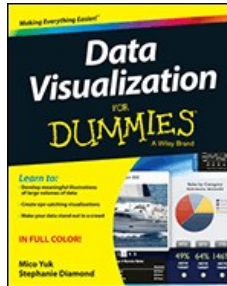


Chapters *To Go*



Data Visualization for Dummies

by Mico Yuk and Stephanie Diamond
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Chapter 4: Using Charts Effectively

In This Chapter

- Keeping charts simple
- Using charts that are clear to users
- Knowing when to use dials

Most people are introduced to charts pretty early in their school careers. Teachers use charts for attendance, seating, spelling, history lessons, and so on. This is probably why, unless you're a math major, you hope you never have to deal with charts again.

But it's time to take a second look. New tools have made it much easier to turn raw data into a good-looking chart. In addition, as a person facing the Big Data age, you probably can't escape it anyway. It's time to embrace data visualizations.

This chapter looks at different types of charts and their use. You need to know which charts are best for beginners and which ones to avoid.



Deciding Which Charts to Use and When to Use Them

The purpose of a chart is to package information in a way that makes it quickly understandable. The thing that makes charts so useful is that they provide a quickly recognizable shape for your data. Think about that for a moment. Each graph you create has its own shape that is dictated by the data inside it. It's a visual explanation of a story.

A good chart can be understood at a glance. The information is communicated by telling you, for example, whether something is going up or going down — for example, whether prices are rising or falling. If you want to know whether a widget is selling, you can consult a chart that shows the trend line.

Understanding where newbies should start

When you're new to a subject, you seek guidelines that help you master the content. Creating charts is no exception. Here are a few rules to get you off to a fast start:

- **Employ simplicity.** Simplicity is the key to creating effective data visualizations. You should focus on using simple charts that are easy to digest. You won't get points for most amount of data displayed.
- **Display only the most important information.** When you're new to charting, you may want to put in a lot of information so that you don't leave out anything of value. Resist this urge, because people can take in only so much information before their eyes glaze over.
- **Require little explanation.** Don't make things so complicated that your users require a manual to understand what you're trying to convey. If you can't get something at a glance, it's too complicated for your reader.
- **Don't overload your data.** It's important to avoid overloading your data visualization, but the trend toward the use of mobile devices makes this practice even more important. Mobile devices reduce the screen real estate to almost half of what's available on a desktop. Typically, a visualization isn't manipulated on a mobile phone; it's only viewed.
- **Stay away from 3-D.** At some point in your data career, you may become a whiz at depicting charts in 3-D. We recommend that you avoid this type of chart, however, until you get more experience under your belt.

Next, you want to know what elements make up a good chart so that you can incorporate those elements:

- **Labels:** Labels are so important, yet many people forget to add them. Whether it's the title of the chart, the chart legend, or the labels for the axes, letting users know what is being displayed is vital. Users typically look at the title of a chart before the actual chart, so be aware that you need one.

- **Color:** Choosing the correct colors for your chart is critical. Whether you are displaying different quantities or pointing out specific measures, choosing appropriate colors is an absolute must. At a glance, most users are likely to focus on brighter colors first, sometimes completely overlooking less highlighted colors, such as gray. Strategically using the right colors in your chart guides your users and adds value by enabling them to decide what to focus on first.
- **Chart Type:** Choosing the correct chart to tell the story of your data is quite a challenge. It's not surprising that the use of pie charts is so highly debated. Many newbies tend to go with what makes their data look pretty, often choosing the wrong chart for the wrong reasons. There are, in fact, very specific uses for the different chart styles, many of which are covered in this chapter.

Figure 4-1 shows how you might set up a chart to display some data on the x- and y-axes. In the figure, each axis is clearly labeled in its correct position.

