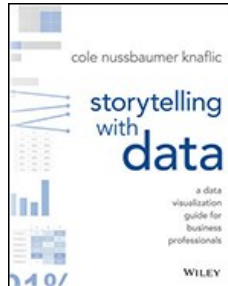


Chapters *To Go*



Storytelling With Data: A Data Visualization Guide For Business Professionals

by Cole Nussbaumer Knaflic
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Introduction

Bad graphs are everywhere

I encounter a lot of less-than-stellar visuals in my work (and in my life—once you get a discerning eye for this stuff, it's hard to turn it off). Nobody sets out to make a bad graph. But it happens. Again and again. At every company throughout all industries and by all types of people. It happens in the media. It happens in places where you would expect people to know better. Why is that?

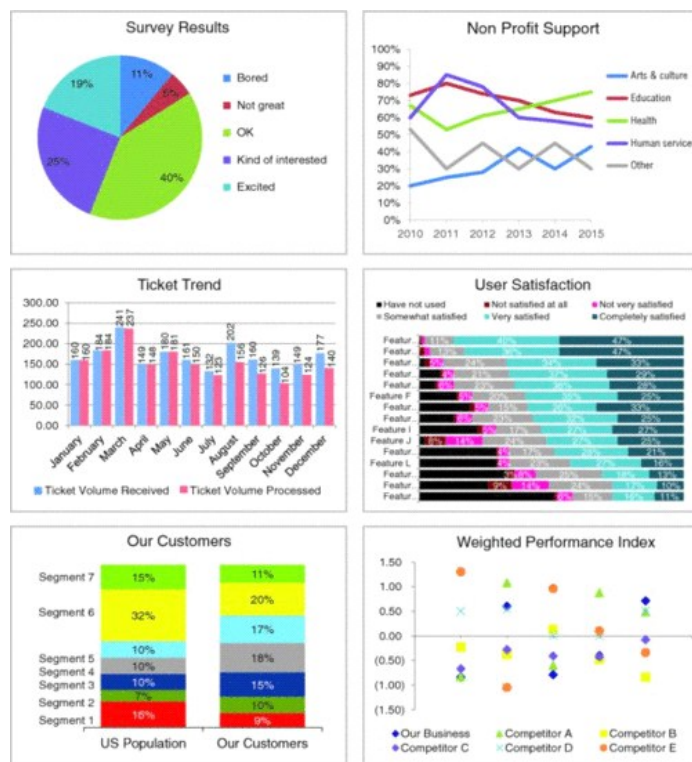


FIGURE 0.1: A sampling of ineffective graphs

We aren't naturally good at storytelling with data

In school, we learn a lot about language and math. On the language side, we learn how to put words together into sentences and into stories. With math, we learn to make sense of numbers. But it's rare that these two sides are paired: no one teaches us how to tell stories with numbers. Adding to the challenge, very few people feel naturally adept in this space.

This leaves us poorly prepared for an important task that is increasingly in demand. Technology has enabled us to amass greater and greater amounts of data and there is an accompanying growing desire to make sense out of all of this data. Being able to visualize data and tell stories with it is key to turning it into *information* that can be used to drive better decision making.

In the absence of natural skills or training in this space, we often end up relying on our tools to understand best practices. Advances in technology, in addition to increasing the amount of and access to data, have also made tools to work with data pervasive. Pretty much anyone can put some data into a graphing application (for example, Excel) and create a graph. This is important to consider, so I will repeat myself: *anyone* can put some data into a graphing application and create a graph. This is remarkable, considering that the process of creating a graph was historically reserved for scientists or those in other highly technical roles. And scary, because without a clear path to follow, our best intentions and efforts (combined with oft-questionable tool defaults) can lead us in some really bad directions: 3D, meaningless color, pie charts.

While technology has increased access to and proficiency in tools to work with data, there remain gaps in capabilities. You can put some data in Excel and create a graph. For many, the process of data visualization ends there. This can render the most interesting story completely underwhelming, or worse—difficult or impossible to understand. Tool defaults and general practices tend to leave our data and the stories we want to tell with that data sorely lacking.

