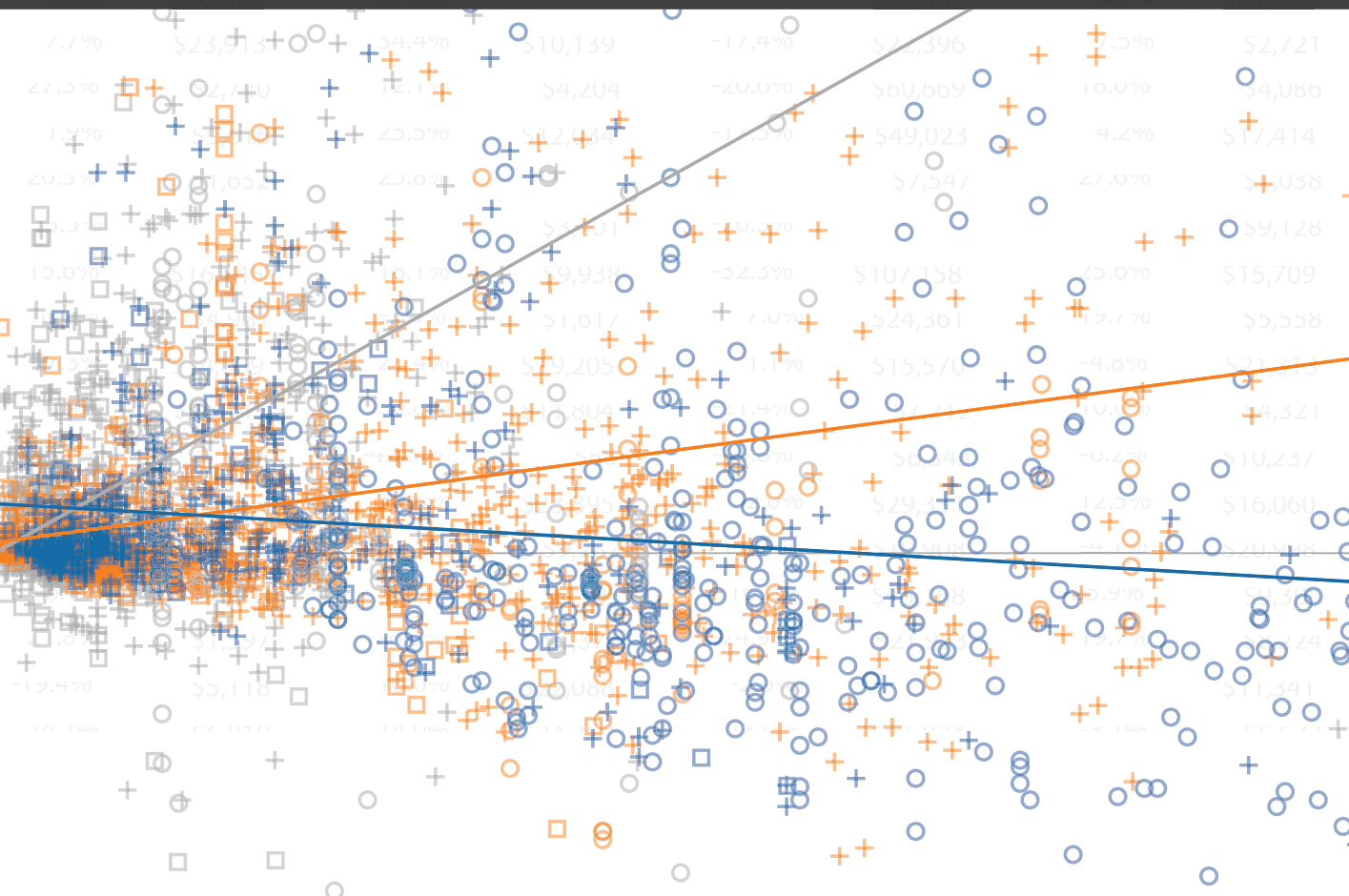


Foreword by Christian Chabot, CEO, Co-founder and Chairman, Tableau Software

Tableau Your Data!

Fast and Easy
Visual Analysis with
Tableau Software®



Daniel G. Murray, with the InterWorks team

WILEY

CHAPTER 1

Creating Visual Analytics with Tableau Desktop

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

EDWARD R. TUFTÉ¹

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 information (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 proprietary 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 requires technical expertise and time. The people with the technical chops to master them are product specialists that don't always know the best way to present the information.

The scale, velocity, and scope of data today demands reporting tools that deploy quickly. They must be suitable for non-technical users to master. They should connect to a wide variety of datasources. 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 that have 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 provides 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 that this IT-centric control model has failed to deliver compelling answers that attract users.

People want to make informed decisions with reliable information. They need timely reports that present the evidence to support their decisions. They want to connect with a variety of datasources, and they don't know the best ways to visualize data. Ideally, the tool used should automatically present the information using the best practices.

THE BUSINESS CASE FOR VISUAL ANALYSIS

Whether the 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 analysis 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)

By interacting with data in real-time while using appropriate visual analytics, Tableau 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, but speed in the design and build stage of type 1 reports is also important when a new type 1 report is created. To effectively enable type 2 and 3 analyses the reporting tool must adapt quickly to ad hoc queries and present the data in intuitively understandable ways.

HOW VISUAL ANALYTICS IMPROVES DECISION-MAKING

Rendering data accurately with appropriate visual analytics reduces the time required to achieve understanding. Review the following examples to see how visual analytics can reduce the time to insight. The goal of these reports is to provide sales analysis by region, product category, and product sub-category.

Figure 1-1 presents data using a grid of numbers (crosstab) and pie charts. Crosstabs are useful for finding specific values. Pie Charts are intended to show one-to-many comparisons of dimensions. The pie charts compare sales by product sub-category.

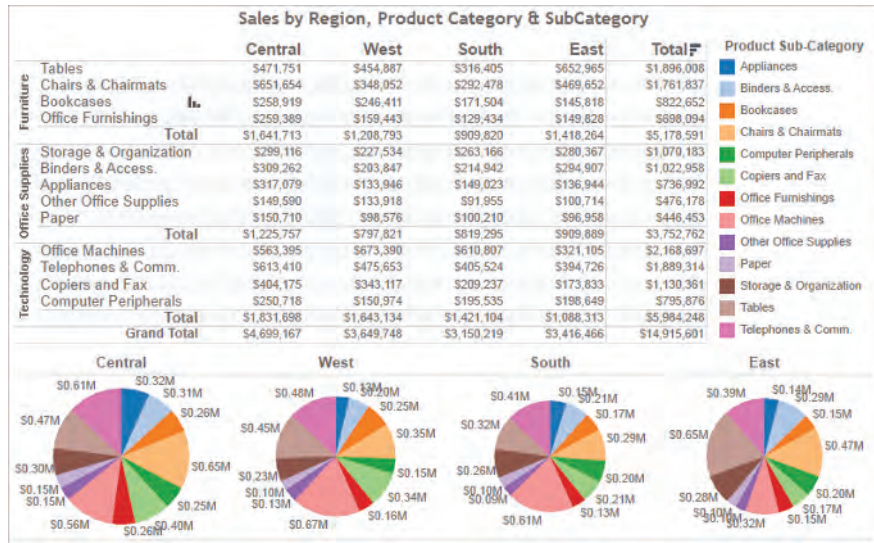


FIGURE 1-1 Sales Mix Analysis using a crosstab and pie charts

Crosstabs are not the most effective way to make one-to-many comparisons or identify outliers. Pie charts are commonly used for comparisons but are one of the least effective ways to compare values across dimensions. It is difficult to make precise comparisons especially between slices, and even more so when there are many slices.

Figure 1-2 employs a bar chart and heat map to convey the same information. Bar charts provide a better means for comparing product sub-categories. The heat map on the right provides total sales for each category. The gray scale color range highlights the high and low selling product sub-categories. The color encoding in the bar chart provides additional information on profit ratio. Reference lines in the bar chart display the average sales for all product sub-categories within each region.

Clearly the bar chart and heat map communicate the sales values more quickly while adding profit ratio information with the use of color. The reference lines within each region and product category provide average sales values. One could argue that the bar chart doesn't communicate the details available in

the crosstab, but in Figure 1-3 those details and more are provided via Tooltips that pop out when you point your mouse at a mark.