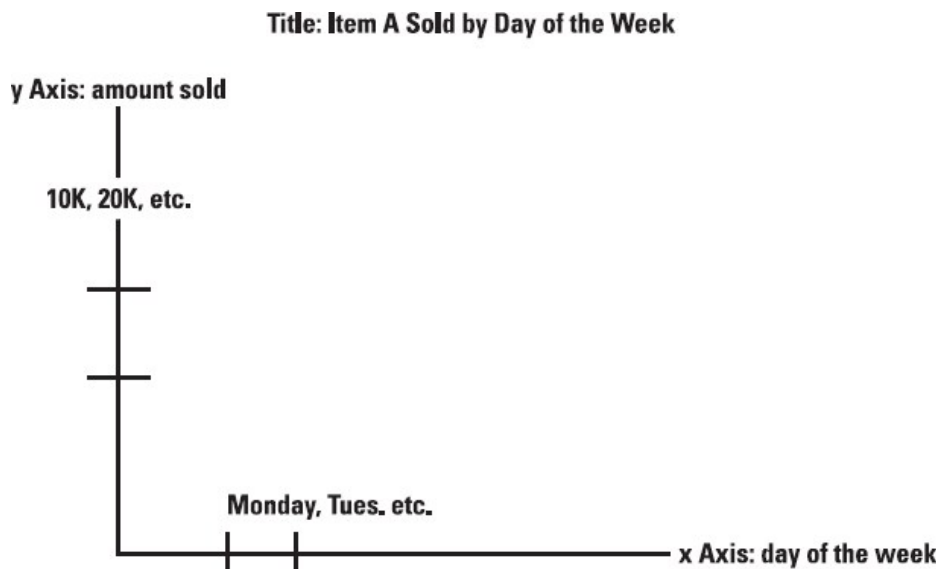


Figure 4-1: A simple chart with an appropriate title and axis labels.

- **Labels:** Users have to know what they're seeing at a glance. Make sure to include labels for everything that isn't readily apparent.

Tip Always include the source of the data at the bottom of the chart if the chart will be viewed outside your company. Read more about copyrights in Chapter 11.

Choosing simple and effective charts

Although you have many chart types to choose among, we recommend starting with some of the simple and most commonly used charts for the most chance for success: bar and column charts, line charts, and pie charts. No doubt you're familiar with them and have seen many examples. In the following sections, we discuss these chart types and show you when to use them.

Bar and column charts

Some people use the term *bar chart* when speaking about a chart that shows the data horizontally or vertically; others call a chart that displays the data vertically a *column chart*. Whatever you call them, these charts are best used for comparisons.

Figure 4-2 shows an example of a column chart. (You can also see the image at [http://www.smartdraw.com/examples/view/future+wealth+holder% 27s+gender+shift+bar+chart.](http://www.smartdraw.com/examples/view/future+wealth+holder%27s+gender+shift+bar+chart.)) Notice that the chart is simple, with a title, a labeled axis, and clear labels to show what the columns represent.

