View Cards Filter and Highlight Data

The View Card area to the right of the data window in Figure 1-8 is used to apply filters in your sheet and to define the use of color, shape, size, and other visual means to convey information in your visualization. Fields placed on the Pages Shelf create an auto-scrolling filter. Fields placed on the Filter shelf create manual filters. Let's focus on the Marks card area first.

The Marks Card Properties

The drop-down selector at the top of the Marks area is used to select the mark type for display. By default, it is defined as Automatic. In this mode, Tableau Desktop will pick the mark type used. You can override that selection by picking any of the available mark types that Tableau supports.

You can use different visual tools to convey meaning in your visualization by placing fields on the desired Marks button. Note that when you hover your mouse over the buttons, additional information will appear:

- **Automatic:** By default, Tableau will supply an appropriate mark type but you can change the mark type used to display the measure by selecting the drop-down menu.
- **Color:** This expresses discrete or continuous values.
- **Size:** This expresses discrete or continuous values.
- **Label:** One or more fields can be expressed as mark labels.
- **Detail:** This disaggregates the marks plotted when dimensions are used and makes the field available in Tooltips.
- **Tooltip:** This makes fields available to ToolTips without disaggregating data.
- **Shape:** This expresses discrete or continuous values.
- **Path:** This is available when the Line or Polygon mark types are selected and your data supports the sequencing of the data. You can path-encode your data using a dimension or a measure.

Multiple fields can be placed on the Color, Label, Detail, and Tooltip buttons. Figure 1-17 displays a scatter plot with color, shape, and size all being utilized to visualize a comparison of profit and shipping cost.

The Column shelf in Figure 1-17 contains shipping costs, making that measure plot horizontally across the page. Profit, on the Row shelf, is displayed vertically. Color is being used to display department, Shape shows order priority (group), and the size of the marks provides information on sales. The customer name is displayed with the Label card, and the average unit price was placed on the Tooltip card, making it available within the tooltip.

The scatter plot in Figure 1-17 is displaying four measures (one inside the tooltip) and three dimensions while displaying the outliers in a way that makes them stand out. Notice the customer names display only when they don't overlap. All of the visual styles were applied by dropping individual fields on the desired Marks card buttons.

Look at Figure 1-17 and focus on the pills contained in the Marks card. Notice that the little icons to the left of each pill provide an indication of how that field is being visualized (what Marks card button it was placed on). The colored circles to the left of Department denote that department is being expressed using color in the view.