Appropriate visual analytics improve decision-making by making it easier to see summary trends and outliers without sacrificing desired details by making those details available on demand.

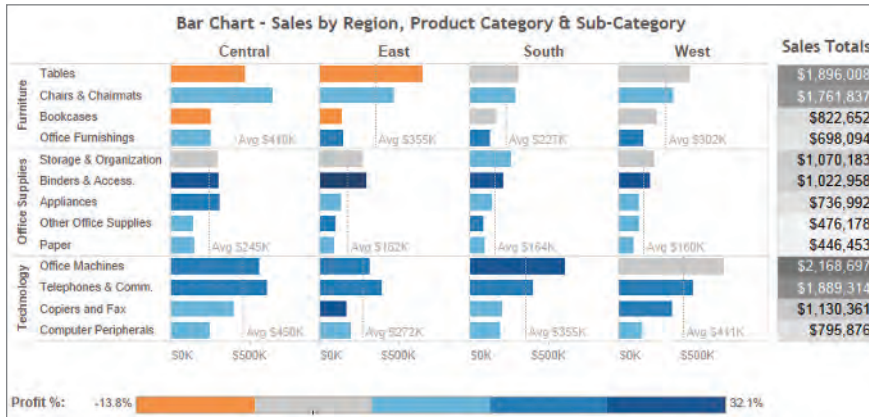


FIGURE 1-2 Sales Mix Analysis using a bar chart and heat map

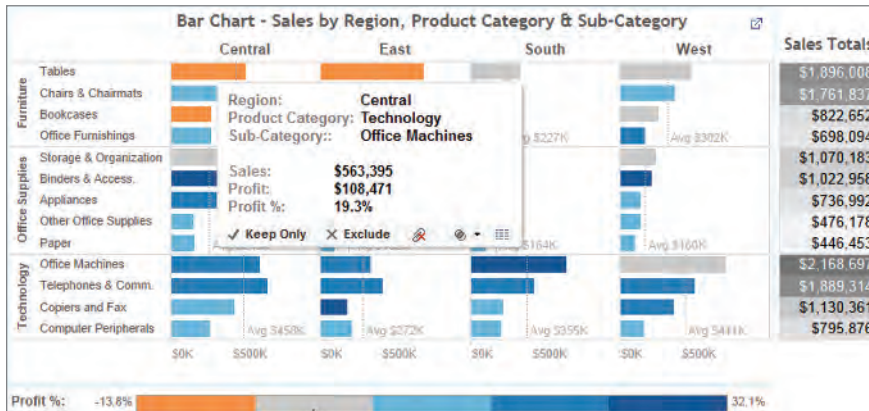


FIGURE 1-3 Adding labels and Tooltips

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 datasources.
- **Visual Competence**—Provide appropriate graphics by default.
- **Sharing**—Facilitate sharing of insight.
- **Scale**—Handle large data sets.

Traditional BI reporting solutions aren't adapted for the variety of datasources 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.

THE TABLEAU SOFTWARE ECOSYSTEM

Tableau's product line includes desktop design and analysis tools for creating and consuming data. For larger deployments, Tableau Server permits information consumers to access reports in a secure environment without the need to load software. Reports are consumed in Tableau Server via a web browser. Tableau Server also enables reports to be consumed on iOS or Android tablet computers. Tableau Public is a free tool that facilitates sharing public data on the web via blogs or webpages. For those that want a hosted solution, Tableau Public Premium is a fee-based service that uses the same technology as Tableau Public in a private consumption environment.

TABLEAU DESKTOP AND TABLEAU READER

Desktop is the design tool for creating visual analytics and dashboards. There are two versions: Personal Edition and Professional Edition. Professional Edition is more popular because it connects to a wider variety of datasources than Personal Edition. Less common datasources can be accessed via the Open Database Connectivity (ODBC) standard.

Tableau Desktop

Table 1-1 displays the available connections arranged by the type of datasource. Personal Edition only connects to local files.

TABLE 1-1 Datasources Accessible to Tableau Desktop

| LOCAL FILES | RELATIONAL DATABASES | ANALYTIC DATABASES | DATA APPLIANCES | DATA CUBES | NOSQL DATASOURCES | WEB SERVICES APIS | OTHER |
|----------------------------|----------------------------------|--------------------|-----------------|-----------------------------|-------------------------|--------------------------------------|-------|
| Microsoft Excel | Firebird | Action Vectorwise | IBM Netezza | Oracle Essbase | Cloudera Hadoop | Google Analytics | ODBC |
| Microsoft Access | IBM DB2 | EMC Greenplum | Teradata | Microsoft Analysis Services | Hortonworks Hadoop Hive | Google Big Query | |
| Text files (txt, csv) | Microsoft SQL Server | ParAccel | SAP Hana | Microsoft PowerPivot | MapR Hadoop Hive | ODATA | |
| Import from Workbook (tbn) | MySQL | SAP Sybase IQ | | | DataStax Enterprise | Salesforce | |
| Tableau Data Extract (tds) | Oracle | HP Vertica | | | | Windows Azure Marketplace Datamarket | |
| | PostgreSQL | Aster Database | | | | Amazon Redshift | |
| | Progress OpenEdge | | | | | | |
| | SAP NetWeaver Business Warehouse | | | | | | |
| | SAP Sybase ASE | | | | | | |

Tableau Desktop is licensed by a named-user. Tableau allows you to reassign licenses and also permits you to install Tableau Desktop on multiple computers so long as the named-user is the only person with access to them.

Tableau Reader

Tableau also permits you to share content with another desktop tool. Tableau Reader is a free version that allows users to consume Tableau Desktop reports without the need for a paid license. The only requirement is that the Tableau report be saved as a packaged workbook.

File Types

You can save and share data using a variety of different file types. The differences between each file type relates to the amount and type of information being stored in the file. Table 1-2 summarizes different Tableau file types.

TABLE 1-2 Tableau File Types

| FILE TYPE (FILE EXTENSION) | SIZE | USE CASE | INCLUDES |
|----------------------------------|-------------------|---|--|
| Tableau Workbook (twb) | Small | Tableau's default way to save work. | Information to visualize data. No source data. |
| Tableau Datasource (tds) | Small | Accessing frequently-used datasources. | Server address, password, and other metadata related to the datasource. |
| Tableau Bookmark (tbn) | Normally small | Sharing worksheets from one workbook to another. | Information to visualize the datasource if the source workbook is a packaged workbook. |
| Tableau Data Extract (tde) | Potentially large | Improves performance. Enables more functions. | Source data as filtered and aggregated during extract. |
| Tableau Packaged Workbook (twbx) | Potentially large | Sharing with Tableau Reader or those without access to the source data. | Extracted data and workbook information to build visualizations. |

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 that don't have a Tableau Desktop license or don't have access to the datasource you can save your work as a packaged workbook (twbx) by using the Save As option when saving your file.

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

Tableau Bookmarks (tbn) allow you to share a single worksheet from your workbook with others. To create a bookmark file, access the main file menu window/bookmark/create bookmark option.

Tableau Data Extracts (tde) leverage Tableau's proprietary data engine. When you create an extract your data is compressed. If your datasource is from a file (Excel, Access, text) Data Extracts add formula functions that don't exist in those sources—including count distinct and median. 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 Server

If you produce a large number of workbooks that have to be updated regularly or you have a large number of people consuming your work, Tableau Server will save you time. Server allows people to view and interact with your work via a web browser. Server will also automatically refresh data extracts that have been published to Tableau Server.

Server is licensed in two ways: by named-user or by core licensing. Named-user licensing makes sense in smaller deployments when fewer than 150 people need access to Tableau Reports. In larger deployments with dynamic access requirements, core licensing is more cost-effective and reduces administrative time because the license is defined by the number of cores in your database server's processor.

Tableau Server provides enhanced security and permits users to customize their access to reports within boundaries defined by the server administrator. Tableau Server's interface provides users with tools for finding, organizing, and commenting on reports. Server enables users to create subscriptions that provide e-mail notification when updated reports are published. It also provides administrators with the ability to monitor access and monitor system performance. Details regarding installation, access, and administration will be covered in Chapters 9 and 10.