Future Wealth Holders' Gender Shift

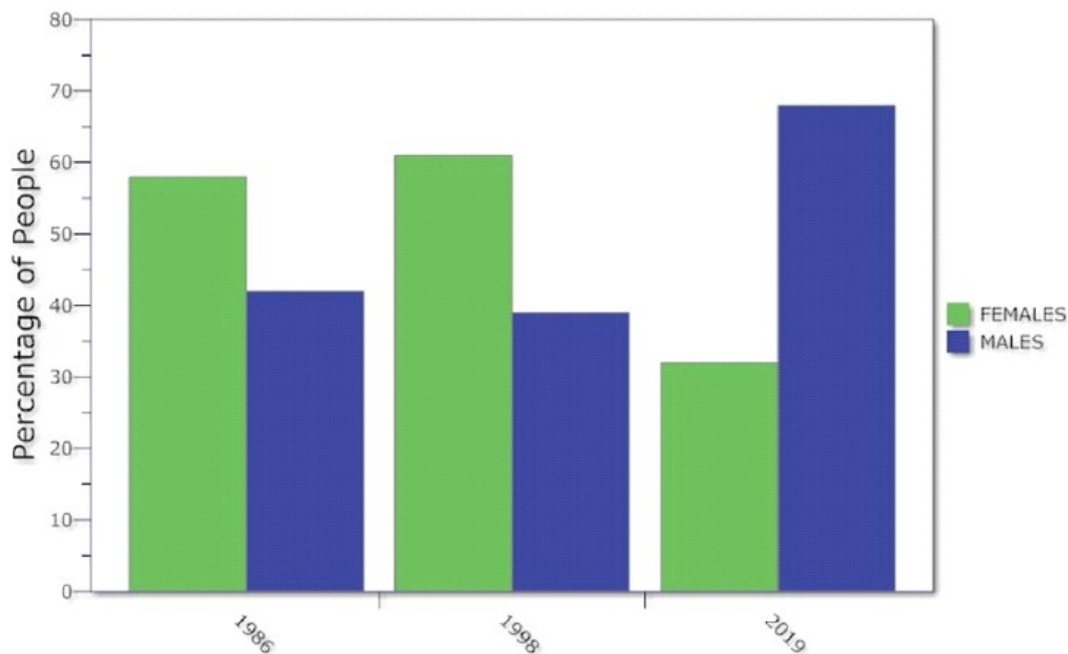


Figure 4-2: Column chart.

Tip When you use a column chart, be sure to shorten or use smaller labels on your x-axis below each bar to ensure they display horizontally. Utilizing longer labels will result in needing to display the title vertically (as shown in [Figure 4-2](#)), which is hard for the user to read.

Line charts

A *line chart* connects data points over a period of time, as shown in [Figure 4-3](#). (You can also find the image at <http://www.smartdraw.com/examples/view/cost-of-crude-oil-line-chart>.)

Line charts are best used for something like a trend to show movement. These charts are easy to read and fairly easy to create. This type of chart should be one of your staples.

Pie charts

The use of pie charts is controversial, and the debate is more than a decade old. Just type the words **avoid pie chart** in a search engine, and you'll literally find more than 1 million entries. One of the best-known data design experts, Edward Tufte, refers to pie charts as "dumb" in his book *The Visual Display of Quantitative Information* (Graphics Press). Tufte argues that pie charts are dumb because they fail to show comparisons and trends as well as bar or line charts do. Many experts argue that the eyes are not good at estimating areas, which you must do when viewing a pie chart.

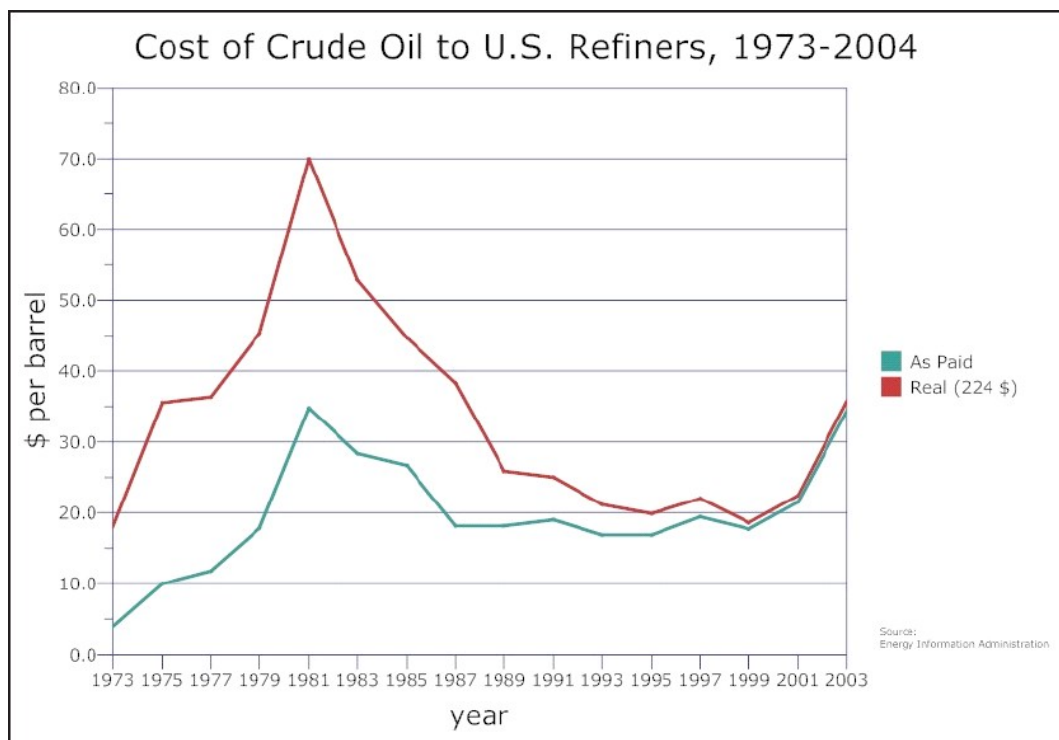


Figure 4-3: Line chart.