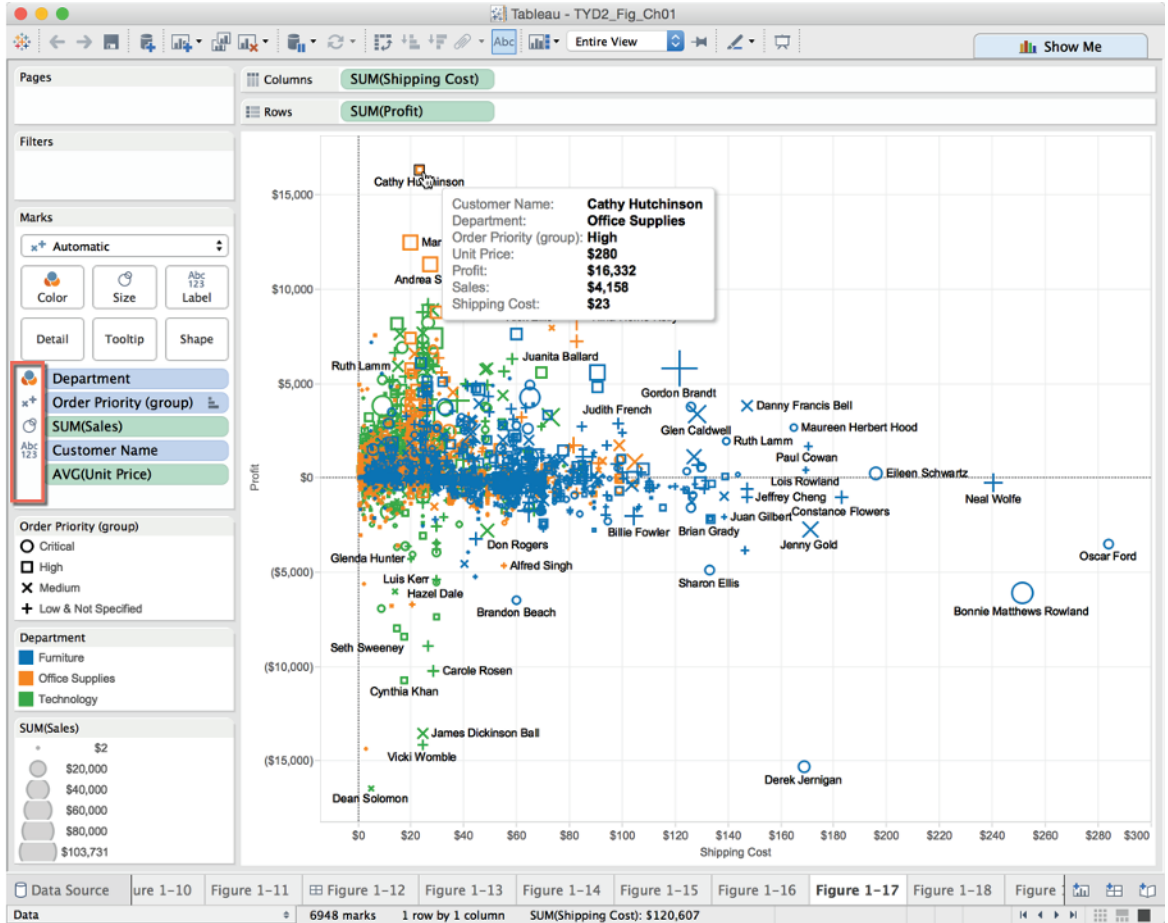


FIGURE 1-17 Scatter plot

One way that you can alter how each field in the Marks card is being used is to point at the small icons to the left of each pill, click the icon, and select another display option.

The Pages Card

As mentioned earlier, any field placed on the Pages shelf generates a scrolling filter that will advance through each member of the set of data that is being displayed manually or automatically.

The Pages shelf creates animated visualizations in Tableau Desktop (this feature does not apply to Tableau Server) by stepping through all of the discrete members of the set. For example, placing a date field on the Pages shelf that

is expressed as month-year will enable the page filter to increment through each month-year over time.

In Figure 1-18, you see that when a field is placed on the Pages shelf, another supporting shelf can be accessed directly under it that contains a manual field selector; auto-scrolling controls providing forward, pause, and stop control over scrolling speed; and a Show History check box.

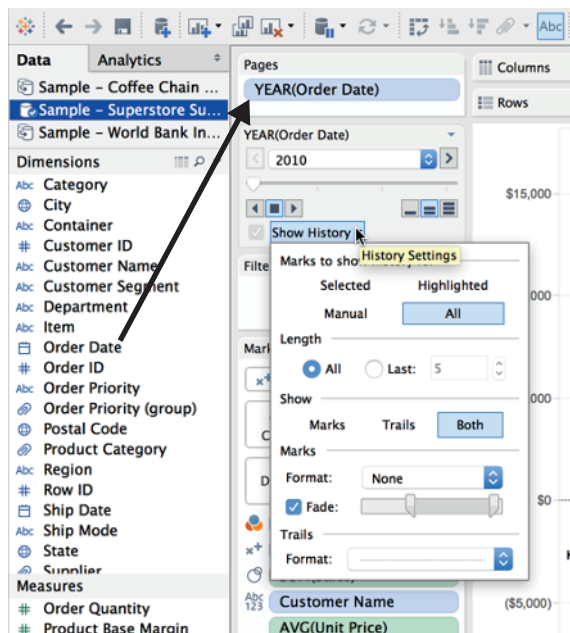


FIGURE 1-18 Pages shelf

In addition, any field placed on the Pages shelf will be converted to a discrete field type because each page will be a member of that field.

Checking the Show History menu exposes options that provide selections to control the way history is displayed and how many marks will be displayed while the filter increments through whatever field has been placed on the shelf.

Trails are lines that connect marks sequentially as scrolling occurs. Selections made in the show section of the menu enable you to control whether marks, trails, or both marks and trails are displayed as the auto filter increments. The Marks section provides controls over the color and fade of the marks. The Trails section provides color and line style controls for the trails. Auto-scrolling filters are not supported in Tableau Server, but they can be consumed via Tableau Reader or Tableau Desktop.

The Filter Card

To filter based on any field (dimension or measure), drag the field to the Filters shelf. The available filter types are somewhat dependent on whether the data is continuous or discrete. You can also filter based on a hierarchy of selections that you will see in the filter menu. To expose the filter on the desktop, right-click the field pill and select the Show Quick Filter option. You learn more about quick filters in Chapters 7 and 8.

