

## chapter nine

# case studies

At this point, you should feel like you have a solid foundation for communicating effectively with data. In this penultimate chapter, we explore strategies for tackling common challenges faced when communicating with data through a number of case studies.

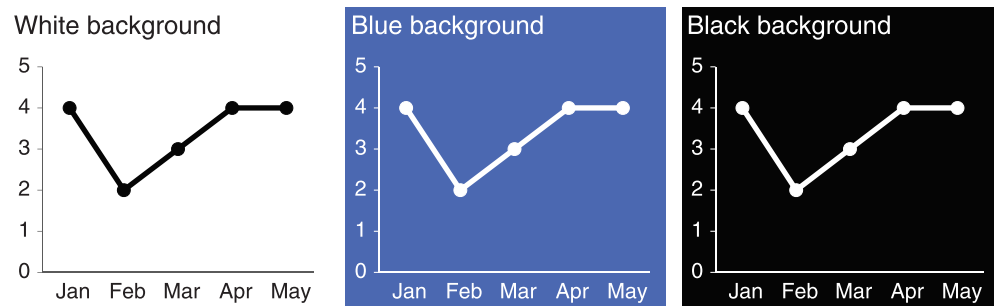
Specifically, we'll discuss:

- Color considerations with a dark background
- Leveraging animation in the visuals you present
- Establishing logic in order
- Strategies for avoiding the spaghetti graph
- Alternatives to pie charts

Within each of these case studies, I'll apply the various lessons we've covered when it comes to communicating effectively with data, but will limit my discussion mainly to the specific challenge at hand.

## CASE STUDY 1: Color considerations with a dark background

When it comes to communicating data, I don't typically recommend anything other than a white background. Let's take a look at what a simple graph looks like on a white, blue, and black background. See Figure 9.1.



**FIGURE 9.1** Simple graph on white, blue, and black background

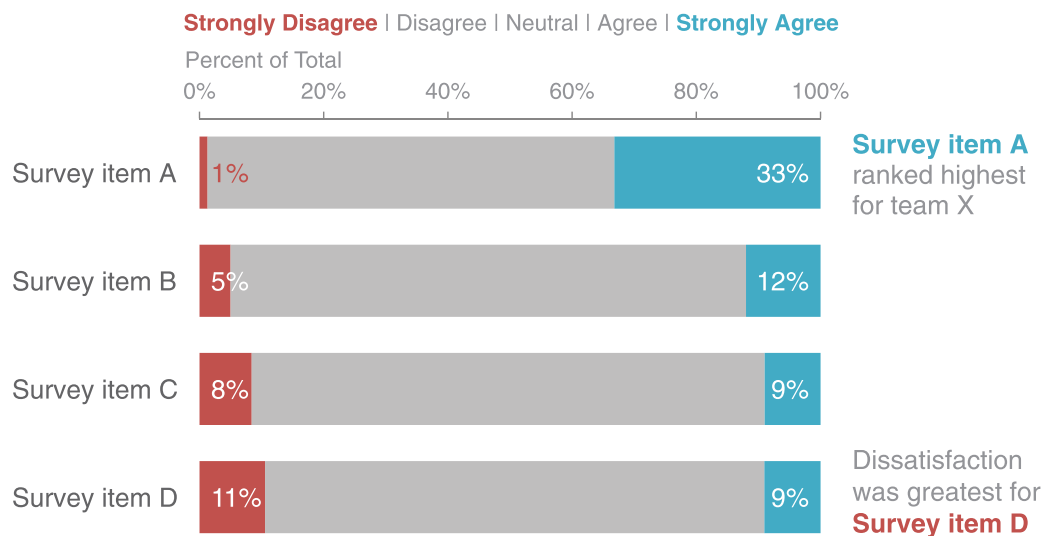
If you had to describe in a single word how the blue and black backgrounds in Figure 9.1 make you feel, what would that word be? For me, it would be *heavy*. With the white background, I find it easy to focus on the data. The dark backgrounds, on the other hand, pull my eyes there—to the background—and away from the data. Light elements on a dark background can create a stronger contrast but are generally harder to read. Because of this, I typically avoid dark and colored backgrounds.

That said, sometimes there are considerations outside of the ideal scenario for communicating with data that must be taken into account, such as your company or client's brand and corresponding standard template. This was the challenge I faced in one consulting project.

I didn't recognize this immediately. It was only after I had completed my initial revamp of the client's original visual that I realized it just didn't quite fit with the look and feel of the work products I'd seen from the client group. Their template was bold and in your face with a mottled, black background spiked with bright, heavily saturated

colors. In comparison, my visual felt rather meek. Figure 9.2 shows a generalized version of my initial makeover of a visual displaying employee survey feedback.

## Survey Results: Team X



**FIGURE 9.2** Initial makeover on white background

In an endeavor to create something more in sync with the client's brand, I remade my own makeover, leveraging the same dark background I'd seen used in some of the other examples shared. In doing so, I had to reverse my normal thought process. With a white background, the further a color is from white, the more it will stand out (so grey stands out less, whereas black stands out very much). With a black background, the same is true, but black becomes the baseline (so grey stands out less, and white stands out very much). I also realized some colors that are typically verboten with a white background (for example, yellow) are **incredibly attention grabbing against black** (I didn't use yellow in this particular example but did in some others).

Figure 9.3 depicts how my "more in line with the client's brand" version of the visual looked.

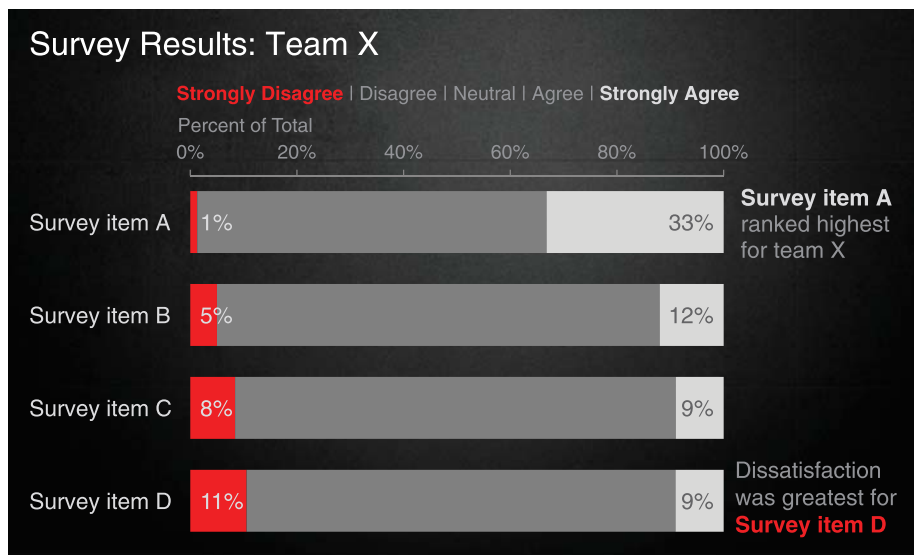


FIGURE 9.3 Remake on dark background

While the content is exactly the same, note how different Figure 9.3 feels compared to Figure 9.2. This is a good illustration of how color can impact the overall tone of a visualization.

## CASE STUDY 2: Leveraging animation in the visuals you present

One conundrum commonly faced when communicating with data is when a single view of the data is used for both presentation and report. When presenting content in a live setting, you want to be able to walk your audience through the story, focusing on just the relevant part of the visual. However, the version that gets circulated to your audience—as a pre-read or takeaway, or for those who weren't able to attend the meeting—needs to be able to stand on its own without you, the presenter, there to walk the audience through it.

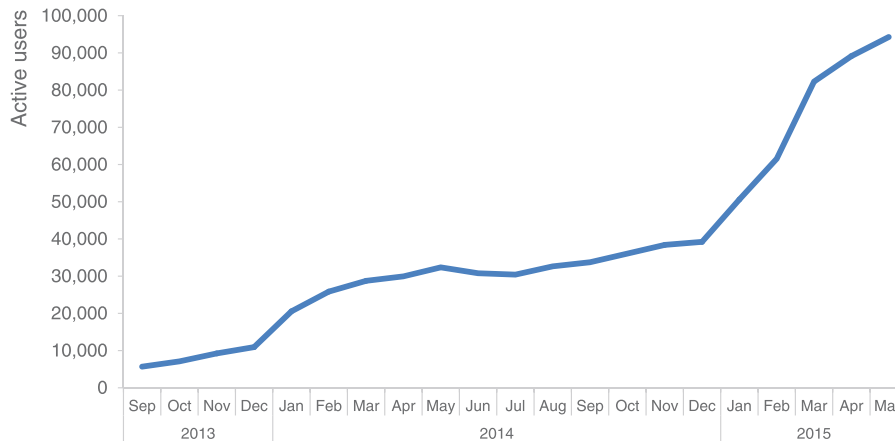
Too often, we use the exact same content and visuals for both purposes. This typically renders the content too detailed for the live presentation (particularly if it is being projected on the big screen) and sometimes not detailed enough for the circulated content. This gives

rise to the slideument—part presentation, part document, and not exactly meeting the needs of either—which we touched upon briefly in Chapter 1. In the following, we'll look at a strategy for leveraging animation coupled with an annotated line graph to meet both the presentation and circulation needs.

Let's assume that you work for a company that makes online social games. You are interested in telling the story around how active users for a given game—let's call it Moonville—have grown over time.

You could use Figure 9.4 to talk about growth since the launch of the game in late 2013.

Moonville: active users over time



Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

**FIGURE 9.4** Original graph

The challenge, however, is that when you put this much data in front of your audience, you lose control over their attention. You might be talking about one part of the data while they are focusing somewhere else entirely. Perhaps you want to tell the story chronologically, but your audience may jump immediately to the sharp increase in 2015 and wonder what drove that. When they do so, they stop listening to you.

Alternatively, you can leverage animation to walk your audience through your visual as you tell the corresponding points of the story. For example, I could start with a blank graph. This forces the audience to look at the graph details with you, rather than jump straight to the data and start trying to interpret it. You can use this approach to build anticipation within your audience that will help you to retain their attention. From there, I subsequently show or highlight *only the data that is relevant to the specific point I am making*, forcing the audience's attention to be exactly where I want it as I am speaking.