Although we agree with the main argument that the human eye isn't very good at estimating areas, it's hard to ignore the fact that pie charts remain among the most beloved types of charts. We believe that it's primarily because of their round shape.

The more you tell data visualization authors to avoid pie charts, the more they want to use them, either because their users request them or because they hope to add some variety to their visualizations.

We believe that you can indeed use pie charts as effective data visualizations if — and only if — you stick to the purpose they were meant to serve and follow the guidelines we provide in this section.

By definition, pie charts are circular charts divided into slices, with the size of each slice showing the relative value. In other words, at a glance, it should be easy to see which slices of the pie contribute the most and least to the whole pie. Well, it's not quite as easy as you may think.

Take a look at the two most common ways pie charts are misused:

- Too many slices are displayed.** We recommend that you limit the number of pie slices to five. Displaying additional slices that are too small to be sorted will only distract the user from the main point. Figure 4-4 shows a pie chart displaying how much (by percentage) each revenue stream has contributed to the company's overall revenue in the last quarter.

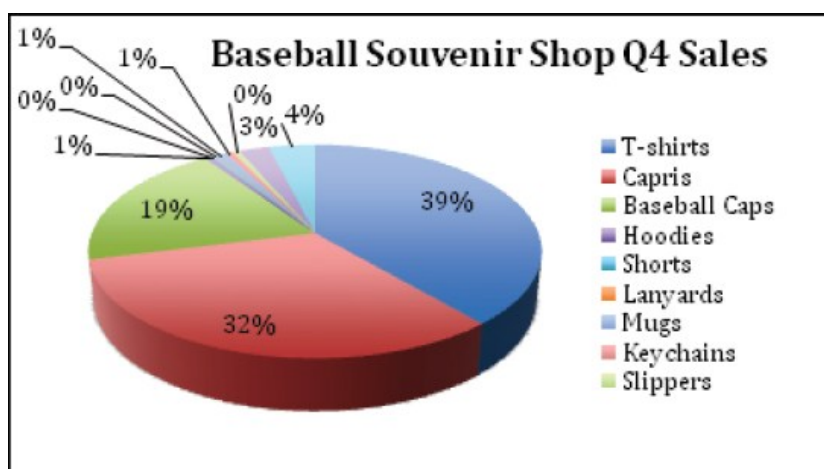


Figure 4-4: This pie has too many slices.

At a glance, it's clear that T-shirts, capris, and baseball caps combined account for 90 percent of the company's sales. What isn't so clear are the products that make up the remaining 10 percent of the revenue.

Figure 4-5 shows a better way to display the same data. Notice that the other products are combined in a slice titled Other. This makes the chart easier to digest. You highlight the top contributors and show the contributions of the additional slices as a single sector.

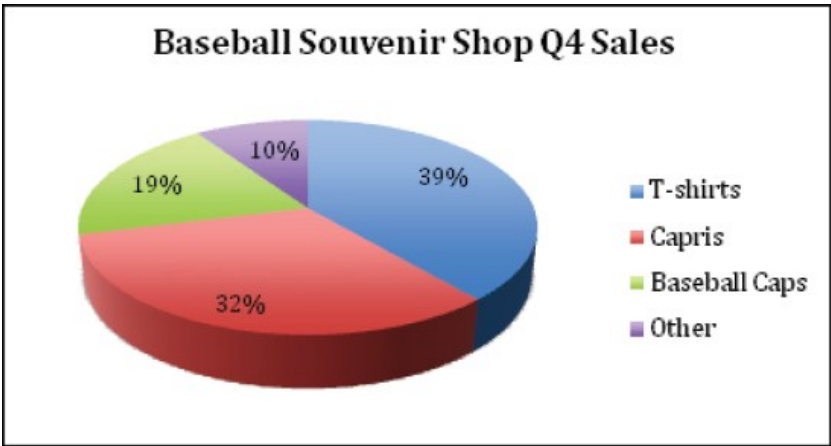


Figure 4-5: The insignificant contributors have been combined into the Other group.