Using the Status Bar to Understand Visualizations

The status bar appears in the lower left of the worksheet. It provides basic metrics about the number of marks displayed in your visualization. The map visualization in Figure 1-19 demonstrates the value of the status bar.

The map in Figure 1-19 plots pie charts that show sales by postal code and department. Notice the status bar at the bottom left of the worksheet indicating 3,356 marks are in view. The total sales value of the marks is \$8,341,246. Each slice in the pies counts as a mark. The status will change if a mark or groups of marks are selected in the worksheet, reflecting the count and value of the selection.

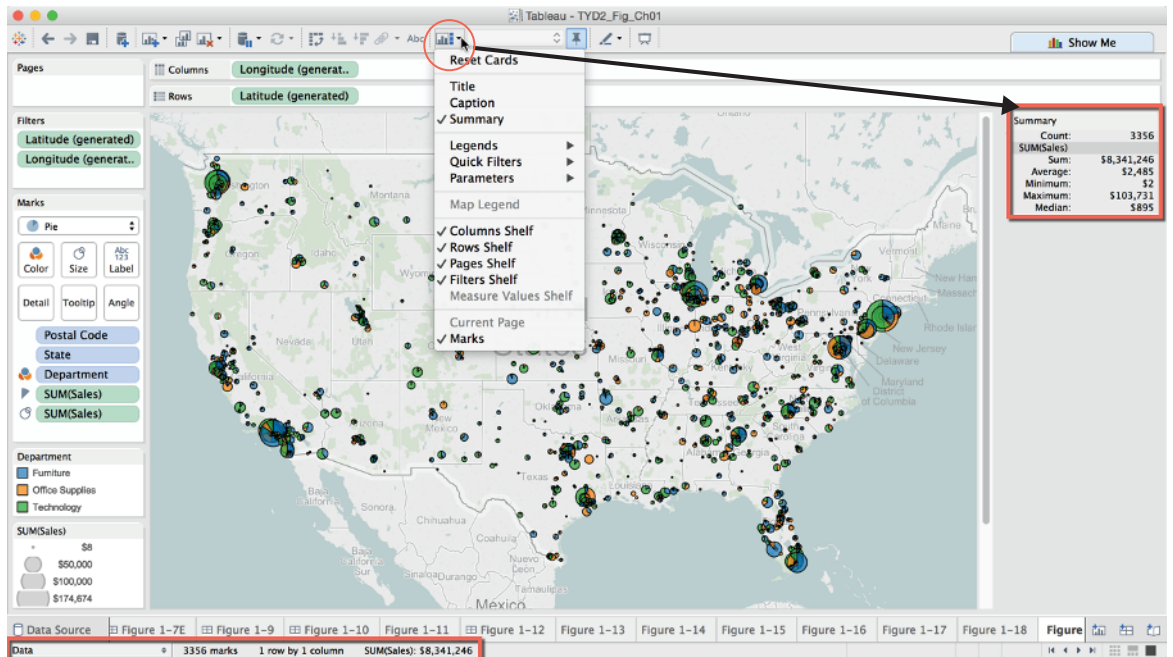


FIGURE 1-19 Status bar and summary

The larger summary card in the upper right is optional. Enable it by using the Show/Hide Cards icon circled in Figure 1-19, and then selecting Summary menu option.

Saving Time with the Show Me Button

Using the Show Me button allows you to build visualizations very quickly. If you can decide on the combination of dimensions and measures you want to analyze, Show Me will build your visualization for you. It will place all of the pills on shelves automatically. See how a map similar to Figure 1-19 can be re-created using the Show Me button in Figure 1-20.