I might say—and show—the following progression:

*Today, I'm going to talk you through a success story: the increase in Moonville users over time. First, let me set up what we are looking at. On the vertical y-axis of this graph, we're going to plot active users. This is defined as the number of unique users in the past 30 days. We'll look at how this has changed over time, from the launch in late 2013 to today, shown along the horizontal x-axis. (Figure 9.5)*

#### Moonville: active users over time



Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

FIGURE 9.5

*We launched Moonville in September 2013. By the end of that first month, we had just over 5,000 active users, denoted by the big blue dot at the bottom left of the graph. (Figure 9.6)*

Moonville: active users over time



Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

FIGURE 9.6

*Early feedback on the game was mixed. In spite of this—and our practically complete lack of marketing—the number of active users nearly doubled in the first four months, to almost 11,000 active users by the end of December. (Figure 9.7)*

Moonville: active users over time



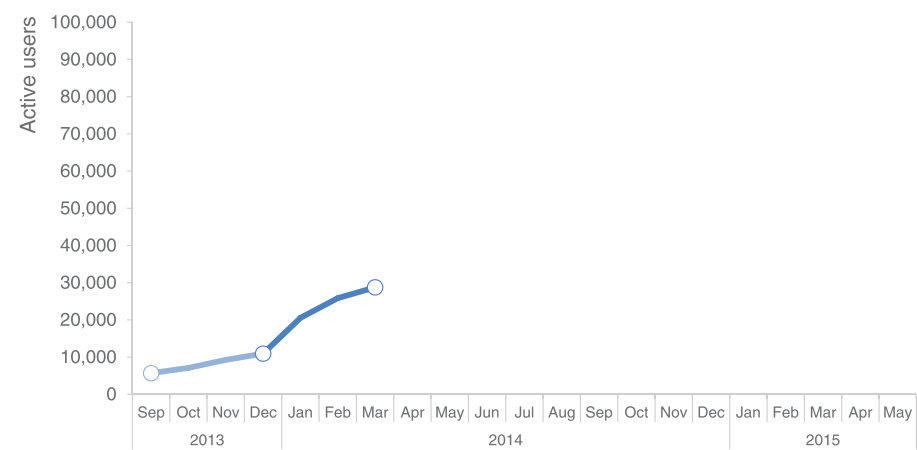
Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

**FIGURE 9.7**



*In early 2014, the number of active users increased along a steeper trajectory. This was primarily the result of the friends and family promotions we ran during this time to increase awareness of the game. (Figure 9.8)*

Moonville: active users over time

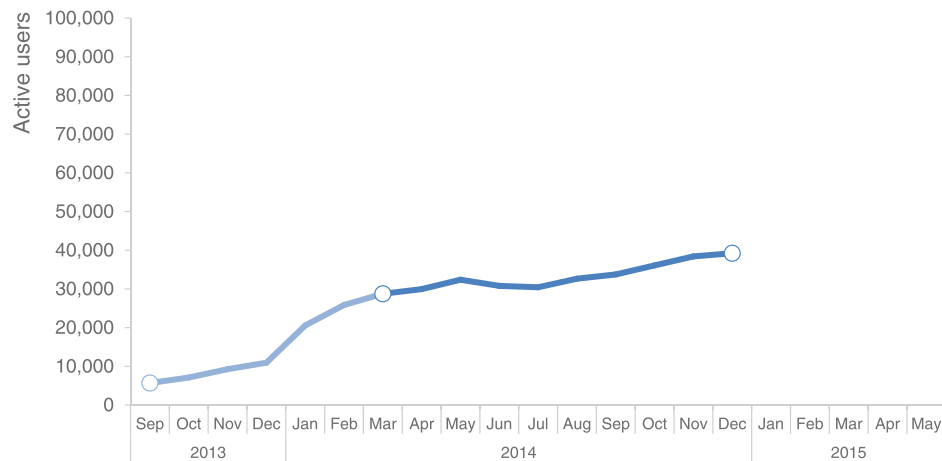


Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

FIGURE 9.8

*Growth was pretty flat over the rest of 2014 as we halted all marketing efforts and focused on quality improvements to the game. (Figure 9.9)*

#### Moonville: active users over time

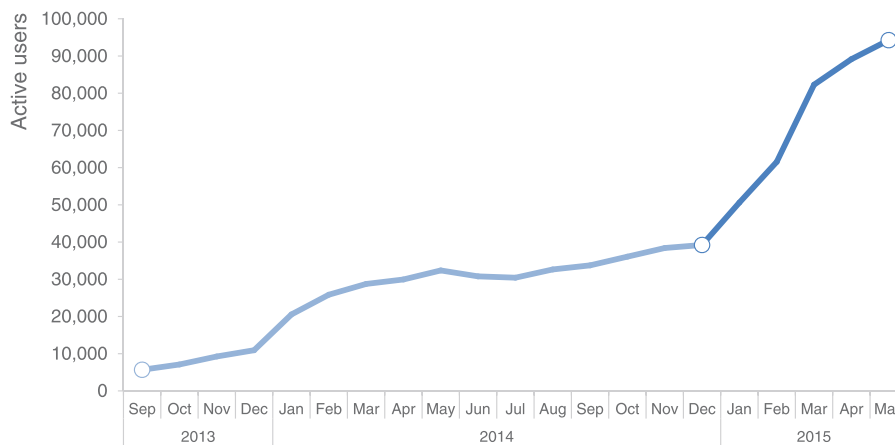


Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

**FIGURE 9.9**

*Uptake this year, on the other hand, has been incredible, surpassing our expectations. The revamped and improved game has gone viral. The partnerships we've forged with social media channels have proven successful for continuing to increase our active user base. At recent growth rates, we anticipate we'll surpass 100,000 active users in June! (Figure 9.10)*

Moonville: active users over time

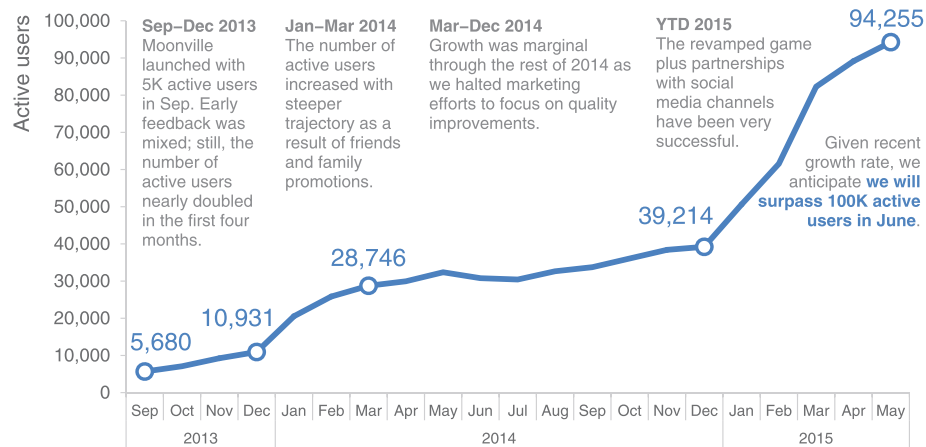


Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

FIGURE 9.10

For the more detailed version that you circulate as a follow up or for those who missed your (stellar) presentation, you can leverage a version that annotates the salient points of the story on the line graph directly, as shown in Figure 9.11.

## Moonville: active users over time



Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

FIGURE 9.11

This is one strategy for creating a visual (or, in this case, set of visuals) that meets both the needs of your live presentation and the circulated version. Note that with this approach, it is imperative that you know your story well to be able to narrate without relying on your visuals (something you should always aim for regardless).

If you're leveraging presentation software, you can set up all of the above on a single slide and use animation for the live presentation, having each image appear and disappear as needed to form the desired progression. Put the final annotated version on top so it's all that shows on the printed version of the slide. If you do this, you can use the exact same deck for the presentation and the communication that you circulate. Alternatively, you can put each graph on a separate slide and flip through them; in this case, you'd only want to circulate the final annotated version.

## CASE STUDY 3: Logic in order

There should be logic in the order in which you display information.

The above statement probably goes without saying. Yet, like so many things that seem logical when we read them or hear them or say them out loud, too often we don't put them into practice. This is one such example.

While I would say my introductory sentence is universally true, I'll focus here on a very specific example to illustrate the concept: leveraging order for categorical data in a horizontal bar chart.

First, let's set the context. Let's say you work at a company that sells a product that has various features. You've recently surveyed your users to understand whether they are using each of the features and how satisfied they've been with them and want to put that data to use. The initial graph you create might look something like Figure 9.12.

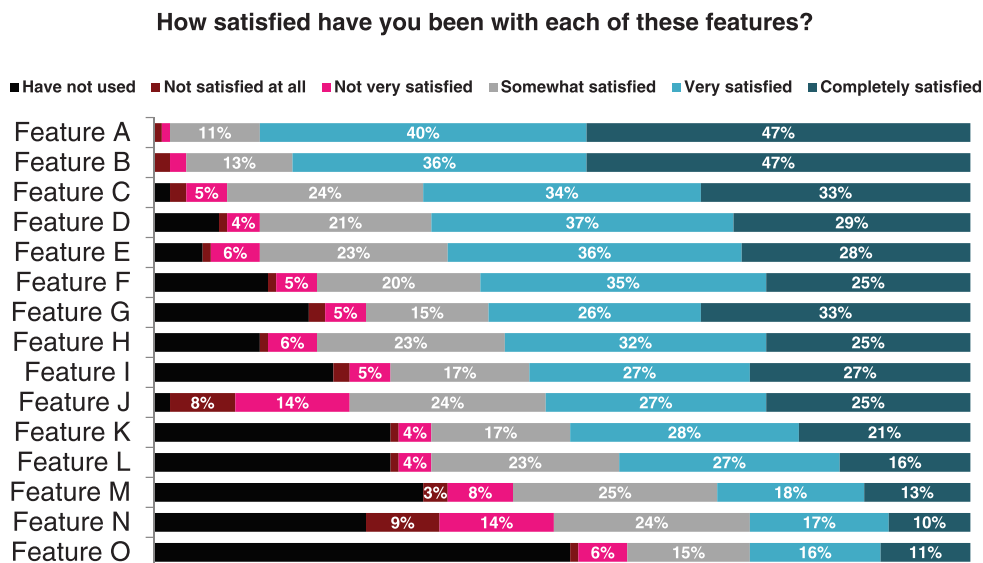
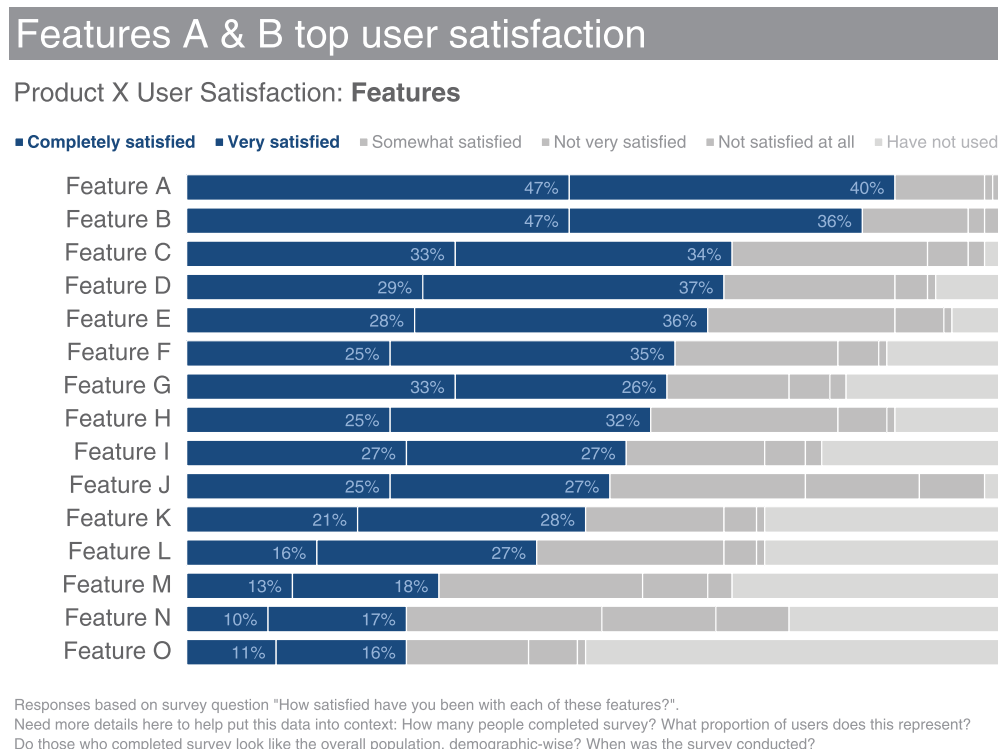


FIGURE 9.12 User satisfaction, original graph

This is a real example, and Figure 9.12 shows the actual graph that was created for this purpose, with the exception that I've replaced the descriptive feature names with Feature A, Feature B, and so on. There is an order here—if we stare at the data for a bit, we find that it is arranged in decreasing order of the “Very satisfied” group plus the “Completely satisfied” group (the teal and dark teal segments on the right side of the graph). This may suggest that is where we should pay attention. But from a color standpoint, my eyes are drawn first to the bold black “Have not used” segment. And if we pause to think about what the data shows, it would perhaps be the areas of dissatisfaction that would be of most interest.