■ **Slices of equal value are displayed.** This is another common mistake. The pie chart in Figure 4-5 has fewer than five slices, but because the value of some of the slices are relatively the same, it's hard to compare the actual contribution of those individual slices relative to another one another.

Figure 4-6 displays the same data from Figure 4-5 in a column chart that has been set to sort in ascending order.

Notice how much easier it is to see which products have contributed the most revenue, even if the differences in some of the values are very slim?

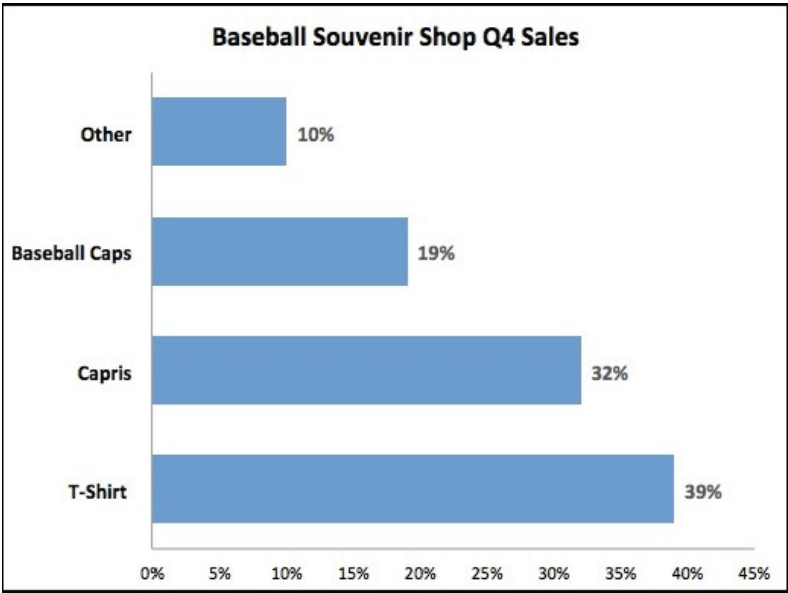


Figure 4-6: The data is sorted in ascending order.

Warning! Unless you're developing static data visualizations such as infographics or a yearly report in which the data isn't updated dynamically, avoid using pie charts. The reality is that most Big Data visualizations are going to be updated dynamically from some real-time database, making it nearly impossible to control the data output. The risk of breaking one, if not both, of the rules of pie charts we provide in this section is very high; ultimately, the risk isn't worth making the data hard to read.

Using gauges and scorecards to monitor

Here's a question you probably thought you wouldn't see in this chapter on using charts: Do you always need to create a chart for your data? The answer is "Not always." You can use other devices instead, such as a gauge or scorecard. People are familiar with gauges because we use them in everyday life. You glance at your car's gas gauge to determine how much gas you have, for example.

In data visualizations, gauges are often used to monitor the status of key performance indicators or something with known data parameters. If you know the lowest and highest measurements, you can use tick marks to display them and use a pointer to show where the data is at the present time. Figure 4-7 shows examples of how gauges are used to display data. (See the image at

www.infragistics.com/help/topic/780FF79B-3E5A-40B3-9AA3-3EB8A2683798.)

Technical Stuff—Who created these charts?

You may not have thought about it before, but somebody had to invent the first bar, line, and pie charts. That person was William Playfair, a Scottish engineer who used the first pie chart in 1801. If you want to impress your friends with trivia, this item is useful to know.