There is a story in your data. But your tools don't know what that story is. That's where it takes you—the analyst or communicator of the information—to bring that story visually and contextually to life. That process is the focus of this book. The following are a few example before-and-afters to give you a visual sense of what you'll learn; we'll cover each of these in detail at various points in the book.

The lessons we will cover will enable you to shift from simply showing data to **storytelling with data**.

Skilled in Microsoft Office? So is everyone else!

Being adept with word processing applications, spreadsheets, and presentation software—things that used to set one apart on a resume and in the workplace—has become a minimum expectation for most employers. A recruiter told me that, today, having “proficiency in Microsoft Office” on a resume isn’t enough: a basic level of knowledge here is assumed and it’s what you can do above and beyond that will set you apart from others. Being able to effectively tell stories with data is one area that will give you that edge and position you for success in nearly any role.

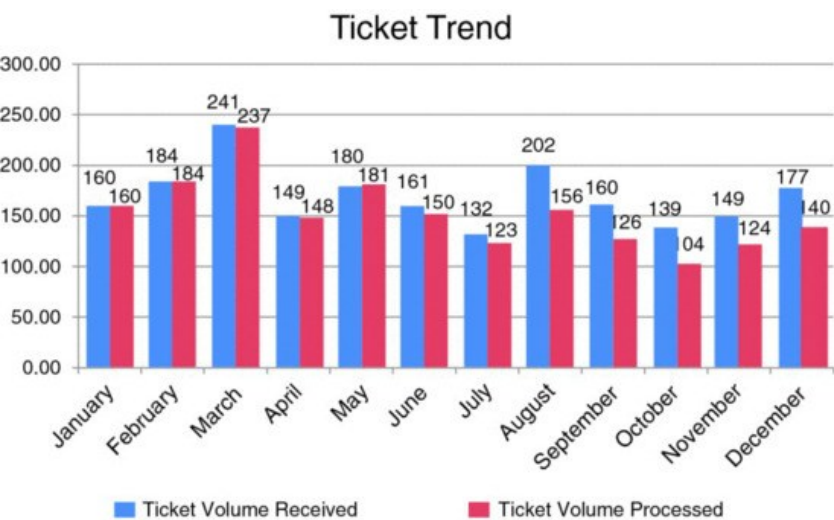
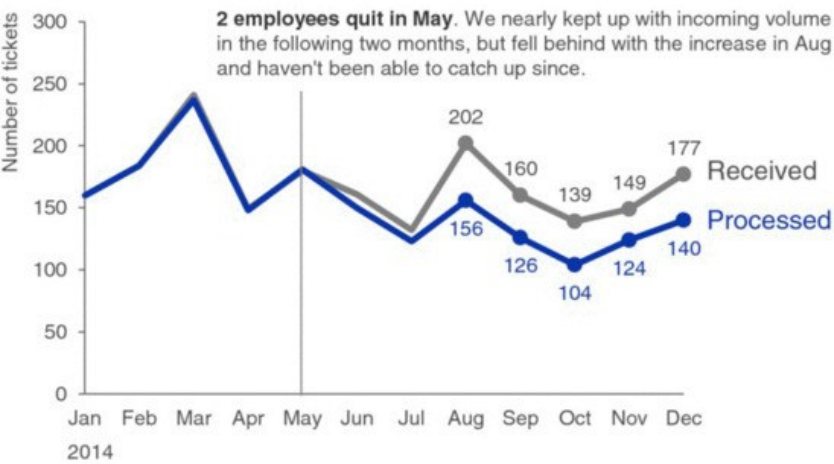


FIGURE 0.2: Example 1 (before): showing data

Please approve the hire of 2 FTEs

to backfill those who quit in the past year

Ticket volume over time



Data source: XYZ Dashboard, as of 12/31/2014 | A detailed analysis on tickets processed per person and time to resolve issues was undertaken to inform this request and can be provided if needed.