Part of the challenge here is that the story—the “so what”—of this visual is missing. We could tell a number of different stories and focus on a number of different aspects of this data. Let's look at a couple of ways to do this, with an eye towards leveraging order.

First, we could think about highlighting the positive story: where our users are most satisfied. See Figure 9.13.



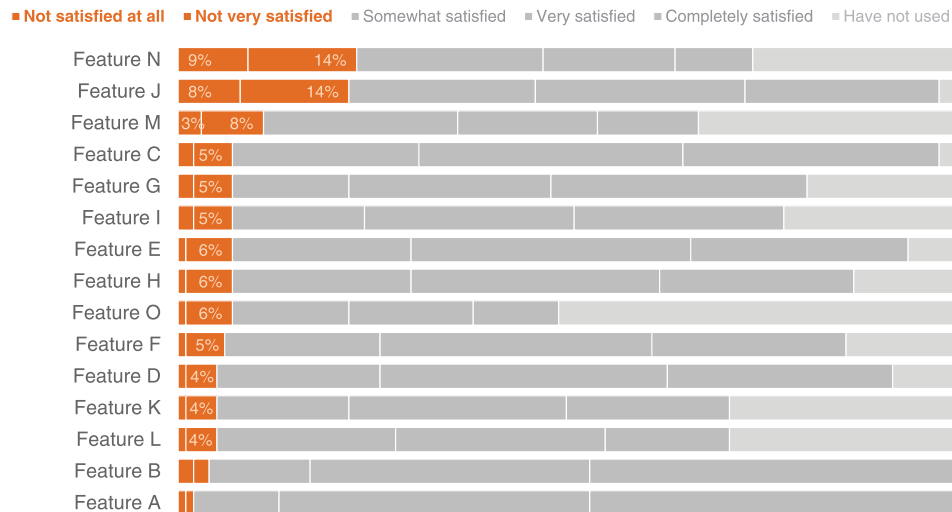
**FIGURE 9.13** Highlight the positive story

In Figure 9.13, I've ordered the data clearly by putting "Completely satisfied" plus "Very satisfied" in descending order—the same as in the original graph—but I've made it much more obvious here through other visual cues (namely, color, but also the positioning of the segments as the first series in the graph, so the audience's attention hits it first as they scan from left to right). I've also used words to help explain *why* your attention is drawn to where it is via the action title at the top, which calls out what you should be seeing in the visual.

We can leverage these same tactics—order, color, placement, and words—to highlight a different story within this data: where users are least satisfied. See Figure 9.14.

### Users least satisfied with Features N & J

#### Product X User Satisfaction: **Features**



Responses based on survey question "How satisfied have you been with each of these features?".

Need more details here to help put this data into context: How many people completed survey? What proportion of users does this represent?

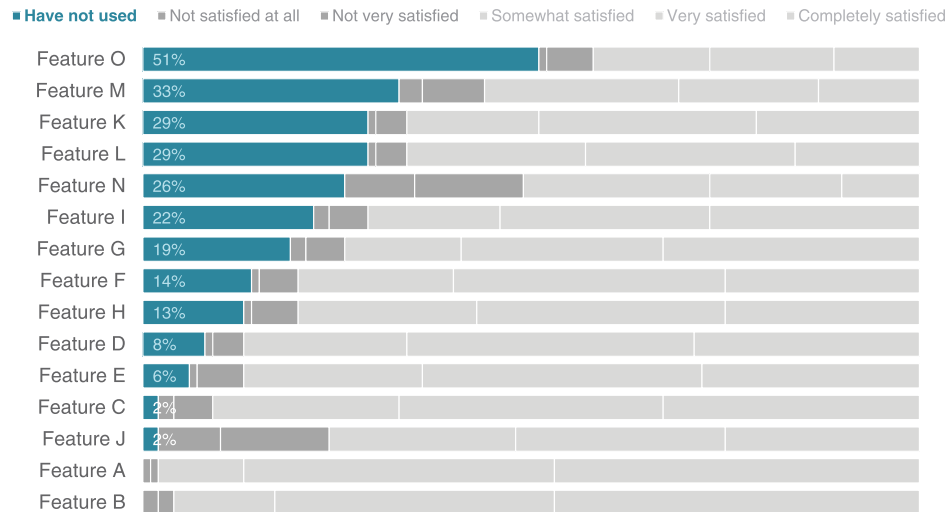
Do those who completed survey look like the overall population, demographic-wise? When was the survey conducted?

**FIGURE 9.14** Highlight dissatisfaction

Or perhaps the real story here is in the unused features, which could be highlighted as shown in Figure 9.15.

## Feature O is least used

### Product X User Satisfaction: Features



Responses based on survey question "How satisfied have you been with each of these features?".  
 Need more details here to help put this data into context: How many people completed survey? What proportion of users does this represent?  
 Do those who completed survey look like the overall population, demographic-wise? When was the survey conducted?

**FIGURE 9.15** Focus on unused features

Note that in Figure 9.15, you can still get to the differing levels of satisfaction (or lack thereof) within each bar, but they've been pushed back to a second-order comparison due to the color choices I've made, while the relative rank ordering of the "Have not used" segment is the clear primary comparison on which my audience is meant to focus.

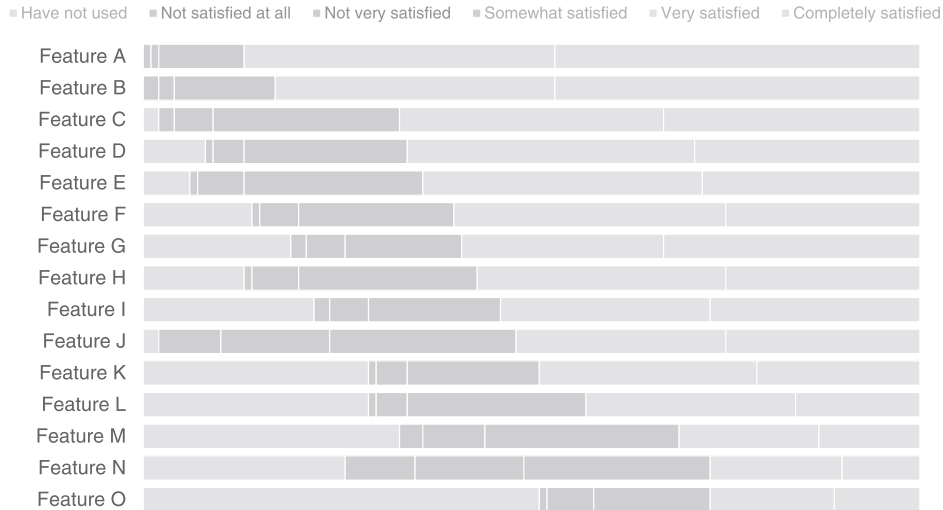
If we want to tell one of the above stories, we can leverage order, color, position, and words as I've shown to draw our audience's attention to where we want them to pay it in the data. If we want to tell *all three* stories, however, I'd recommend a slightly different approach.

It isn't very nice to get your audience familiar with the data only to completely rearrange it. Doing so creates a mental tax—the same sort of unnecessary cognitive burden that we discussed in Chapter 3 that we want to avoid. Let's create a base visual and preserve the same order so our audience only has to familiarize themselves with the detail once—highlighting the different stories one at a time through strategic use of color.



## User satisfaction varies greatly by feature

### Product X User Satisfaction: **Features**



Responses based on survey question "How satisfied have you been with each of these features?".  
 Need more details here to help put this data into context: How many people completed survey? What proportion of users does this represent?  
 Do those who completed survey look like the overall population, demographic-wise? When was the survey conducted?

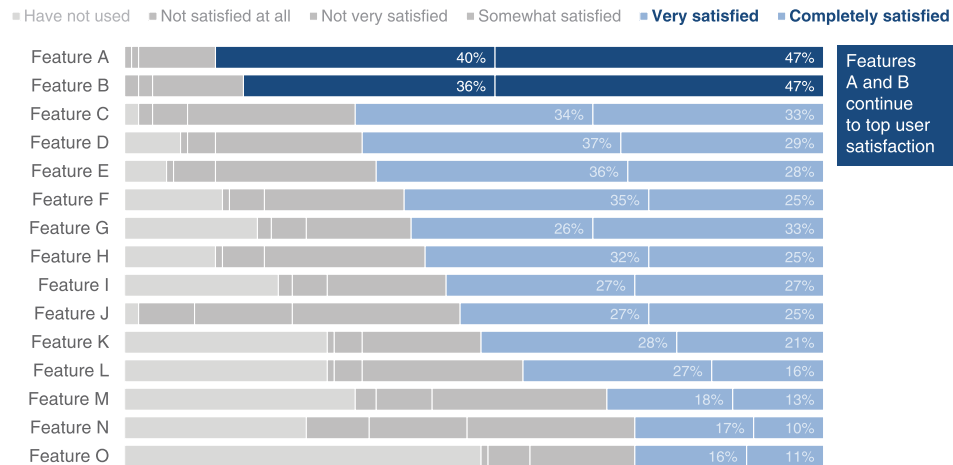
**FIGURE 9.16** Set up the graph

Figure 9.16 depicts our base visual, without anything highlighted. If I were presenting this to an audience, I'd use this version to walk them through what they are looking at: survey responses to the question, "How satisfied have you been with each of these features?"—ranging from the positive "Completely satisfied" at the right to "Not satisfied at all" and, finally, "Have not used" at the far left (leveraging the natural association of positive at the right and negative at the left). Then I'd pause to tell each of the stories in succession.

First comes a visual similar to what we started with in the last series that highlights where users are the most satisfied. In this version, I've leveraged different shades of blue to draw attention not only to the proportion of users who are satisfied but specifically to Features A and B within those segments that rank highest, tying these bars visually to the text that illustrates my point. See Figure 9.17.

## User satisfaction varies greatly by feature

### Product X User Satisfaction: Features



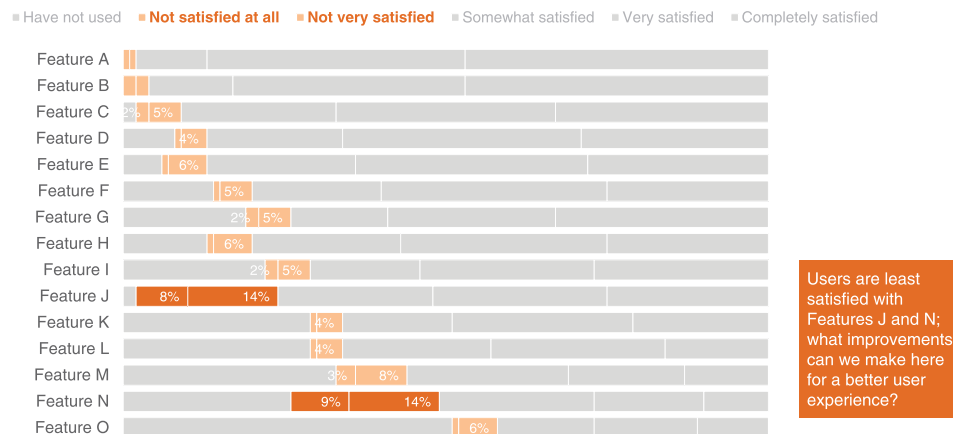
Responses based on survey question "How satisfied have you been with each of these features?".  
 Need more details here to help put this data into context: How many people completed survey? What proportion of users does this represent?  
 Do those who completed survey look like the overall population, demographic-wise? When was the survey conducted?