Tableau Public

Tableau Public is a free hosted web service that can be used to publish Tableau Reports on the web. Commonly used content management systems like WordPress, Tumblr, and Typepad are supported. Tableau's licensed desktop editions can also publish content to Tableau Public. Tableau also offers a free Public desktop edition for creating and publishing reports. Tableau Public has the following limitations:

- Tableau Desktop only connects to Microsoft Access, Excel, or text files.
- Your work can only be saved to Tableau's public Server.
- Storage space on Tableau Public is limited to 50 megabytes per named-user.

- Datasource size is limited to 100,000 records.
- Workbooks saved on Tableau Public can be viewed and downloaded by anyone.

For these reasons Tableau Public is an ideal way for hobbyists and bloggers to create and share interactive visualizations on the web. But, it is not a substitute for full desktop or server licensing.

Tableau Public Premium

The premium edition is a fee-based service that permits subscribers to protect the confidentiality of their data by blocking the ability for information consumers to download source workbook files. Subscriber fees are based on the customized record limits and storage limits. For entities that do not have the resources or desire to manage their own instance of Tableau Server, Tableau Public Premium offers a cost effective way to share proprietary data over the web and maintain security over the source data set used to create the visualizations.

Recommended Hardware Configuration

Tableau provides minimum hardware specifications on their website, which are presented below. Analysts that build reports should have better equipment. More internal memory will have a significant positive effect on speed.

Install 4 to 8 megabytes of internal memory for the best performance. Tableau's rendering engine will take advantage of modern graphics cards as well. Solid-state disk drives outperform physical hard disks. But, don't outfit your Report-building analysts with state-of-the-art equipment if the majority of your user base is using 4 year-old junk. What performs well on a well-appointed computer may not be as enjoyable an experience on a dated system.

Tableau Desktop

- Microsoft Windows 7, Vista, XP, Server 2008, Server 2003 (on x86 or x64 chipsets), or Microsoft Windows 8.
- 32-bit or 64-bit versions of Windows.
- Minimum of an Intel Pentium 4 or AMD Opteron processor.
- 250 megabytes minimum free disk space.
- 32-bit color depth recommended.
- Note: Internet Explorer is not supported.

At the time of this writing (January 2013) Tableau does not support Apple operating systems. Many people successfully use Apple products to run Tableau by

running a virtual Windows environment on their laptop. Apple's Boot Camp provides a means to run Windows on a MacBook. Other commercial products such as VMware Fusion or Parallels Desktop can be used to run Tableau on a MacBook as well.

Tableau is believed to be planning a desktop Mac OSX version, but there have been no official statements from the company regarding release dates.

Tableau Server

- Microsoft Windows Server 2008, 2008R2, 2003 SP1, or higher; Windows 7 or x86 or x64 chipsets; or Microsoft Windows 8
- 32-bit or 64-bit version of Windows
- Minimum of a Pentium 4 or AMD Opteron processor
- 32-bit color depth recommended
- Internet Protocol version 4 (IPv4)

Very Small Deployments (proof of concepts, initial evaluations, 1-2 users)

- Dual-core 2.0 GHz or higher minimum recommended CPU
- 4.0 gigabytes minimum system memory
- 2.5 gigabytes minimum free disk space

Small Deployments (less than 25 users)

- Quad-core, 2.0 GHz or higher minimum recommended CPU
- 8 gigabytes minimum system memory
- 5 gigabytes minimum free disk space

Medium Deployments (less than 100 users)

- Two Quad-core, 2.0 GHz or higher minimum recommended CPU
- 32 gigabytes minimum system memory
- 50 gigabytes minimum free disk space

Large Enterprise Deployments

Many factors affect the sizing and configuration of hardware for large enterprise deployments. The number of concurrent users, demand patterns, and network infrastructure must all be considered. Server licenses can be deployed over multiple hardware boxes to ensure good response times. You should consult your Tableau representative for configuration options.

INTRODUCING THE TABLEAU DESKTOP WORKSPACE

In this section you will learn about Tableau’s workspace controls. This chapter is intended as a supplement (not a replacement) to Tableau’s excellent online manual.

USING THE WORKSPACE 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 effectively using Tableau within a few hours.

THE START PAGE AND DATA CONNECTION PAGE

Open Tableau and you’ll be presented with the start page displayed in Figure 1-4. Notice the small tabs in the upper-right side of the screen. The Home button with the orange house icon should be highlighted.

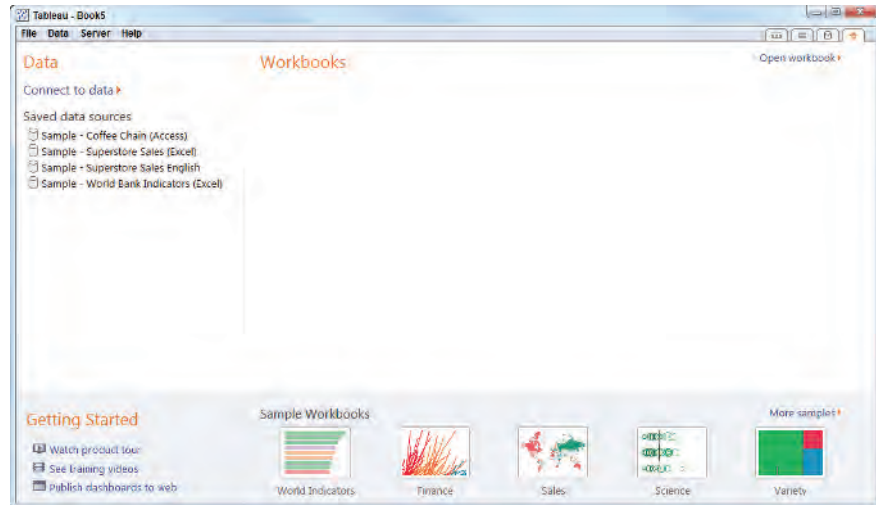


FIGURE 1-4 Tableau start page

On the left side, the data window presents connection options. If you click on Connect to Data you’ll be taken to the data connection workspace. You can also access this page by clicking on the hard disk icon tab next to the Start button.

If you need to connect to one of the datasources listed in the On a Server section, you must to go to Tableau’s website and download a connector for

the desired database. Downloading a connector requires less than a minute if you have a decent web connection. There is no limit to the number of data connection drivers you can install, but some vendors require that you validate a valid license to their software before downloading their connector.

On the right side of the Connect to Data page you will see saved data connections. Tableau provides four as sample data for learning. Any other connections you have saved (.tds files) are displayed there as well.

Return to the Home button and look at the Workbooks area in the start page. The Workbooks area saves the last nine workbooks you've opened. If you want to keep a workbook there that you use frequently, hover over the workbook image and click on the push pin. That will prevent the workbook from being cycled out of view. Figure 1-5 displays a workbook related to this chapter that I want to keep on my start page.

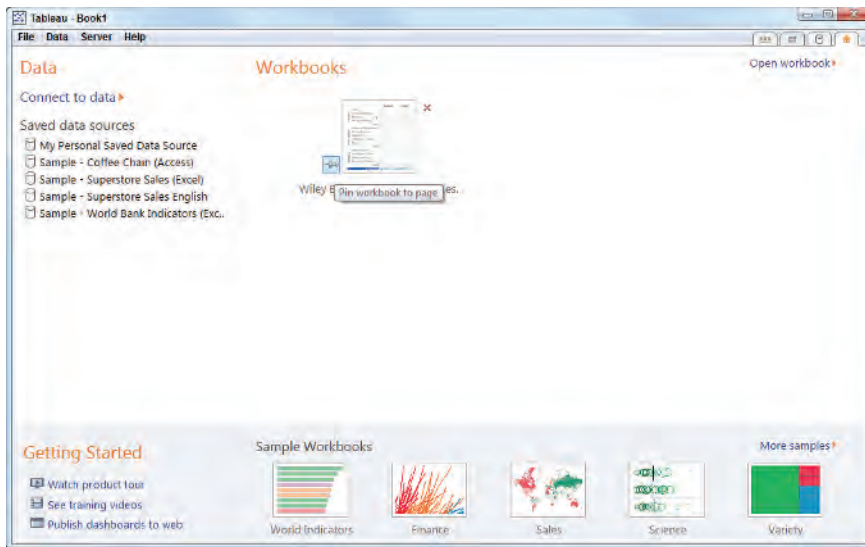


FIGURE 1-5 Pin a workbook to the start page

To remove saved workbooks from the start page click on the red X that appears when you hover over the workbook's image. At the bottom of the start page, the Getting Started area provides links to training videos and promotional materials. The sample workbook area provides links to sample workbooks containing excellent example material. Clicking on More Samples takes you to Tableau's visual gallery on the web with even more example workbooks.