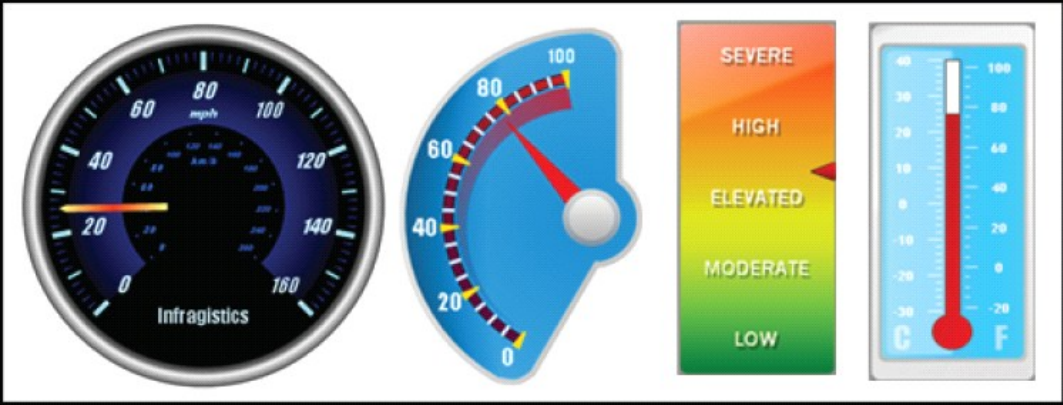


Figure 4-7: Gauges.

Just like pie charts, gauges have their critics. Some people believe that a gauge doesn't provide historical data, so it's not as useful as it could be. The same is true for scorecards.

Considered to be a separate form of data visualization altogether (depending on the source), scorecards are also used to monitor measurements. As opposed to a gauge, which is limited to monitoring a single measurement, a single scorecard can monitor multiple measurements at the same time, which makes it more useful to more users. Figure 4-8 show how a scorecard can be used to view sales data across two quarters (see the image at www.otusanalytics.com/wp/wp-content/uploads/2013/01/salesRepPerformanceScorecard.png).

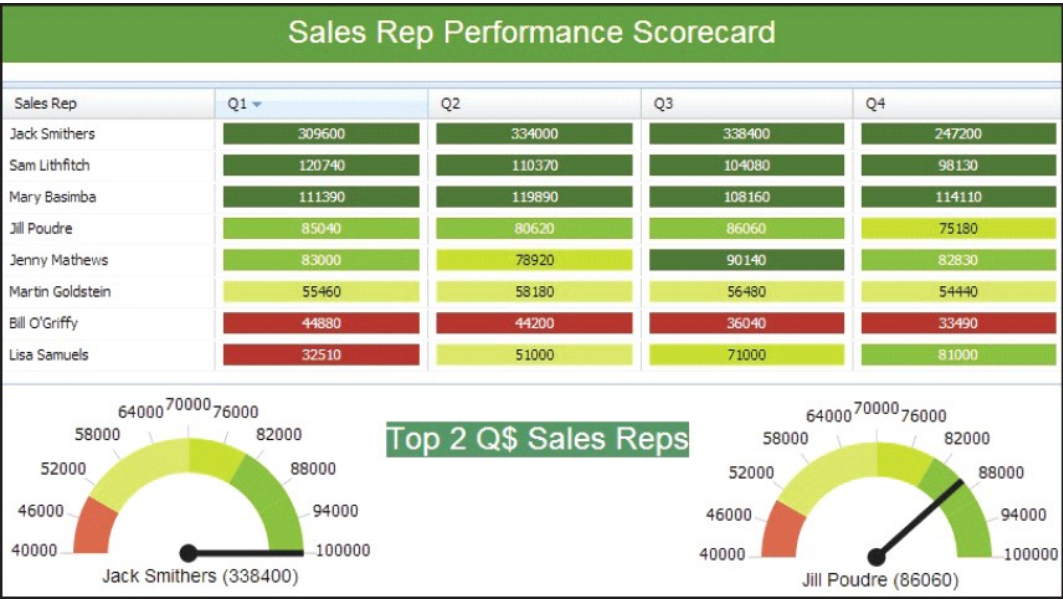


Figure 4-8: Scorecard.