FIGURE 9.17 Satisfaction

This is followed by a focus on the other end of the spectrum to where users are least satisfied, again calling out and highlighting specific points of interest. See Figure 9.18.

## User satisfaction varies greatly by feature

### Product X User Satisfaction: Features



Responses based on survey question "How satisfied have you been with each of these features?".  
 Need more details here to help put this data into context: How many people completed survey? What proportion of users does this represent?  
 Do those who completed survey look like the overall population, demographic-wise? When was the survey conducted?

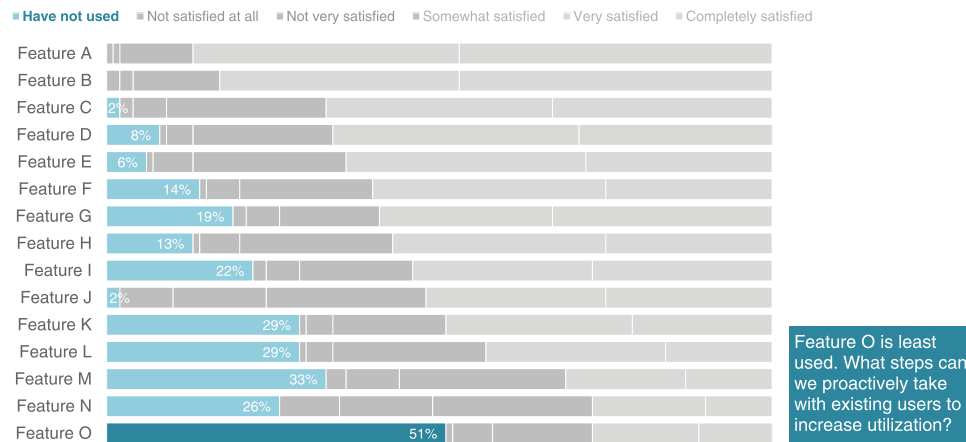
FIGURE 9.18 Dissatisfaction

Note how it isn't as easy to see the relative rank ordering of the features highlighted in Figure 9.18 as it was when they were put in descending order (Figure 9.14) because they aren't aligned along a common baseline to either the left or the right. We can still relatively quickly see the primary areas of dissatisfaction (Features J and N) since they are so much bigger than the other categories and because of the color emphasis. I've added a callout box to highlight this through text as well.

Finally, preserving the same order, we can draw our audience's attention to the unused features. See Figure 9.19.

## User satisfaction varies greatly by feature

### Product X User Satisfaction: **Features**



Responses based on survey question "How satisfied have you been with each of these features?".  
 Need more details here to help put this data into context: How many people completed survey? What proportion of users does this represent?  
 Do those who completed survey look like the overall population, demographic-wise? When was the survey conducted?

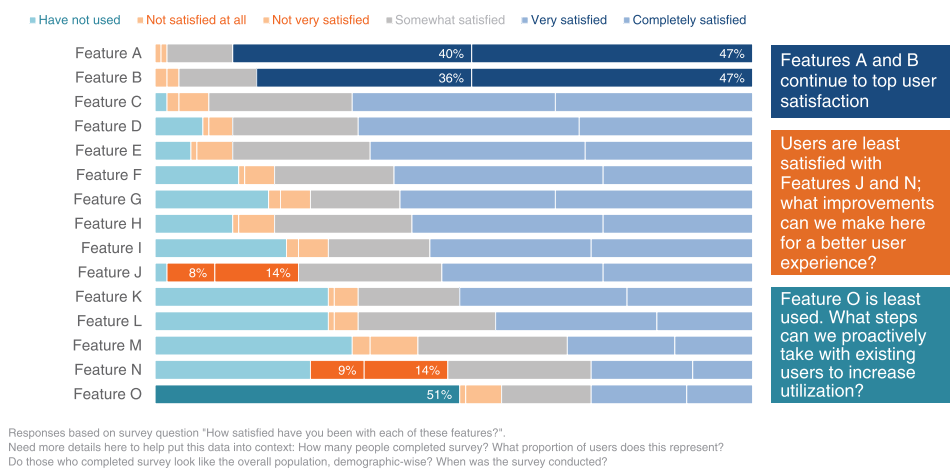
**FIGURE 9.19** Unused features

In Figure 9.19, it is easier to see the rank ordering (even though the categories aren't monotonically increasing from top to bottom) because of the alignment to a consistent baseline at the left of the graph. Here, we want our audience to focus mainly on the very bottom feature in the graph—Feature O. Since we're trying to preserve the established order and can't do this by putting it at the top (where the audience would encounter it first), the bold color and callout box help draw attention to the bottom of the graph.

The preceding views show the progression I'd use in a live presentation. The sparing and strategic use of color lets me direct my audience's attention to one component of the data at a time. If you are creating a written document to be shared directly with your audience, you might compress all of these views into a single, comprehensive visual, as shown in Figure 9.20.

## User satisfaction varies greatly by feature

### Product X User Satisfaction: **Features**



**FIGURE 9.20** Comprehensive visual

When I process Figure 9.20, my eyes do a number of zigzagging "z's" across the page. First, I see the bold "Features" in the graph title. Then I'm drawn to the dark blue bars—which I follow across to the dark blue text box that tells me what's interesting about what I'm looking at (you'll note my text here is mostly descriptive, mainly due to the anonymity of the example; ideally this space would be used to provide greater insight). Next, I hit the orange text box, read it, and glance back leftward to see the evidence in the graph that supports it. Finally, I see the teal bar emphasized at the bottom and look across to see the text that describes it. Strategic use of color sets the various series apart from one another while also making it clear where the audience should look for the specific evidence of what is being described in the text.

Note that with Figure 9.20 it is harder for your audience to form *other* conclusions with the data, since attention is drawn so strongly to the particular points I want to highlight. But as we've discussed repeatedly, once you've reached the point of needing to communicate, *there should be a specific story or point that you want to highlight*, rather than let your audience draw their own conclusions. Figure 9.20 is too dense for a live presentation but could work well for the document that will be circulated.

I've mentioned this previously but would feel remiss not to point out that in some cases there is intrinsic order in the data you want to show (ordinal categories). For example, instead of features, if the categories were age ranges (0–9, 10–19, 20–29, etc.), you should keep those categories in numerical order. This provides an important construct for the audience to use as they interpret the information. Then use the other methods of drawing attention (through color, position, callout boxes with text) to direct the audience's attention to where you want them to pay it.

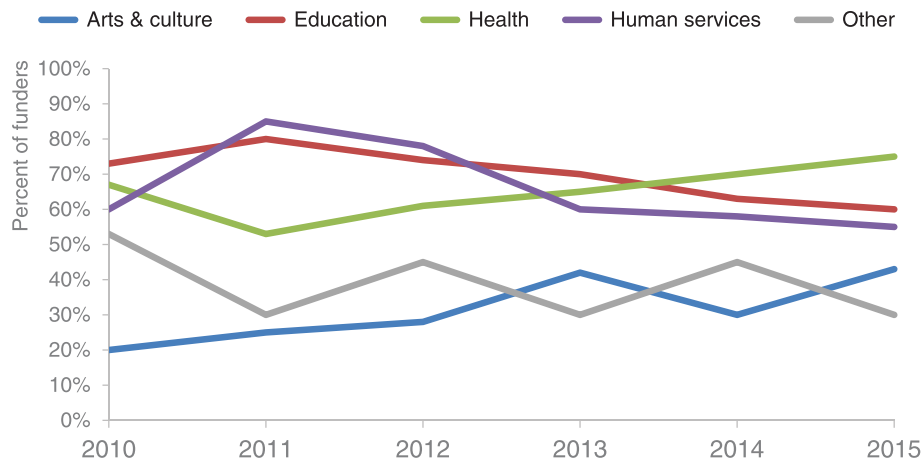
Bottom line: there should be logic in the order of the data you show.

## CASE STUDY 4: Strategies for avoiding the spaghetti graph

While I very much enjoy food, I have a distaste for any chart type that has food in its title. My hatred of pie charts is well documented. Donuts are even worse. Here is another to add to the list: the spaghetti graph.

If you aren't sure if you've seen a spaghetti graph before, I'll bet that you have. A spaghetti graph is a line graph where the lines overlap a lot, making it difficult to focus on a single series at a time. They look something like Figure 9.21.

### Types of non-profits supported by area funders



Data is self-reported by funders; percents sum to greater than 100 because respondents can make multiple selections.

**FIGURE 9.21** The spaghetti graph

Graphs like Figure 9.21 are known as spaghetti graphs because they look like someone took a handful of uncooked spaghetti noodles and threw them on the ground. And they are about as informative as those haphazard noodles would be as well ...

which is to say ...

not at all.

Note how difficult it is to concentrate on a single line within that mess, due to all of the crisscrossing and because so much is competing for your attention.

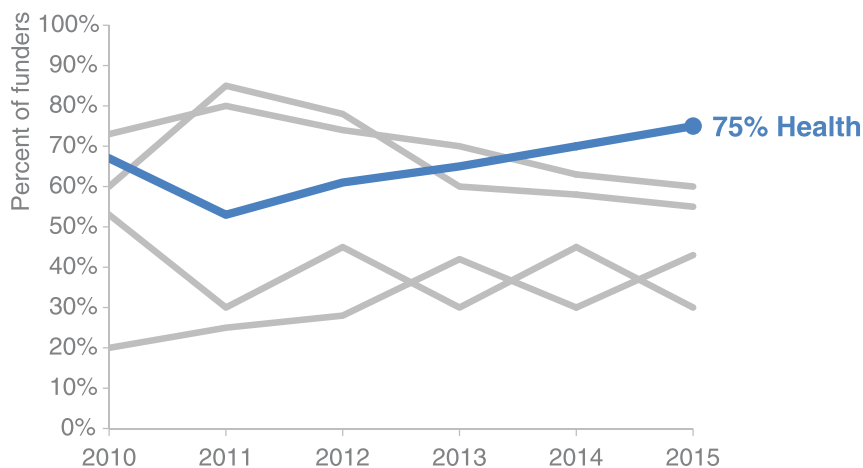
There are a few strategies for taking the would-be-spaghetti graph and creating more visual sense of the data. I'll cover three such strategies and show them applied in a couple of different ways to the

data graphed in Figure 9.21, which shows types of nonprofits supported by funders in a given area. First, we'll look at an approach you should be familiar with by now: using preattentive attributes to emphasize a single line at a time. After that, we'll look at a couple of views that separate the lines spatially. Then finally, we'll look at a combined approach that leverages elements of these first two strategies.