Multiple Worksheet Page

There are two more workspace icons in the start page. The one with four gray boxes aligned in a square displays all of the worksheets in the workbook. There is a workbook with all the examples for this chapter that you can see in Figure 1-6 containing 18 different worksheets. This is the “slide-deck” view—it looks like PowerPoint’s slide sorter view.

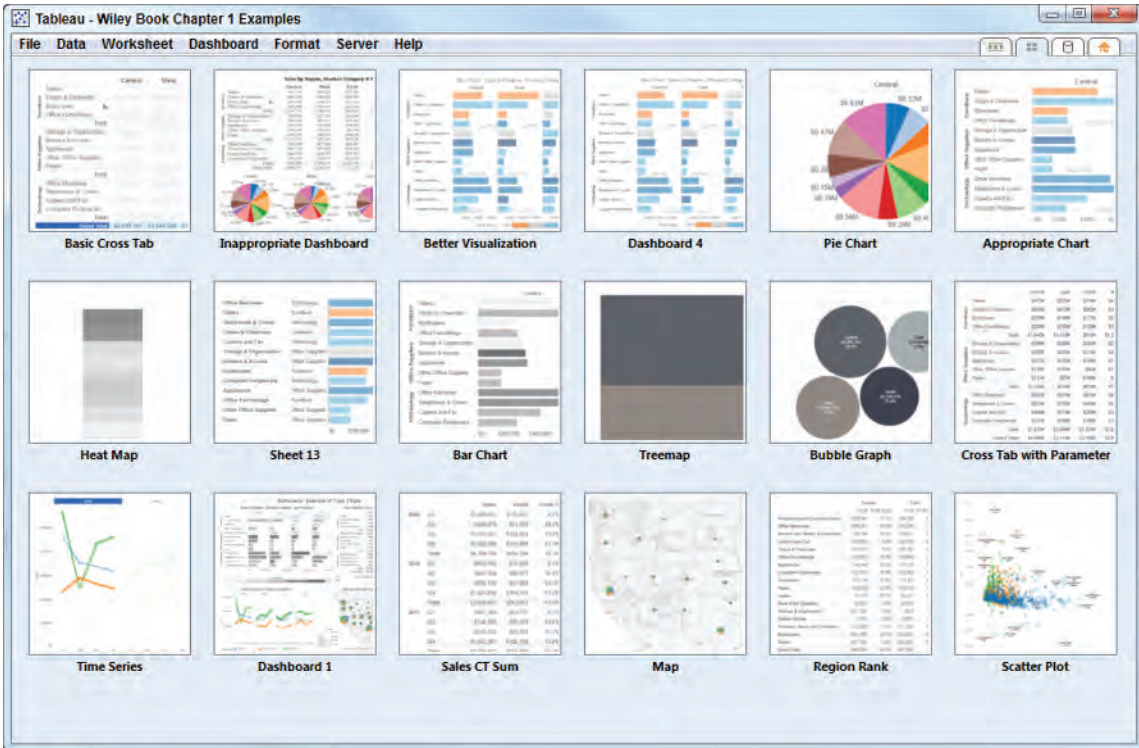


FIGURE 1-6 Multiple worksheet display

You can reorder worksheet tabs by dragging them to the desired position. Double-clicking will open that worksheet. If you have to give a presentation using a workbook with many worksheets, and you want the transitions from worksheet to worksheet to instantly appear, right-click while pointing anywhere in the page and select the (Refresh All Thumbnail) option. This will cause Tableau to update every view in the workbook and will make transitions to new worksheets appear instantly. This is particularly helpful if your datasource contains large files.

Tableau Workspace

Clicking on the far left icon (with three squares) displays the Tableau Worksheet page and exposes the contents of the worksheet tab selected at the bottom of the screen. When you connect to a new datasource this is also the default workspace view. Go to the home page and select the Sample - Superstore Subset (Excel) spreadsheet file. You just opened a connection to a saved data source and should have a blank worksheet open.

There are many ways you can open a workspace page; for example, if you display Tableau's icon on your desktop and you have a datasource displayed on your desktop. Dragging any datasource icon and dropping it on the Tableau icon opens Tableau's worksheet page for the selected datasource. Keep in mind that you can open as many connections as you want in Tableau by going to the start page or data connection page and selecting a new connection. Figure 1-7 is worksheet-connected to the Sample-Superstore Sales-Excel data set used to create scatter plots.

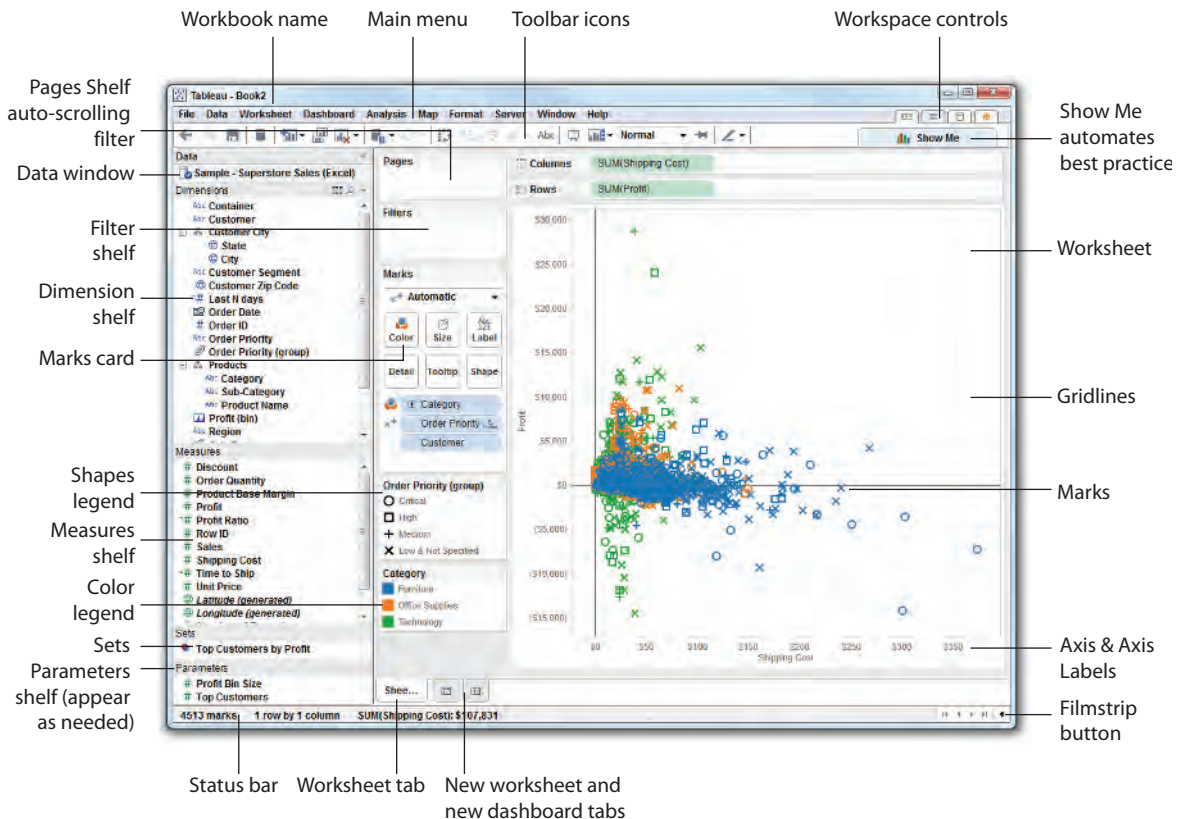


FIGURE 1-7 Worksheet page

The annotations in Figure 1-7 are the specifics that are covered in the remainder of this chapter.