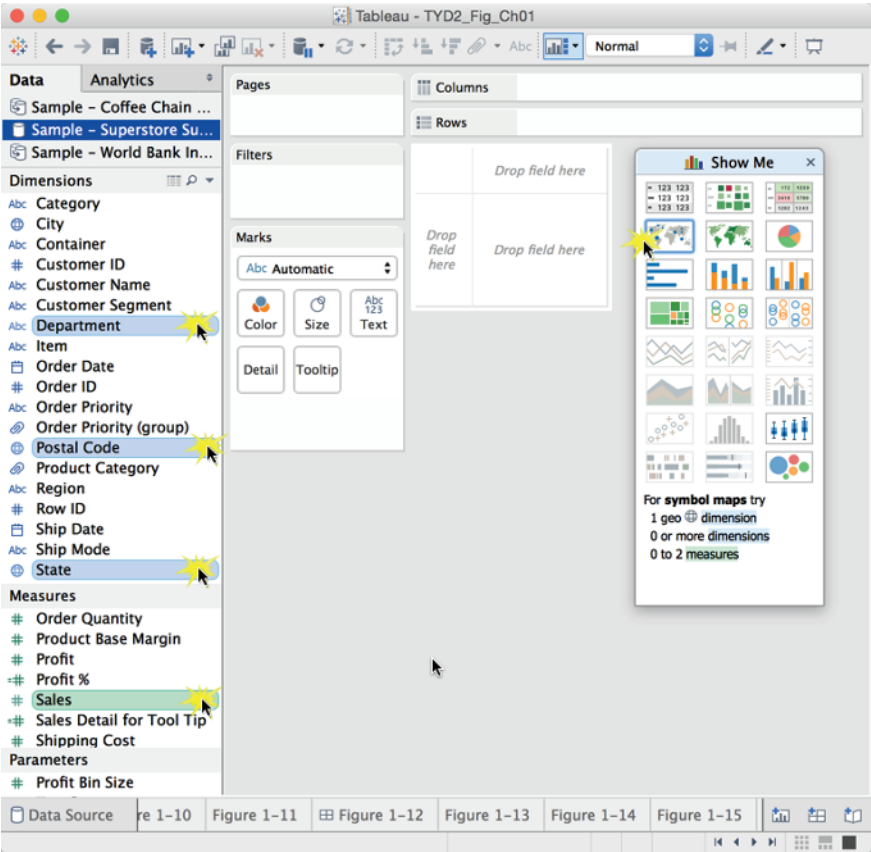


FIGURE 1-20 Building a map with Show Me

Using the Sample – Superstore Subset (Excel) data source, multi-select State, Postal Code, Department, and Sales. Then pick the symbol map and hold the Ctrl button (Windows only) down on your keyboard while pointing at and

clicking each field. To multi-select fields on the Mac, use the Command key. Your screen should look like Figure 1-20.

Show Me can be dragged to any location on your desktop. The text at the bottom of the Show Me dialog box provides additional feedback on the combination of dimensions and measures that should be selected in order for the chart type to be available. Other highlighted chart styles are also supported by the selections of measures and dimensions. The charts that are grayed-out are not currently available based on the current field selections. Note that the time series charts are all gray because a date dimension hasn't been selected.

The map in Figure 1-19 was created by selecting the map highlighted by Show Me. The marks were styled using the Color Marks card fading the color and putting a black border around the marks. Leaving the Show Me button open allows you to quickly pick many different chart styles and see the results. Show Me is a time-saver and a great way to see how different pill placements can affect the appearance of your visualization.

SUMMARY

Now that you've got a basic introduction to the desktop workspace, in the next chapter you learn a variety of ways you can connect to data and the different kinds of data sources you can connect to using Tableau Desktop.

NOTES

1. Edward R. Tufte, *The Visual Display of Quantitative Information* (Cheshire, CT: Graphics, 2001), 91.
2. Margaret Rouse, NoSQL (Not Only SQL Database), "Essential Guide, Big Data Applications: Real-World Strategies for Managing Big Data," SearchDataManagement, October 5, 2011, <http://searchdatamanagement.techtarget.com/definition/NoSQL-Not-Only-SQL>.
3. Andrew Ryan, "Under the Hood: Hadoop Distributed Filesystem Reliability with Namenode and Avatarnote," <https://www.facebook.com/notes/facebook-engineering/under-the-hood-hadoop-distributed-file-system-reliability-with-namenode-and-avata/10150888759153920>.
4. Stephen Swoyer, "Report Debunks Business Intelligence Usage Myth," <http://tdwi.org/Articles/2009/05/20/Report-Debunks-BI-Usage-Myth.aspx?Page=1>.
5. Stephen Few, *Information Dashboard Design: The Effective Visual Communication of Data*, Berkeley, California, (O'Reilly Media, Inc, 2006), 4.

6. "The Art of Analytics," Keynote by Christian Chabot and Chris Stolte at the Tableau Customer Conference 2014, September 9, 2014. <https://tc14.tableausoftware.com/keynote>.
7. "The Tableau Workspace, Toolbar," accessed December 2, 2014, onlinehelp.tableausoftware.com/v9.0/pro/online/windows/en-us/help.htm#environ_workspace_toolbar.html.