### Emphasize one line at a time

One way to keep the spaghetti graph from becoming visually overwhelming is to use preattentive attributes to draw attention to a single line at a time. For example, we could focus our audience on the increase in the percentage of funders donating over time to health nonprofits. See Figure 9.22.

Types of non-profits supported by area funders

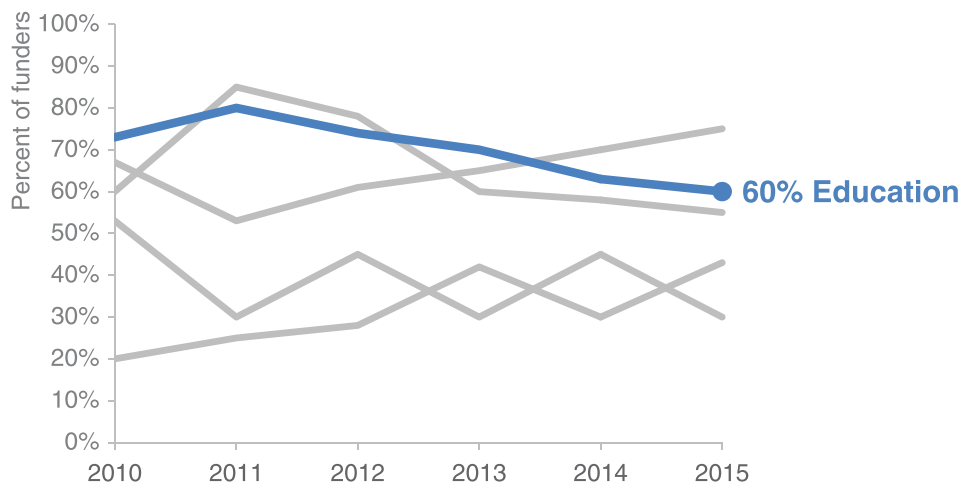


Data is self-reported by funders; percents sum to greater than 100 because respondents can make multiple selections.

**FIGURE 9.22** Emphasize a single line

Or we could use the same strategy to emphasize the decrease in the percentage of funders donating to education-related nonprofits. See Figure 9.23.

### Types of non-profits supported by area funders



Data is self-reported by funders; percents sum to greater than 100 because respondents can make multiple selections.

**FIGURE 9.23** Emphasize another single line

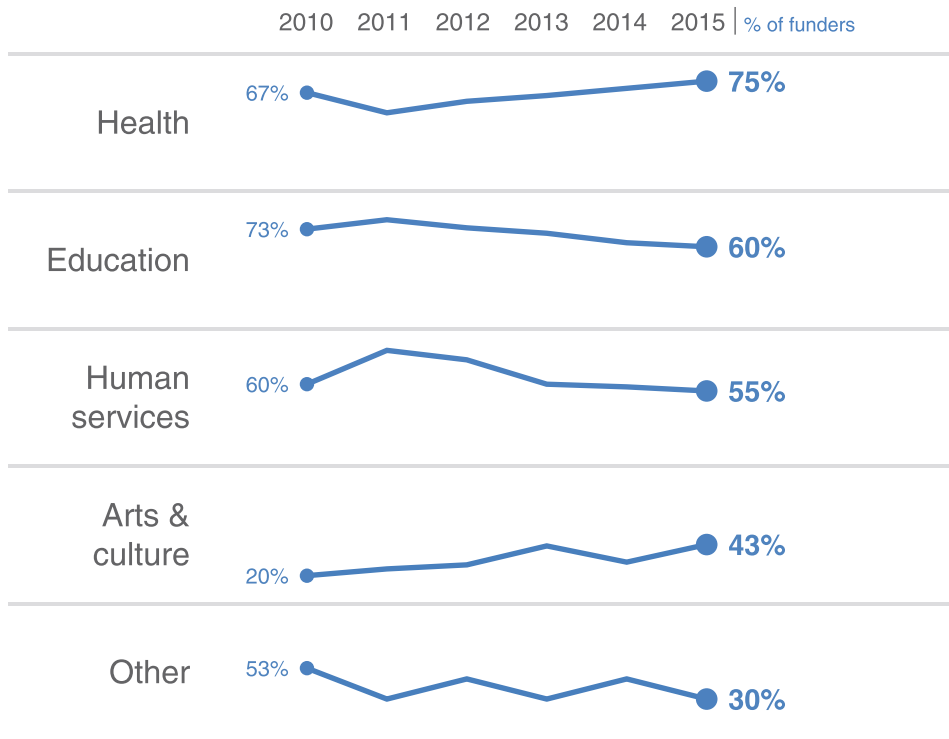
In Figures 9.22 and 9.23, color, thickness of line, and added marks (the data marker and data label) act as visual cues to draw attention to where we want our audience to focus. This strategy can work well in a live presentation, where you explain the details of the graph once (as we've seen in the recent case studies), then cycle through the various data series in this manner, highlighting what is interesting or should be paid attention to with each and why. Note that we need either this voiceover or the addition of text to make it clear why we are highlighting the given data and provide the story for our audience.

### Separate spatially

We can untangle the spaghetti graph by pulling the lines apart either vertically or horizontally. First, let's look at a version where the lines are pulled apart vertically. See Figure 9.24.



## Types of non-profits supported by area funders



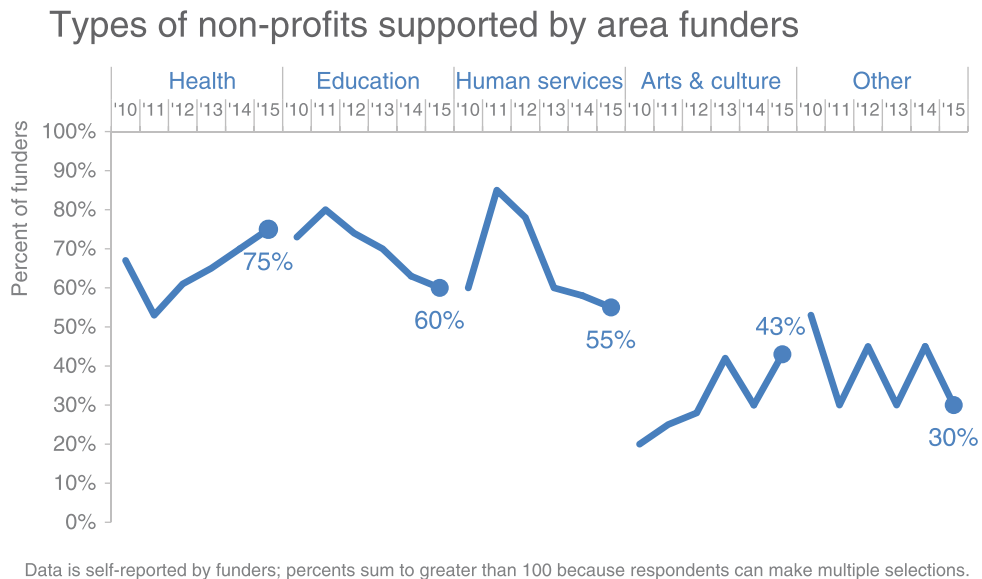
Data is self-reported by funders; percents sum to greater than 100 because respondents can make multiple selections.

**FIGURE 9.24** Pull the lines apart vertically

In Figure 9.24, the same x-axis (year, shown at the top) is leveraged across all of the graphs. In this solution, I've created five separate graphs but organized them such that they appear to be a single visual. The y-axis within each graph isn't shown; rather, the starting and ending point labels are meant to provide enough context so that the axis is unnecessary. Though they aren't shown, it is important that the y-axis minimum and maximum are the same for each graph so the audience can compare the relative position of each line or point within the given space. If you were to shrink these down, they would look similar to what Edward Tufte calls "sparklines" (a very small line graph typically drawn without axis or coordinates to show the general shape of the data; *Beautiful Evidence*, 2006).

This approach assumes that being able to see the trend for a given category (Health, Education, etc.) is more important than comparing

the values across categories. If that isn't the case, we can consider pulling the data apart horizontally, as illustrated in Figure 9.25.



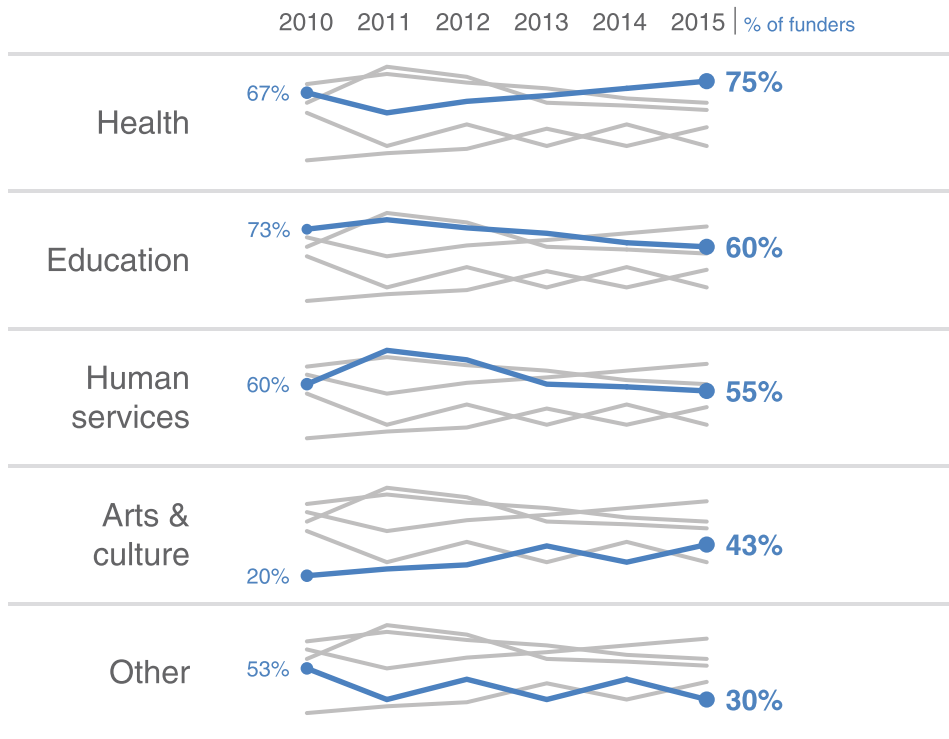
**FIGURE 9.25** Pull the lines apart horizontally

Whereas in Figure 9.24 we leveraged the x-axis (years) across the five categories, in Figure 9.25 we leverage the same y-axis (percent of funders) across the five categories. Here, the relative height of the various data series allows them to more easily be compared with each other. We can quickly see that the highest percentage of funders in 2015 donate to Health, a lower percentage to Education, an even lower percentage to Human Services, and so on.

### Combined approach

Another option is to combine the approaches we've outlined so far. We can separate spatially *and* emphasize a single line at a time, while leaving the others there for comparison but pushing them to the background. As was the case with the prior approach, we can do this by separating the lines vertically (Figure 9.26) or horizontally (Figure 9.27).