WHAT YOU NEED TO KNOW ABOUT THE MENU

As Tableau Desktop has matured, the desktop menu has become less important. There has been a migration of features away from the main menu closer to the work in the worksheet, near marks, and in Tooltips. This section will focus on features that are still accessed via the main menu.

File Menu

Like any Windows program the file menu contains Open, Save, and Save As functions. The most frequently used feature found in this menu is the Print to pdf option. 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 option to review and change it. A fast way to create a packaged workbook is available from the export packaged workbook option. Saving your workbook this way eliminates a couple of clicks versus the more commonly used file/save as method.

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, 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 datasource in the data window. The Edit Relationships menu option is used in data blending. This menu option is necessary if the field names in two different datasources are not identical. It allows you to specifically define the related fields. Details related to data blending will be covered in Chapter 2.

Worksheet Menu

Several frequently used features exist in this menu. The Export option allows you to export your worksheet as an image, an Excel crosstab, or in Access database file format. The Duplicate as Crosstab option creates a crosstab version of the worksheet and places it in a new worksheet. Figure 1-8 is the output from the Describe Sheet Menu option.

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.

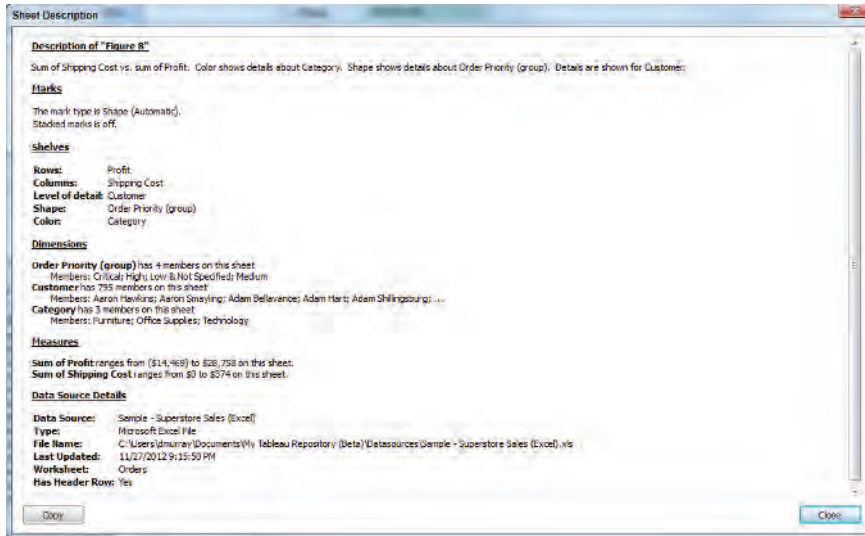


FIGURE 1-8 Describe worksheet output

Analysis Menu

As your skills advance 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 datasource.

Map Menu

The Map Menu option is used to alter the base map color scheme between normal (water is color blue), gray (water is white) or dark (land is black, water gray). The other menu options all relate in some way to replacing Tableau's standard maps with other map sources. You can also import geocoding for custom locations using the geocoding menu. All these options will be covered in detail in Chapter 5.

Format Menu

You may not use this menu very often because pointing at anything 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 worksheet. Do that from the Cell Size menu. If you don't like the default workbook theme use the Workbook Theme menu to select one of the other two options.

Server Menu

Use this menu if you need to login and publish work to Tableau Server. If you are doing a little dashboard building for fun or for a blog post, use the Tableau Public menu. To use this you must sign-up for a free Tableau Public account. The section on options in Chapter 10 for securing reports will describe 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.

Window Menu

If you have a large workbook with many worksheets and you want to share one of the worksheets with someone else, use the bookmark menu to create a bookmark file (tbn).

Help Menu

The top section of this menu includes menu options that access Tableau's on-line manual, training videos, and sample workbooks. If you need to find your product key the Manage Product Key menu option will display it. Finally, if you have a slow loading dashboard—or one that doesn't filter quickly—the Start Performance Recording activates Tableau's performance analysis tool. Then actuate some filters to generate activity. When completed, go back to the menu and turn off the performance recorder. Tableau will create another workbook that contains performance metrics related to the source workbook. Performance tuning will be covered in detail later in Chapter 8 on dashboard design, and in Chapter 9 in the section on server performance tuning.

LEVERAGING TOOLBAR ICONS

The toolbar displayed in Figure 1-9 makes the most commonly needed functions readily accessible.

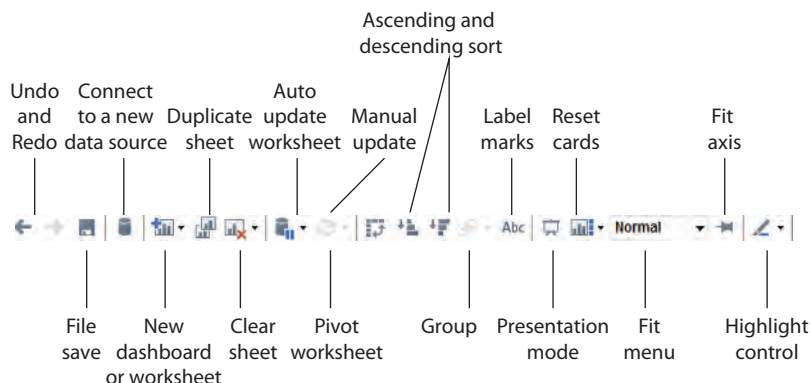


FIGURE 1-9 Worksheet toolbar

Tableau keeps an unlimited audit trail of every click made since the beginning of each session. The undo/redo arrows allow you to scroll backward or forward in time—indefinitely. If you make a mistake and don't know exactly how to fix it, click the Undo button and go back in time until your error is removed. Use the Save button frequently because Tableau does not have an auto save feature. The new Dashboard/Worksheet button is one of the ways you can add a new page to your workbook.

The Duplicate Sheet button allows you to add an exact copy of a worksheet or dashboard page you're currently in, to a new page. This is useful if you're experimenting and don't want to break your current view.

Using the Auto and Manual Update buttons is useful if you have a particularly large data set that requires a few seconds to generate visuals when you drag elements into the worksheet. Suspending Auto Update allows you to place elements without delay and then run the update after you've finished.

Quickly sort your worksheet by clicking the Ascending or Descending Sort buttons. The toolbar that looks like a paper clip allows you to multi-select marks in the worksheet and group them together. The Label Mark button turns toggles labeling of marks on and off.

Presentation mode is turned on or off using the small icon that looks like an upside-down television set or a projector screen. This option hides or un-hides the design shelves. Use this if you are giving a presentation and want to use Tableau as your presentation slide deck.

The reset cards icon provides a menu that allows you to turn on and off screen elements that provide additional information. Caption provides a text description of items that comprise your worksheet. Summary adds statistical details about your visualization.

The fit menu allows you to control how Tableau fills the screen with the visualization. You can fit the entire view in the available space or stretch it vertically or horizontally. The default normal fit uses only the space needed by the visualization. If it is too large for the screen, scrollbars will appear. If it doesn't require the entire screen, gray space will result.

The push pin fixes the axis of your view. Use this if you want to zoom into any chart and hold the view. This is particularly useful on maps. Chapter 5 covers map options in detail.

The highlight control enables comparison by highlighting selected combinations of dimensions. This is useful in many charts but you will find it to be very helpful when highlighting marks in scatter plots.

THE DATA WINDOW, DATA TYPES, AND AGGREGATION

When you connect Tableau to a datasource it is expressed in the data window. You can connect to as many different datasources as you want in a single workbook. The small icons associated with data connections provide additional details about the nature of the connection. Figure 1-10 shows a workbook with three different data connections.

Two cans with an arrow means the connection is an active data extract.

Blue highlight means the fields from this datasource are being displayed in the dimensions and measures shelf.

The blue check mark indicates this data connection is active in this worksheet.

The **Dimensions** shelf contains filtering and sorting elements, text, dates, or geographic fields.

The **Dimensions** shelf contains numbers that you may want to use in formulas.