Finding online tools for chart making

When you're creating your first chart, you'll probably use Microsoft Excel. But you can use many online tools to accomplish the same task. Here are a few that you may want to consider:

- **Rich Chart Live** (www.richchartlive.com/RichChartLive): Available in both free and fee-based versions
- **ChartGo** (www.chartgo.com/index.jsp): Free
- **ChartGizmo** (<http://chartgizmo.com>): Free

- **Online Chart Tool** (www.onlinecharttool.com): Free

Dipping Into Less-Common Charts

We've provided a clear list of charts to stick with if you're new to charting. We use the KISS acronym, which means "Keep It Simple, Superstar!" We realize, however, that you'll get bored using the same vanilla charts, as we all do, and you'll want to make your data visualization "sexy" by venturing into more exotic chart territory.

Remember While you're trying to find sexier charts to display your data, it's important to keep in mind that the ultimate goal of any data visualization is to take a huge data set and display intelligence data in the form of charts, text, and other visual elements that are easy for the user to digest.

Here are three common chart types that lure newbies with their sex appeal but provide little to no value to readers, who are often confused by them:

- **Radar charts:** Also known as spider or star charts because of their appearance, radar charts are designed to plot the values of different categories along a separate axis that starts from the center and ends in the outer ring, as shown in [Figure 4-9](#).

Although this cobweb of a chart definitely adds some sex appeal to your Big Data visualization, most users have no idea how to read the data. They get confused trying to decipher it without some accompanying text. We advise sticking to a bar or column chart instead.

- **Candlestick charts:** Candlestick charts were invented for the stock market and are used to describe the price movements of derivatives, securities, or currency over time. Stock-market data is the only type of data for which this chart type should be used. Understanding when a candlestick is high or low isn't a concept that most readers are familiar with, so this type of chart will only serve to confuse them.

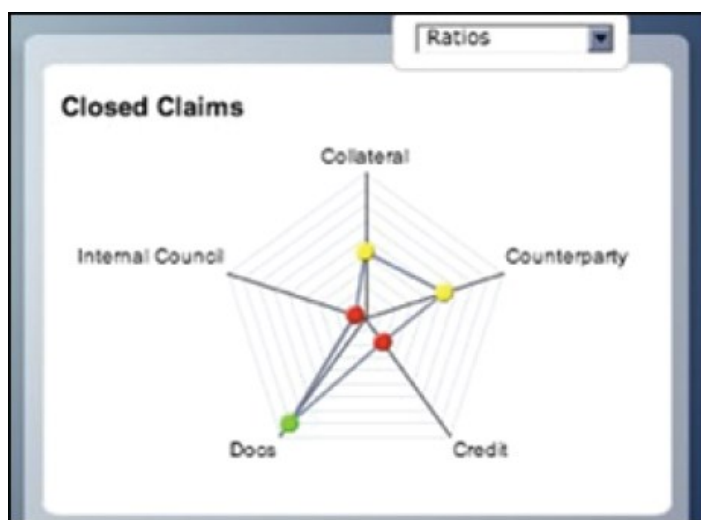


Figure 4-9: Radar chart.

[Figure 4-10](#) shows a candlestick chart displaying stock-related data. (You can find the image at www.visifire.com/documentation/Visifire_Documentation/Charts/Common_Tasks/creatingcandlestick_chart_using_axisxlabel.htm.)