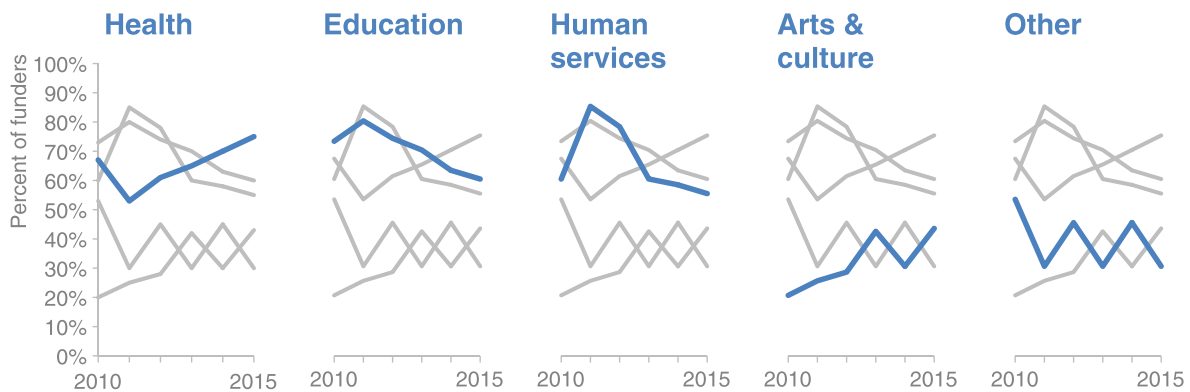
## Types of non-profits supported by area funders



Data is self-reported by funders; percents sum to greater than 100 because respondents can make multiple selections.

**FIGURE 9.26** Combined approach, with vertical separation

## Types of non-profits supported by area funders



Data is self-reported by funders; percents sum to greater than 100 because respondents can make multiple selections.

**FIGURE 9.27** Combined approach, with horizontal separation

Having a number of small graphs together, as shown in Figure 9.27, is sometimes referred to as “small multiples.” As noted previously, it’s imperative here that the details of each graph (the x- and y-axis minimum and maximum) are the same so that the audience can quickly compare the highlighted series across the various graphs.

This approach, shown in Figures 9.26 and 9.27, can work well if the context of the full dataset is important but you want to be able to focus on a single line at a time. Because of the denseness of information, this combined approach may work better for a report or presentation that will be circulated rather than a live presentation, where it will be more challenging to direct your audience where you want them to look.

As is frequently the case, there is not a single “right” answer. Rather, the solution that will work best will vary by situation. The meta-lesson is: if you find yourself facing a spaghetti graph, don’t stop there. Think about what information you want to most convey, what story you want to tell, and what changes to the visual could help you accomplish that effectively. Note that in some cases, this may mean showing less data altogether. Ask yourself: Do I need all categories? All years? When appropriate, reducing the amount of data shown can make the challenge of graphing data like that shown in this example easier as well.

## CASE STUDY 5: Alternatives to pies

Recall the scenario we discussed in Chapter 1 about the summer learning program on science. To refresh your memory: you just completed a pilot summer program on science aimed at improving perceptions of the field among 2nd and 3rd grade elementary children. You conducted a survey going into the program and at the end of the program, and want to use this data as evidence of the success of the pilot program in your request for future funding. Figure 9.28 shows a first attempt at graphing this data.

## Survey results: summer learning program on science

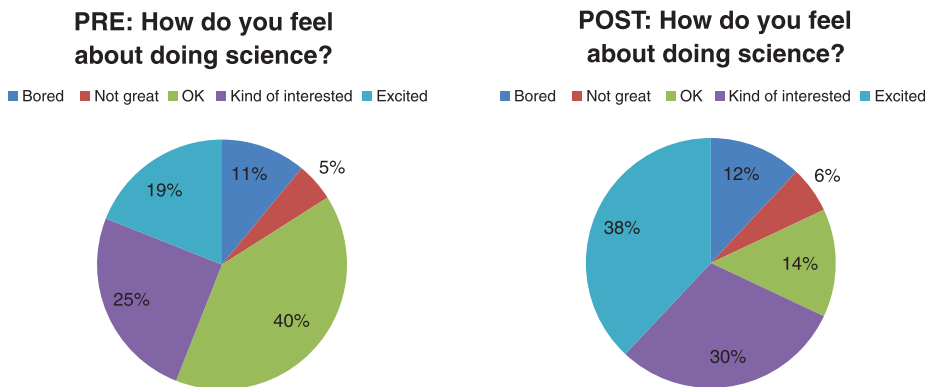


FIGURE 9.28 Original visual

The survey data demonstrates that, on the basis of improved sentiment toward science, the pilot program was a great success. Going into the program, the biggest segment of students (40%, the green slice in Figure 9.28, left) felt just “OK” about science—perhaps they hadn’t made up their minds one way or the other. However, after the program (Figure 9.28, right), we see the 40% in green shrinks down to 14%. “Bored” (blue) and “Not great” (red) went up a percentage point each, but the majority of the change was in a positive direction. After the program, nearly 70% of kids (purple plus teal segments) expressed some level of interest toward science.

Figure 9.28 does this story a great disservice. I shared my less-than-favorable view on pie charts in Chapter 2, so I hope this judgment is not met with surprise. Yes, you can get to the story from Figure 9.28, but you have to work for it and overcome the annoyance of trying to compare segments across two pies. As we’ve discussed, we want to limit or eliminate the work your audience has to do to get at the information, and we certainly don’t want to annoy them. We can avoid such challenges by choosing a different type of visual.

Let’s take a look at four alternatives for displaying this data—show the numbers directly, simple bar graph, stacked horizontal bar graph, and slopegraph—and discuss some considerations with each.

### Alternative #1: show the numbers directly

If the improvement in positive sentiment is the main message we want to impart to our audience, we can consider making that the only thing we communicate. See Figure 9.29.

Pilot program was a success

After the pilot program,

68%

of kids expressed interest towards science,  
compared to 44% going into the program.

Based on survey of 100 students conducted before and after pilot program (100% response rate on both surveys).

**FIGURE 9.29** Show the numbers directly

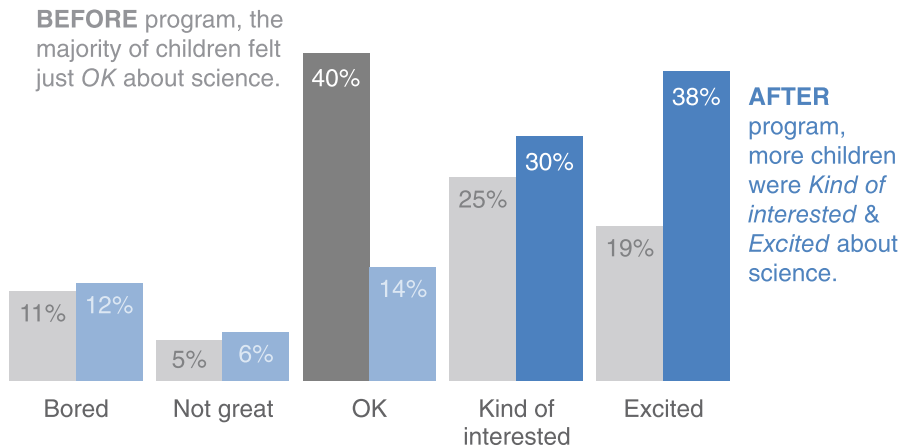
Too often, we think we have to include all of the data and overlook the simplicity and power of communicating with just one or two numbers directly, as demonstrated in Figure 9.29. That said, if you feel you need to show more, look to one of the following alternatives.

### Alternative #2: simple bar graph

When you want to compare two things, you should generally put those two things as close together as possible and align them along a common baseline to make this comparison easy. The simple bar graph does this by aligning the Before and After survey responses with a consistent baseline at the bottom of the graph. See Figure 9.30.

## Pilot program was a success

How do you feel about science?



Based on survey of 100 students conducted before and after pilot program (100% response rate on both surveys).

**FIGURE 9.30** Simple bar graph

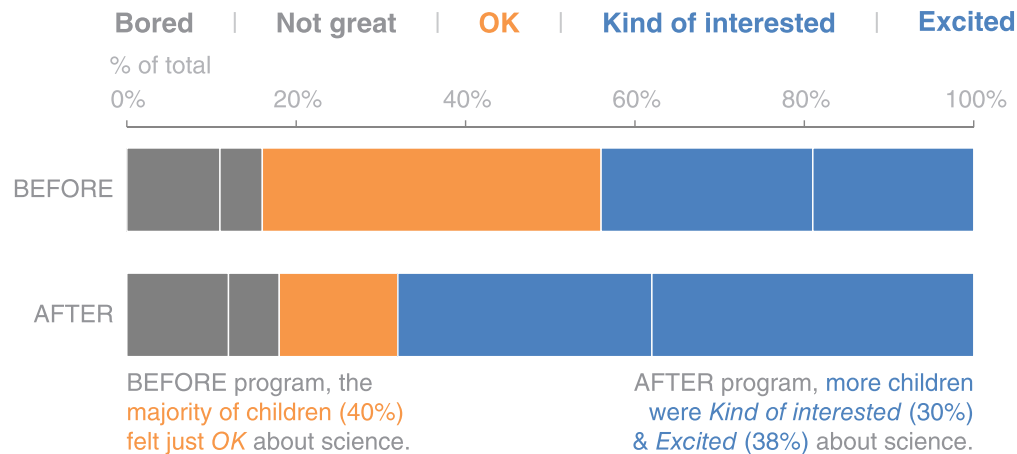
I am partial to this view for this specific example because the layout makes it possible to put the text boxes right next to the data points they describe (note that other data is there for context but is slightly pushed to the background through the use of lighter colors). Also, by having Before and After as the primary classification, I'm able to limit the visual to two colors—grey and blue—whereas three colors will be used in the following alternatives.

### Alternative #3: 100% stacked horizontal bar graph

When the part-to-whole concept is important (something you don't get with either Alternative #1 or #2), the stacked 100% horizontal bar graph achieves this. See Figure 9.31. Here, you get a consistent baseline to use for comparison at the left and at the right of the graph. This allows the audience to easily compare both the negative segments at the left and the positive segments at the right across the two bars and, because of this, is a useful way to visualize survey data in general.

## Pilot program was a success

How do you feel about science?



Based on survey of 100 students conducted before and after pilot program (100% response rate on both surveys).

**FIGURE 9.31** 100% stacked horizontal bar graph

In Figure 9.31, I chose to retain the x-axis labels rather than put data labels on the bars directly. I tend to do it this way when leveraging 100% stacked bars so that you can use the scale at the top to read either from left to right or from right to left. In this case, it allows us to attribute numbers to the change from Before to After on the negative end of the scale (“Bored” and “Not great”) or from right to left, doing the same for the positive end of the scale (“Kind of interested” and “Excited”). In the simple bar graph shown previously (Figure 9.30), I chose to omit the axis and label the bars directly. This illustrates how different views of your data may lead you to different design choices. Always think about how you want your audience to use the graph and make your design choices accordingly: different choices will make sense in different situations.