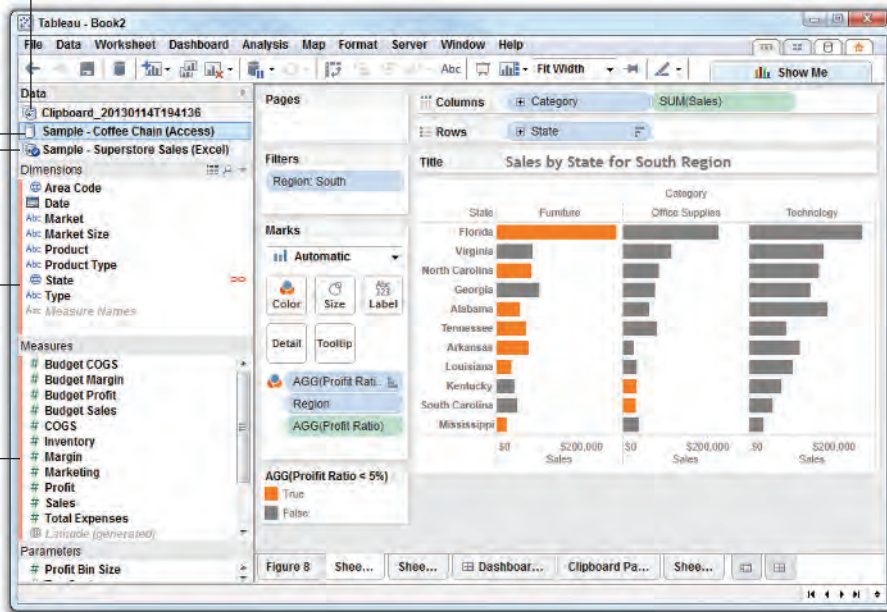


FIGURE 1-10 Data shelf

There are subtle visual clues regarding the exact state of each connection. The blue check circle next to the superstore data connection indicates that is the active connection in the worksheet. So, the bar chart in the worksheet was created using dimensions and measures from that datasource. The coffee chain data connection is a direct connection that is indicated by the icon of the single can. Also note the blue highlighting. Those datasource fields are currently displayed on the dimensions and measures shelves. The clipboard datasource at the top of the data window was cut and pasted into Tableau. It is also a data extract indicated by the icon displaying two cans with an arrow.

When you create data connections, Tableau will evaluate the fields and place them on the dimensions and measures shelves automatically. Tableau normally gets most of the fields placed correctly. If something is incorrectly placed, simply drag the field to the correct location. Errors occur sometimes when numbers are used to depict dimensions. For example, if you connect to a spreadsheet that contains customer identification numbers, that field may be placed into the measures shelf. It is important to get those fields properly placed. Dragging a customer identification number from the measures shelf into the worksheet would result in the field being summed. Properly placed on the dimensions shelf, the customer identification number would behave like a dimension and be expressed in a column or row the same way category and state are expressed in Figure 1-10.

Data Types

Tableau expresses fields and assigns data types automatically. If the data type is assigned by the datasource, Tableau will use that data type. If the datasource 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)

Look at Figure 1-10 and focus on the icons next to the fields in the dimensions and measures shelves. 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. 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
- 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 aggregate 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 level for a specific view. To change the default aggregation, right-click on that field inside the data shelf 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. Figure 1-11 provides an example. By right-clicking on the SUM(Sales) pill and selecting the Measure (SUM) menu option, you can select any of the aggregations highlighted.

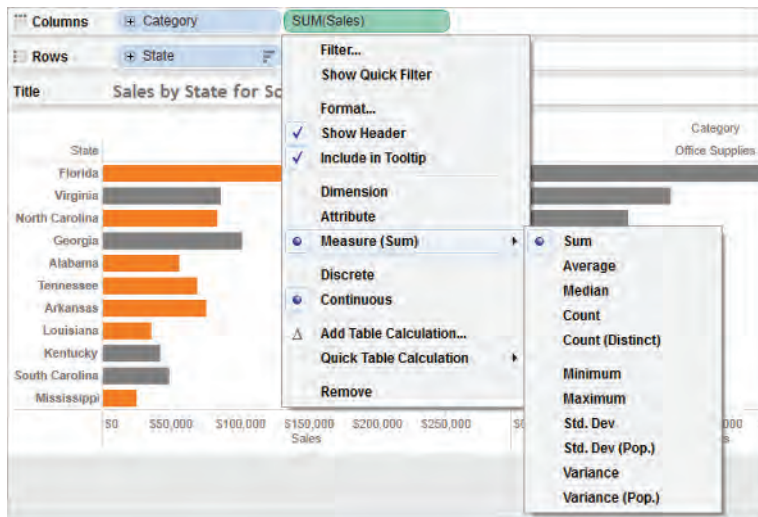


FIGURE 1-11 Changing aggregation

The datasource used in Figure 1-11 is a data extract of an Excel spreadsheet. It is important to understand that if you relied on a direct connection to Excel, the median and count (distinct) aggregations would not be available. Excel, Access, and text files do not natively support these aggregate types. Tableau’s extract engine does.

A Word about Dimension and Attribute

Most aggregates involve mathematical concepts comprehensible to most people. 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—not so with the dimension and attribute aggregations. The best way to explain these aggregates is to provide examples of them being used. Refer to the aggregate function definitions and examples in Appendix A—Understanding and Using Tableau Functions.

BUILDING VISUALIZATIONS WITH THE ROW AND COLUMN SHELVES

Row and column shelves are used to express data in your worksheet. Dimensions and measures can be displayed in any order or either shelf. Figure 1-12 is a basic time series chart that shows sales trends by year and then quarter.

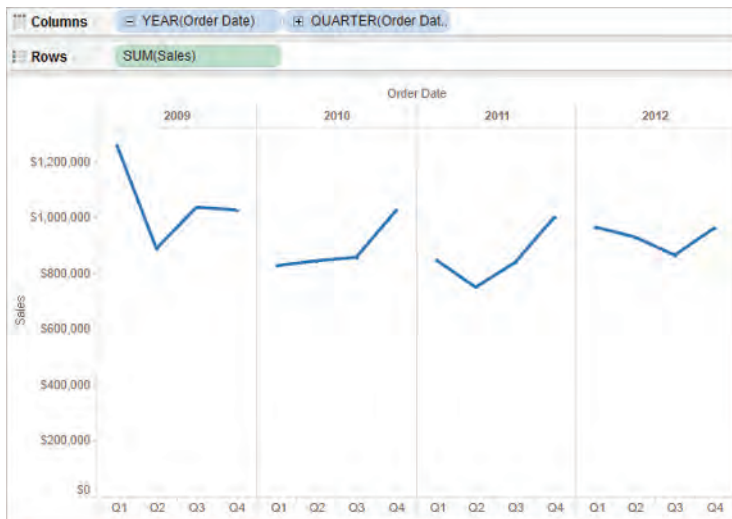


FIGURE 1-12 Time series by year, quarter

The time series has breaks in the line because time is discretely broken down by year and then quarter. Figure 1-13 displays the same data, rearranging time by showing quarter first and then year, making it easier to see how sales changed in each quarter.

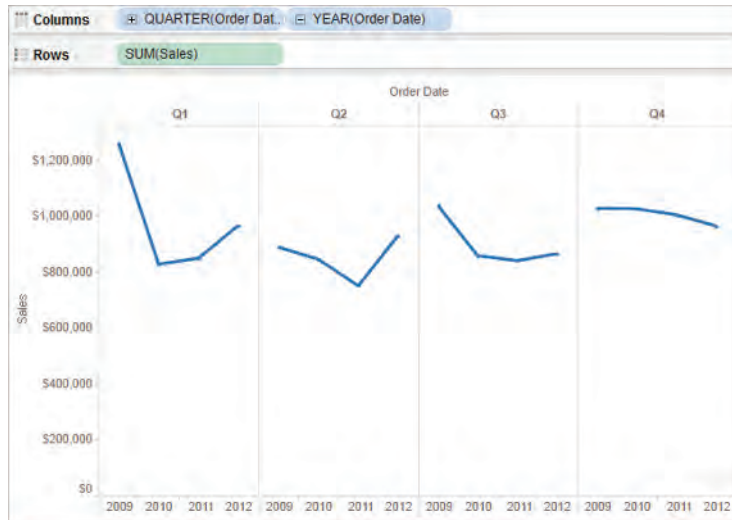


FIGURE 1-13 Time series by quarter, year

Placing the year pill to the right of the quarter pill altered the context of the view by making it easier to compare the sales trends within each quarter over time.