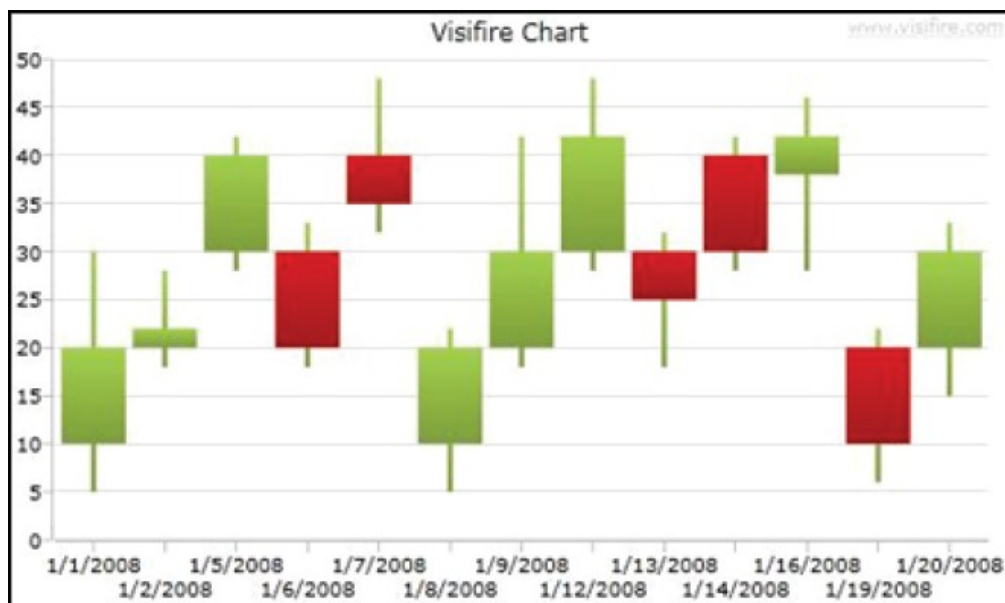


Figure 4-10: Candlestick chart.

- Waterfall charts:** These charts display the effect of positive and negative changes on a specific value over time. Waterfall charts are nicknamed "flying bricks" because they appear to be flying in midair.

Figure 4-11 shows a typical waterfall chart displaying financial profit/loss data. Colors on the bars indicate a negative or positive change in value, so you can easily see the \$100,000 plunge that the company's profit took (from \$420,000 to \$320,000) and all the contribution costs in between.

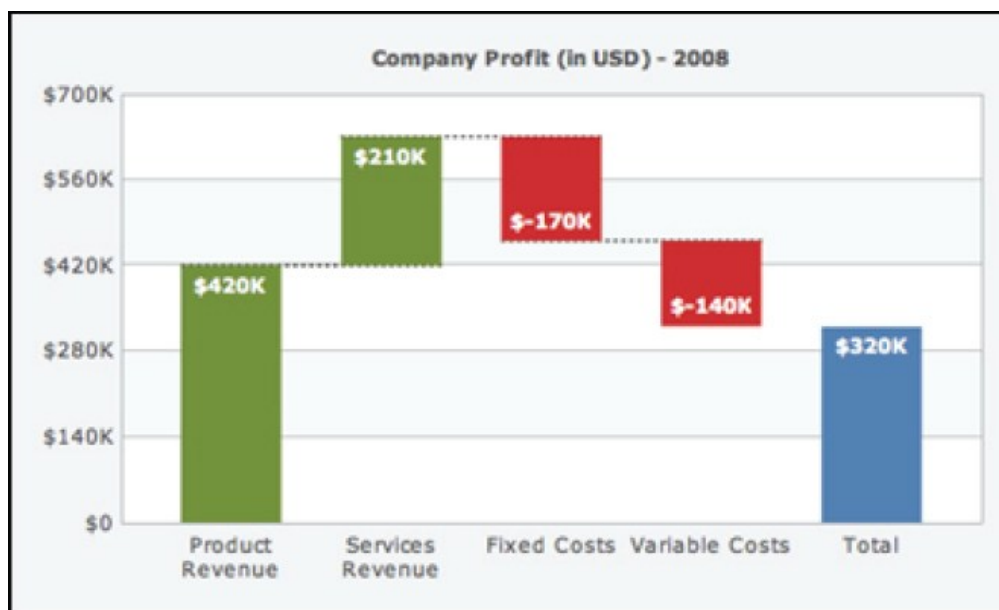


Figure 4-11: A waterfall chart.

Tip We recommend that you avoid using radar and candlestick charts. On the other hand, we advise using waterfall charts after you've mastered the simple charts we recommend earlier in this chapter. Waterfall charts aren't all bad, and their meaning isn't difficult for users to discern. When you do decide to use these charts, we highly recommend putting some text at the bottom to help readers who are encountering this type of chart for the first time.

Remember Don't get carried away trying to fit your data into a sexy chart. Instead, focus on the message you're trying to convey. Charts were made for data; data wasn't made for charts. The message of your data should always dictate the charts you use. If you choose a sexy chart and then try to fit in data, you almost always confuse users, which lowers user adoption.