### Alternative #4: slopegraph

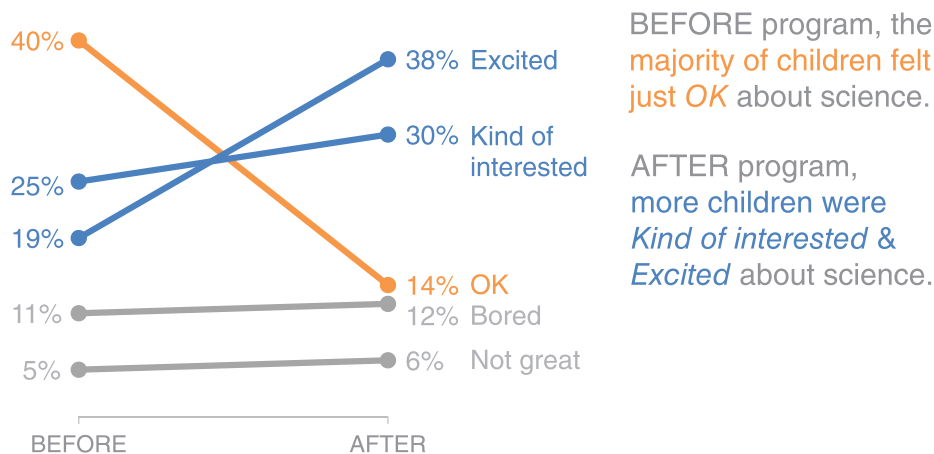
The final alternative I’ll present here is a slopegraph. As was the case with the simple bar chart, you don’t get a clear sense of there being a whole and thus pieces-of-a-whole in this view (in the way that you



do with the initial pie or with the 100% horizontal stacked bar). Also, if it is important to have your categories ordered in a certain way, a slopegraph won't always be ideal since the various categories are placed according to the respective data values. In Figure 9.32 on the right-hand side, you do get the positive end of the scale at the top, but note that "Bored" and "Not great" at the bottom are switched relative to how they'd appear in an ordinal scale because of the values that correspond with these points. If you need to dictate the category order, use the simple bar graph or the 100% stacked bar graph, where you can control this.

## Pilot program was a success

How do you feel about science?



Based on survey of 100 students conducted before and after pilot program (100% response rate on both surveys).

**FIGURE 9.32** Slopegraph

With the slopegraph in Figure 9.32, you can easily see the visual percentage change from Before to After for each category via the slope of the respective line. It's easy to see quickly that the category that increased the most was "Excited" (due to the steep slope) and the category that decreased markedly was "OK." The slopegraph also provides clear visual ordering of categories from greatest to least (via their respective points in space from top to bottom on the left and right sides of the graph).

Any of these alternatives might be the best choice given the specific situation, how you want your audience to interact with the information, and what point or points of emphasis you want to make. The big lesson here is that you have a number of alternatives to pies that can be more effective for getting your point across.

## In closing

In this chapter, we discussed considerations and solutions for tackling several common challenges faced when communicating visually with data. Inevitably, you'll face data visualization challenges that I have not addressed. There is as much to be learned from the critical thinking that goes into solving some of these scenarios as there is from the "answer" itself. As we've discussed, when it comes to data visualization, rarely is there a single correct path or solution.

### Even more examples

**F**or more case studies like the ones we've considered here, check out my blog at [storytellingwithdata.com](http://storytellingwithdata.com), where you'll find a number of before-and-after examples leveraging the lessons that we've learned.

When you find yourself in a situation where you are unsure how to proceed, I nearly always recommend the same strategy: pause to consider your audience. What do you need them to know or do? What story do you aim to tell them? Often, by answering these questions, a good path for how to present your data will become clear. If one doesn't, try several views and seek feedback.

My challenge to you is to consider how you can apply all of the lessons we've learned and your critical thinking skills to the various and varied data visualization challenges you face. The responsibility—and the opportunity—to tell a story with data is yours.

# final thoughts

Data visualization—and communicating with data in general—sits at the intersection of science and art. There is certainly some science to it: best practices and guidelines to follow, as we’ve discussed throughout this book. But there is also an artistic component. This is one of the reasons this area is so much fun. It is inherently diverse. Different people will approach things in varying ways and come up with distinct solutions to the same data visualization challenge. As we’ve discussed, there is no single “right” answer. Rather, there are often multiple potential paths for communicating effectively with data. Apply the lessons we’ve covered in this book to forge *your* path, with the goal of using your artistic license to make the information easier for your audience to understand.

You have learned a great deal over the course of this book that sets you up for success when it comes to communicating effectively with data. In this final chapter, we’ll discuss some tips on where to go from here and strategies for upskilling storytelling with data competency in your team and organization. Finally, we will end with a recap of

the main lessons we've covered and send you off eager and ready to tell stories with data.

## Where to go from here

Reading about effective storytelling with data is one thing. But how do you translate what we've learned to practical application? The simple way to get good at this is to *do it*: practice, practice, and practice some more. Look for opportunities in your work to apply the lessons we've learned. Note that it doesn't have to be all or nothing—one way to make progress is through incremental improvements to existing or ongoing work. Consider also when you can leverage the entire storytelling with data process that we've covered from start to finish.

### Now I want to overhaul our entire monthly report!

**Y**ou likely see graphs differently than you did at the onset of our journey together. Rethinking the way you visualize data is a great thing. But don't let overambitious goals overwhelm and hinder progress. Consider what incremental improvements you can make as you work toward storytelling with data nirvana. For example, if you're considering overhauling your regular reports, an interim step could be to start thinking of the report as the appendix. Leave the data there for reference, but push it to the back so it doesn't distract from the main message. Insert a few slides or a cover note up front and use this to pull out the interesting stories, leveraging the storytelling with data lessons we've covered. This way you can more easily focus your audience on the important stories and resulting actions.

For some specific, concrete steps on where to go from here, I'll outline five final tips: learn your tools well, iterate and seek feedback, allow ample time for this part of the process, seek inspiration from

others, and—last but not least—have some fun while you’re at it! Let’s discuss each of these.

### Tip #1: learn your tools well

For the most part, I’ve intentionally avoided discussion on tools because the lessons we’ve covered are fundamental and can be applied to varying degrees in any tool (for example, Excel or Tableau). Try not to let your tools be a limiting factor when it comes to communicating effectively with data. Pick one and get to know it as best you can. When you’re first starting out, a course to become familiar with the basics may be helpful. In my experience, however, the best way to learn a tool is to use it. When you can’t figure out how to do something, don’t give up. Continue to play with the program and search Google for solutions. Any frustration you encounter will be worth it when you can bend your tool to your will!

You don’t need fancy tools in order to visualize data well. The examples we’ve looked at in this book were all created with Microsoft Excel, which I find is the most pervasive when it comes to business analytics.

While I use mainly Excel for visualizing data, this isn’t your only option. There are a plethora of tools out there. The following is a very quick rundown of some of the popular ones currently used for creating data visualizations like the ones we’ve examined:

- **Google spreadsheets** are free, online, and sharable, allowing multiple people to edit (as of this writing, there remain graph formatting constraints that make it challenging to apply some of the lessons we’ve covered when it comes to decluttering and drawing attention where you want it).
- **Tableau** is a popular out-of-the-box data visualization solution that can be great for exploratory analysis because it allows you to quickly create multiple views and nice-looking graphs from your data. It can be leveraged for the explanatory via the Story Points

feature. It is expensive, though a free Tableau Public option is available if uploading your data to a public server isn't an issue.

- Programming languages—like **R**, **D3** (JavaScript), **Processing**, and **Python**—have a steeper learning curve but allow for greater flexibility, since you can control the specific elements of the graphs you create and make those specifications repeatable through code.
- Some people use **Adobe Illustrator**, either alone or together with graphs created in an application like Excel or via a programming language, for easier manipulation of graph elements and a professional look and feel.

### How I use PowerPoint

**F**or me, PowerPoint is simply the mechanism that allows me to organize a handout or present on the big screen. I nearly always start from a totally blank slide and do not leverage the built-in bullets that too easily turn content from presentation to teleprompter.

You can build graphs directly in PowerPoint; however, I tend not to do this. There is greater flexibility in Excel (where, in addition to the graph, you can also have some elements of a visual—for example, titles or axis labels—directly in the cells, which is sometimes useful). Because of this, I create my visuals in Excel, then copy and paste into PowerPoint as an image. If I am using text together with a visual—for example, to draw attention to a specific point—I typically do that via a text box in PowerPoint.

The animation feature within PowerPoint can be useful for progressing through a story with iterations of the same visual, as shown in Chapter 8 or some of the case studies in Chapter 9. When using animation in PowerPoint, use only simple Appear or Disappear (in some instances, Transparency can also be useful); steer clear of any animation that causes elements to fly in or fade out—this is the presentation software equivalent of 3D graphs—unnecessary and distracting!

Another essential basic tool for visualizing data that I did not include in the preceding list is **paper**—which brings me to my next tip.

### Tip #2: iterate and seek feedback

I've presented the storytelling with data process as a linear path. That's not often the case in reality. Rather, it takes iterating to get from early ideas to a final solution. When the best course for visualizing certain data is unclear, start with a blank piece of paper. This enables you to brainstorm without the constraints of your tools or what you know how to do in your tools. Sketch out potential views to see them side-by-side and determine what will work best for getting your message across to your audience. I find that we form less attachment to our work product—which can make iterating easier—when we are working on paper rather than on our computers. There is also something freeing about drawing on blank paper that may make it easier to identify new approaches if you're feeling stuck. Once you have your basic approach sketched, consider what you have at your disposal—tools, or internal or external experts—to actually create the visual.

When creating your visual in your graphing application (for example, Excel) and refining to get from good to great, you can leverage what I call the "optometrist approach." Create a version of the graph (let's call it A), then make a copy of it (B) and make a single change. Then determine which looks better—A or B. Often, the practice of seeing slight variations next to each other makes it quickly clear which view is superior. Progress in this manner, preserving the latest "best" visual and continuing to make minor modifications in a copy (so you always have the prior version to go back to in case the modification worsens it) to iterate toward your ideal visual.

At any point, if the best path is unclear, seek feedback. The fresh set of eyes that a friend or colleague can bring to the data visualization endeavor is invaluable. Show someone else your visual and have them talk you through their thought process: what they pay attention to, what observations they make, what questions they have,

and any ideas they may have for better getting your point across. These insights will let you know if the visual you've created is on the mark or, in the case when it isn't, give you an idea of where to make changes and focus continued iteration.

When it comes to iterating, there is one thing you need perhaps more than anything else in order to be successful: *time*.

### Tip #3: devote time to storytelling with data

Everything we've discussed throughout this book takes time. It takes time to build a robust understanding of the context, time to understand what motivates our audience, time to craft the 3-minute story and form the Big Idea. It takes time to look at the data in different ways and determine how to best show it. It takes time to declutter and draw attention and iterate and seek feedback and iterate some more to create an effective visual. It takes time to pull it all together into a story and form a cohesive and captivating narrative.

It takes even more time to do all of this well.

One of my biggest tips for success in storytelling with data is to allow adequate time for it. If we don't consciously recognize that this takes time to do well and budget accordingly, our time can be entirely eaten up by the other parts of the analytical process. Consider the typical analytical process: you start with a question or hypothesis, then you collect the data, then you clean the data, and then you analyze the data. After all of that, it can be tempting to simply throw the data into a graph and call it "done."

But we simply aren't doing ourselves—or our data—justice with this approach. The default settings of our graphing application are typically far from ideal. Our tools do not know the story we aim to tell. Combine these two things and you run the risk of losing a great deal of potential value—including the opportunity to drive action and effect change—if adequate time isn't spent on this final step in the analytical process: the communication step. This is the only part of



the entire process that your audience actually sees. Devote time to this important step. Expect it to take longer than you think to allow sufficient time to iterate and get it right.

#### Tip #4: seek inspiration through good examples

Imitation really is the best form of flattery. If you see a data visualization or example of storytelling with data that you like, consider how you might adapt the approach for your own use. Pause to reflect on what makes it effective. Make a copy of it and create a visual library that you can add to over time and refer to for inspiration. Emulate the good examples and approaches that you see.