NUMBER OF RECORDS, MEASURE VALUES, AND MEASURE NAMES

Tableau automatically adds three fields to every data set. Number of records is a calculated value that sums the rows in the datasource. Note that field icons preceded by an equals sign are calculated values. Measure names and measure values are special fields that allow you to display multiple measures on a single axis. Figure 1-14 was created by double-clicking on the measure names field and selecting the swap button on the toolbar to change the orientation of the chart.

When measure values are deployed, a new shelf appears that holds the pills for every measure in the data set. Selecting measure names and measure values will automatically display all of the measures in your datasource with their corresponding descriptions. You can use the measure names pill to filter out specific values by right-clicking in the pill and de-selecting measures you no longer want to display on the axis.

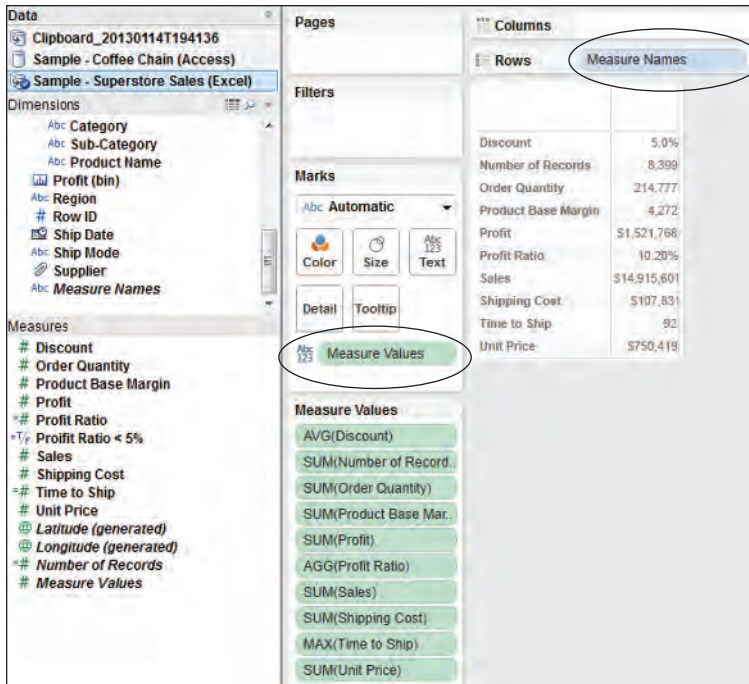


FIGURE 1-14 Measure names, measure values

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 1-12 and 1-14 again. Can you guess what those colors mean? Most people think blue pills are dimensions and green pills are measures. That's a good guess but the right answer is more subtle. Figure 1-15 displays the time series without any breaks between the years. Notice that there is only one pill on the color shelf and it is green.

Green denotes continuous and blue measures discrete. When a time dimension pill is green the data is displayed using an unbroken, continuous line. In Figure 1-12 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.

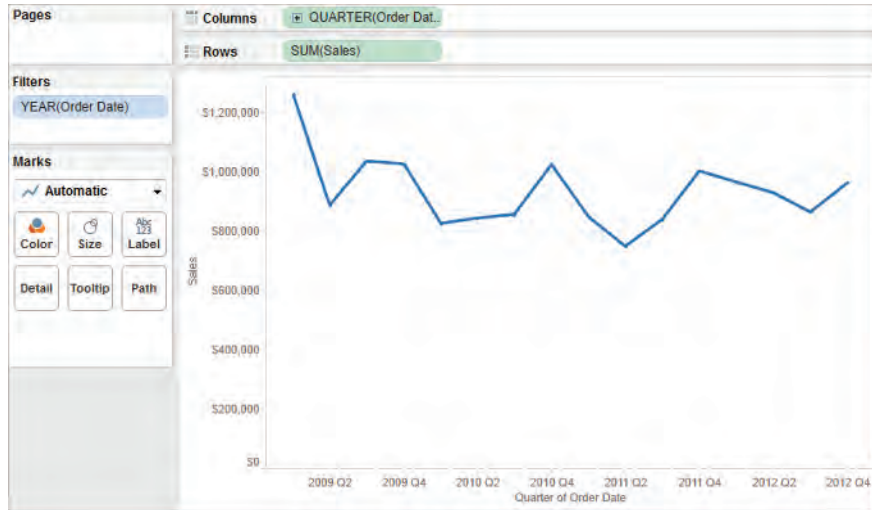


FIGURE 1-15 Time series: continuous date

USING THE VIEW CARDS TO IDENTIFY TRENDS AND OUTLIERS

The Marks Card is the primary means for using color, size, shape, position, and text to express dimensions and measures in visualizations.

The Marks Card and Buttons

Tableau applies color, shape, and size to visualizations using the view cards. The view cards also enable filtering, labeling, and provide a way for you to add details on demand that are not visible in your chart. Visual details are added to the chart by placing field pills on the desired mark type.

- Color—Expresses discrete or continuous values
- Size—Expresses discrete or continuous values
- Label—One or more fields can be expressed as label on marks
- Detail—Disaggregates the marks plotted
- Tooltip/Tooltips—Makes fields available to Tooltips without disaggregating data
- Shape—Expresses discrete or continuous fields

Multiple fields can be placed on the color, label, detail, and Tooltip buttons. Figure 1-16 displays a scatter plot with color, shape, and size all being utilized to visualize a comparison of profit and shipping cost.

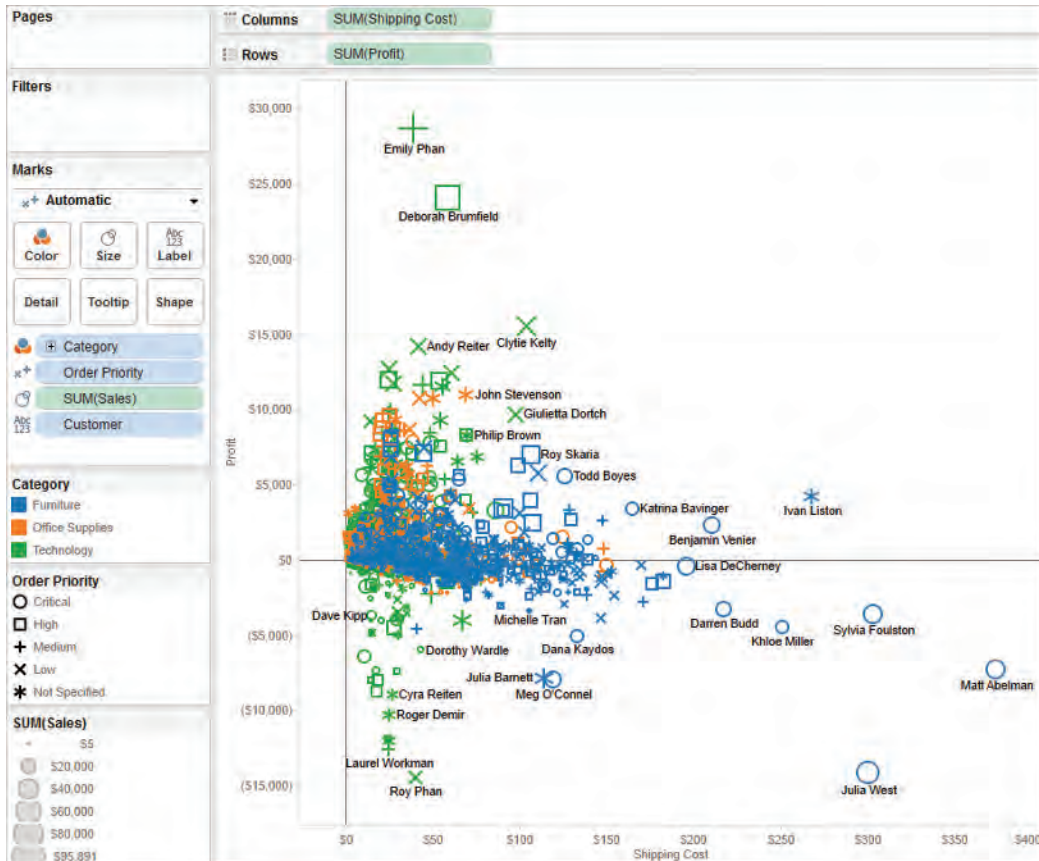


FIGURE 1-16 Scatter plot

The column shelf in Figure 1-16 contains shipping expense, making that measure plot horizontally across the page. Profit, on the row shelf, is displayed vertically. Color is being used to depict product category, shape shows order priority, and the size of the marks provides information on sales. This scatter plot is displaying three measures 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. You can also alter the way each field in the marks card is used by pointing at the small icons to the left of each pill, clicking your left mouse button, and selecting another option.