Said more provocatively—imitation *is a good thing*. We learn by emulating experts. That's why you see people with their sketchpads and easels at art museums—they are interpreting great works. My husband tells me that while learning to play the jazz saxophone, he would listen to the masters repeatedly—narrowing at times to a single measure played at a slower speed that he would practice until he could repeat the notes perfectly. This idea of using great examples as an archetype to learn applies to data visualization as well.

There are a number of great blogs and resources on the topic of data visualization and communicating with data that contain many good examples. Here are a few of my current personal favorites (including my own!):

- **Eager Eyes** ([eagereyes.org](http://eagereyes.org), Robert Kosara): Thoughtful content on data visualization and visual storytelling.
- **FiveThirtyEight's Data Lab** ([fivethirtyeight.com/datalab](http://fivethirtyeight.com/datalab), various authors): I like their typically minimalist graphing style on a large range of news and current events topics.
- **Flowing Data** ([flowingdata.com](http://flowingdata.com), Nathan Yau): Membership gets you premium content, but there are a lot of great free examples of data visualization as well.

- **The Functional Art** ([thefunctionalart.com](http://thefunctionalart.com), Alberto Cairo): An introduction to information graphics and visualization, with great concise posts highlighting advice and examples.
- **The Guardian Data Blog** ([theguardian.com/data](http://theguardian.com/data), various authors): News-related data, often with accompanying article and visualizations, by the British news outlet.
- **HelpMeViz** ([HelpMeViz.com](http://HelpMeViz.com), Jon Schwabish): “Helping people with everyday visualizations,” this site allows you to submit a visual to receive feedback from readers or scan the archives for examples and corresponding conversations.
- **Junk Charts** ([junkcharts.typepad.com](http://junkcharts.typepad.com), Kaiser Fung): By self-proclaimed “web’s first data viz critic,” focuses on what makes graphics work and how to make them better.
- **Make a Powerful Point** ([makeapowerfulpoint.com](http://makeapowerfulpoint.com), Gavin McMahon): Fun, easy-to-digest content on creating and giving presentations and presenting data.
- **Perceptual Edge** ([perceptualedge.com](http://perceptualedge.com), Stephen Few): No-nonsense content on data visualization for sensemaking and communication.
- **Visualising Data** ([visualisingdata.com](http://visualisingdata.com), Andy Kirk): Charts the development of the data visualization field, with great monthly “best visualisations of the web” resource list.
- **VizWiz** ([vizwiz.blogspot.com](http://vizwiz.blogspot.com), Andy Kriebel): Data visualization best practices, methods for improving existing work, and tips and tricks for using Tableau Software.
- **storytelling with data** ([storytellingwithdata.com](http://storytellingwithdata.com)): My blog focuses on communicating effectively with data and contains many examples, visual makeovers, and ongoing dialogue.

This is just a sampling. There is a lot of great content out there. I continue to learn from others who are active in this space and doing great work. You can, too!

## Learn from the not-so-great examples, too

Often, you can learn as much from the poor examples of data visualization—what not to do—as you can from those that are effective. Bad graphs are so plentiful that entire sites exist to curate, critique, and poke fun at them. For an entertaining example, check out WTF Visualizations ([wtfviz.net](http://wtfviz.net)), where content is described simply as “visualizations that make no sense.” I challenge you not only to recognize when you encounter a poor example of data visualization but also to pause and reflect on why it isn’t ideal and how it could be improved.

You now have a discerning eye when it comes to the visual display of information. You will never look at a graph the same. One workshop attendee told me that he is “ruined”—he can’t encounter a data visualization without applying his new lens for assessing effectiveness. I love hearing these stories, as it means I’m making progress toward my goal of ridding the world of ineffective graphs. You have been ruined in this same way, but this is actually a really good thing! Continue to learn from and leverage the aspects of good examples you see, while avoiding the pitfalls of the poor ones, as you start to create your own data visualization style.

### Tip #5: have fun and find your style

When most people think about data, one of the furthest things from their mind is creativity. But within data visualization, there is absolutely space for creativity to play a role. Data can be made to be breathtakingly beautiful. Don’t be afraid to try new approaches and play a little. You’ll continue to learn what works and what doesn’t over time.

You may also find that you develop a personal data visualization style. For example, my husband says he can recognize visuals that I created or influenced. Unless a client brand calls for something else, I

tend to do everything in shades of grey and use blue sparingly in a minimalist style, almost always in plain old Arial font (I like it!). That doesn't mean your approach must imitate these specifics to be successful. My own style has evolved based on personal preferences and learning through trial and error—testing out different fonts, colors, and graph elements. I can recall one particularly unfortunate example that incorporated a grey-to-white shaded graph background and far too many shades of orange. I've come a long way!

To the extent that it makes sense given the task at hand, don't be afraid to let your own style develop and creativity come through when you communicate with data. Company brand can also play a role in developing a data visualization style; consider your company's brand and whether there are opportunities to fold that into how you visualize and communicate with data. Just make sure that your approach and stylistic elements are making the information easier—not more difficult—for your audience to consume.

Now that we've looked at some specific tips for you to follow, let's turn to some ideas for building storytelling with data competency in others.

## Building storytelling with data competency in your team or organization

I am a strong believer that anyone can improve their ability to communicate with data by learning and applying the lessons we've covered. That said, some will have more interest and natural aptitude than others in this space. When it comes to being effective at communicating with data in your team or your organization, there are a few potential strategies to consider: upskill everyone, invest in an expert, or outsource this part of the process. Let's briefly discuss each of these.

## Upskill everyone

As we've discussed, part of the challenge is that data visualization is a single step in the analytical process. Those hired into analytical roles typically have quantitative backgrounds that suit them well for the other steps (finding the data, pulling it together, analyzing it, building models), but not necessarily any formal training in design to help them when it comes to the communication of the analysis. Also, increasingly those without analytical backgrounds are being asked to put on analytical hats and communicate using data.

For both of these groups, finding ways to impart foundational knowledge can make everyone better. Invest in training or use the lessons covered here to generate momentum. On this latter note, here are some specific ideas:

- **Storytelling with data book club:** read a chapter at a time and then discuss it together, identifying examples specific to your work where the given lesson can be applied.
- **Do-it-yourself workshop:** after finishing the book, conduct your own workshop—soliciting examples of communicating with data from your team and discussing how they can be improved.
- **Makeover Monday:** challenge individuals to a weekly makeover of less-than-ideal examples employing the lessons we've covered.
- **Feedback loop:** set the expectation that individuals must share work in progress and offer feedback to each other grounded in the storytelling with data lessons.
- **And the winner is:** introduce a monthly or quarterly contest, where individuals or teams can submit their own examples of effective storytelling with data then start a gallery of model examples, adding to it over time via contest winners.

Any of these approaches—alone or combined—can create and help ensure continued focus on effective visualization and storytelling with data.

### Invest in an internal expert or two

Another approach is to identify an individual or a couple of individuals on your team or in your organization who are interested in data visualization (even better if they've already displayed some natural aptitude) and invest in them so they can become your in-house experts. Make it an expectation of their role to be an internal data visualization consultant to whom others on the team can turn for brainstorming and feedback or to overcome tool-specific challenges. This investment can take the form of books, tools, coaching, workshops, or courses. Provide time and opportunities to learn and practice. This can be a great form of recognition and career development for the individual. As the individual continues to learn, they can share this with others as a way to ensure continued team development as well.

### Outsource

In some situations, it may make sense to outsource visual creation to an external expert. If time or skill constraints are too great to overcome for a specific need, turning to a data visualization or presentation consultant may be worth considering. For example, one client contracted me to design an important presentation that they would need to give a number of times in the upcoming year. Once the basic story was in place, they knew they could make the minor changes needed to make it fit the various venues.

The biggest drawback of outsourcing is that you don't develop the skills and learn in the same way as if you tackle the challenge internally. To help overcome this, look for opportunities to learn from the consultant during the process. Consider whether the output can also provide a starting point for other work, or if it can be evolved over time as you develop internal capability.

### A combined approach

The teams and organizations I've seen become the most successful in this space leverage a combined approach. They recognize

the importance of storytelling with data and invest in training and practice to give everyone the foundational knowledge for effective data visualization. They also identify and support an internal expert, to whom the rest of the team can turn for help overcoming specific challenges. They bring in external experts to learn from as makes sense. They recognize the value of being able to tell stories with data effectively and invest in their people to build this competency.

Through this book, I've given you the foundational knowledge and language to use to help your team and your organization excel when it comes to communicating with data. Think about how you can frame feedback in terms of the lessons we've covered to help others improve their ability and effectiveness as well.

Let's wrap up with a recap of the path we've taken to effective storytelling with data.

## Recap: a quick look at all we've learned

We have learned a great deal over the course of this book, from context to cutting clutter and drawing attention to telling a robust story. We've worn our designer hats and looked at things through our audience's eyes. Here is a review of the main lessons we've covered:

1. **Understand the context.** Build a clear understanding of who you are communicating to, what you need them to know or do, how you will communicate to them, and what data you have to back up your case. Employ concepts like the 3-minute story, the Big Idea, and storyboarding to articulate your story and plan the desired content and flow.
2. **Choose an appropriate visual display.** When highlighting a number or two, simple text is best. Line charts are usually best for continuous data. Bar charts work great for categorical data and must have a zero baseline. Let the relationship you want to show guide the type of chart you choose. Avoid pies, donuts, 3D, and secondary y-axes due to difficulty of visual interpretation.



3. **Eliminate clutter.** Identify elements that don't add informative value and remove them from your visuals. Leverage the Gestalt principles to understand how people see and identify candidates for elimination. Use contrast strategically. Employ alignment of elements and maintain white space to help make the interpretation of your visuals a comfortable experience for your audience.
4. **Focus attention where you want it.** Employ the power of preattentive attributes like color, size, and position to signal what's important. Use these strategic attributes to draw attention to where you want your audience to look and guide your audience through your visual. Evaluate the effectiveness of preattentive attributes in your visual by applying the "where are your eyes drawn?" test.
5. **Think like a designer.** Offer your audience visual affordances as cues for how to interact with your communication: highlight the important stuff, eliminate distractions, and create a visual hierarchy of information. Make your designs accessible by not overcomplicating and leveraging text to label and explain. Increase your audience's tolerance of design issues by making your visuals aesthetically pleasing. Work to gain audience acceptance of your visual designs.
6. **Tell a story.** Craft a story with clear beginning (plot), middle (twists), and end (call to action). Leverage conflict and tension to grab and maintain your audience's attention. Consider the order and manner of your narrative. Utilize the power of repetition to help your stories stick. Employ tactics like vertical and horizontal logic, reverse storyboarding, and seeking a fresh perspective to ensure that your story comes across clearly in your communication.

Together, these lessons set you up for success when communicating with data.



## In closing

When you opened this book, if you felt any sense of discomfort or lack of expertise when it comes to communicating with data, my hope is that those feelings have been mitigated. You now have a solid foundation, examples to emulate, and concrete steps to take to overcome the data visualization challenges you face. You have a new perspective. You will never look at data visualization the same. You are ready to assist me with my goal of ridding the world of ineffective graphs.

There is a story in your data. If you weren't convinced of that before our journey together, I hope you are now. Use the lessons we've covered to make that story clear to your audience. Help drive better decision making and motivate your audience to act. Never again will you simply show data. Rather, you will create visualizations that are thoughtfully designed to impart information and incite action.

**Go forth and tell your stories with data!**