The Pages Shelf

Any field placed on the pages shelf generates an auto-scrolling filter. Use it to create animated visualizations in Tableau Desktop. In Figure 1-17 you see that

when a field is placed on the pages shelf another supporting shelf appears directly under it that contains a manual field selector and auto-scrolling controls providing forward/pause/stop, control over scrolling speed, and a show history check box.

Checking the show history box exposes a menu that provides different options 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. For example, if a date field is placed on the pages shelf, the pages shelf filter can automatically increment through each month contained in the data set.

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.

Filter Shelf

Any field placed on the filter shelf enables a filter for that dimension or field. The style of filter control is dependent on whether the field is continuous or discrete. If you want to expose a filter in the worksheet, right-click on any pill used anywhere in the workspace and select the menu option Show Quick Filter.

HOW THE STATUS BAR HELPS YOU 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 1-18 demonstrates the value of the status bar.

The map in Figure 1-18 plots pie charts that show sales by city and product category. Notice the status bar at the bottom left of the worksheet indicating 3,624 marks are in view. The total sales value of the marks is \$14,915,601. Each

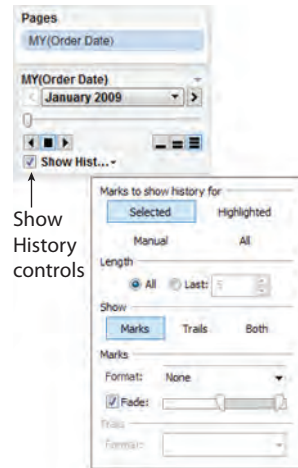


FIGURE 1-17 Pages Shelf and Show History Menu

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.

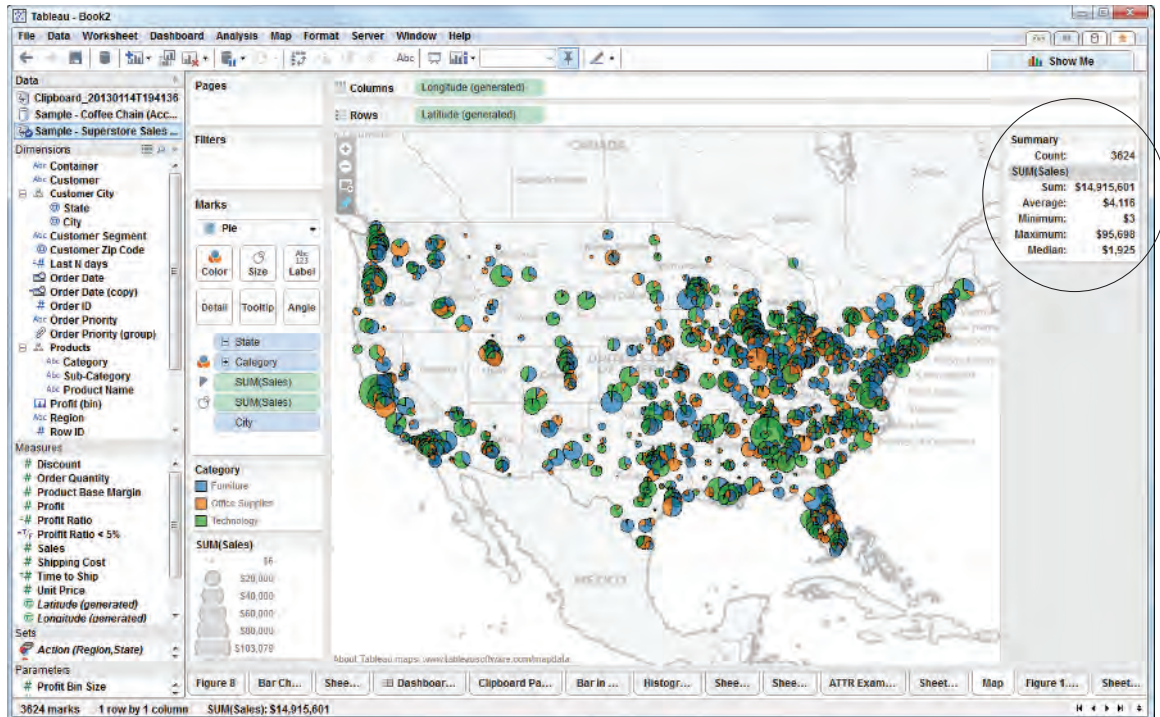


FIGURE 1-18 Status bar and summary

The larger summary card in the upper right is optional. You can enable it by using the toolbar highlighted in yellow, and then selecting summary.

SAVING TIME BY USING 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 the map in Figure 1-18 can be re-created using the Show Me button in Figure 1-19.

You may want to use sales by category and city on the map. To visualize them, multi-select those fields and click the Show Me button. The screen should look like Figure 1-19.

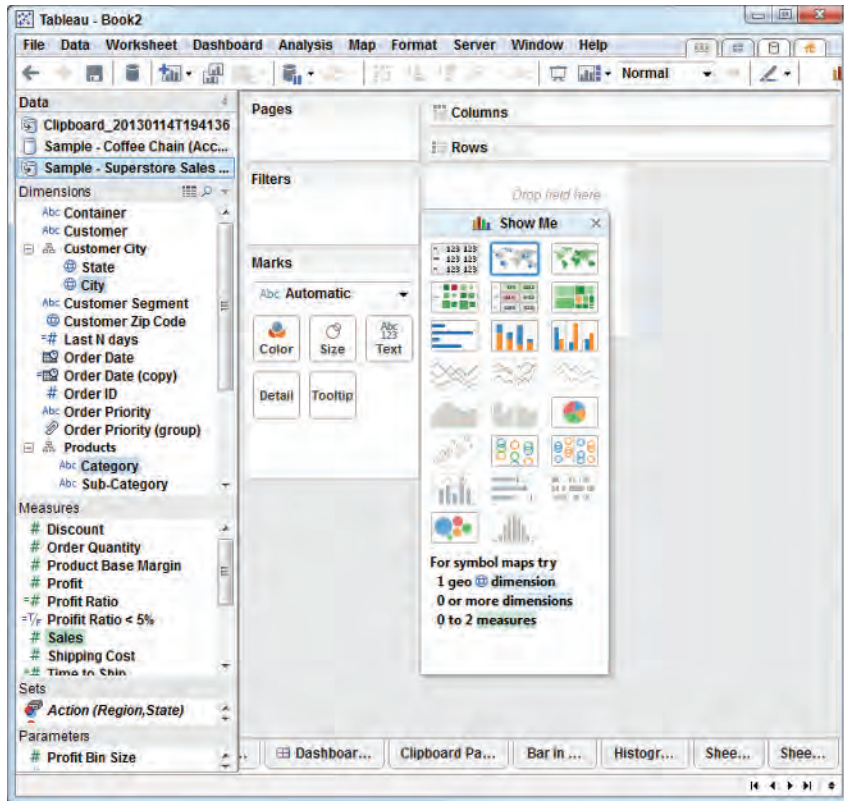


FIGURE 1-19 Building a map with Show Me

Show Me can be dragged to any location on your desktop. The text at the bottom provides additional feedback on the combination of dimensions and measures that should be selected in order for 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 available. Note that the time series charts are all gray because a date dimension hasn't been selected.

The map in Figure 1-18 was created by selecting the map highlighted by Show Me. 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.

Now that you've got a basic introduction to the desktop workspace, in Chapter 2: Connecting to Your Data you will learn a variety of ways you can connect to data and the different kinds of datasources you can connect to using Tableau Desktop.

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