FIGURE 0.3: Example 1 (after): storytelling with data

Survey Results

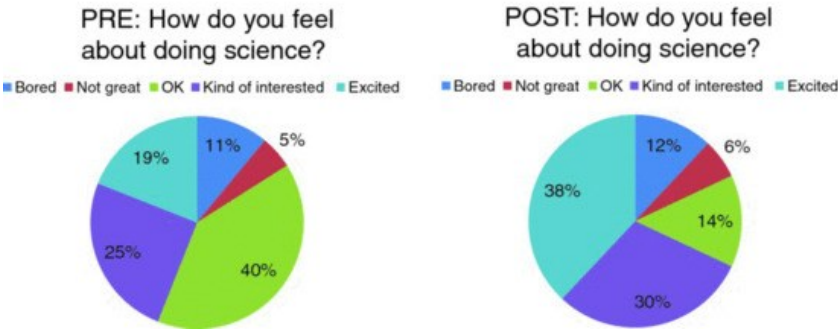


FIGURE 0.4: Example 2 (before): showing data

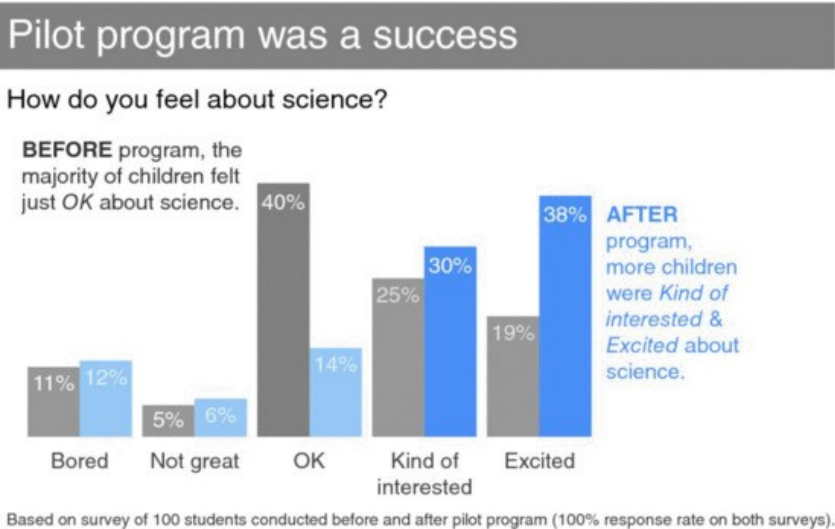


FIGURE 0.5: Example 2 (after): storytelling with data

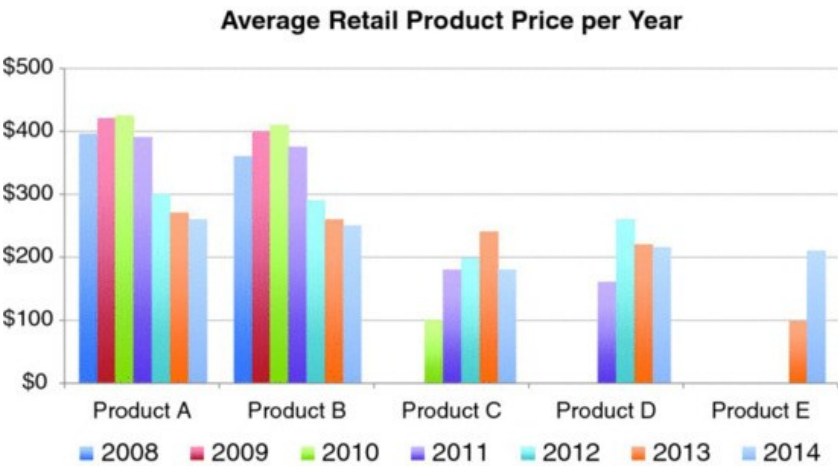


FIGURE 0.6: Example 3 (before): showing data

To be competitive, we recommend introducing our product *below* the \$223 average price point in the \$150–\$200 range

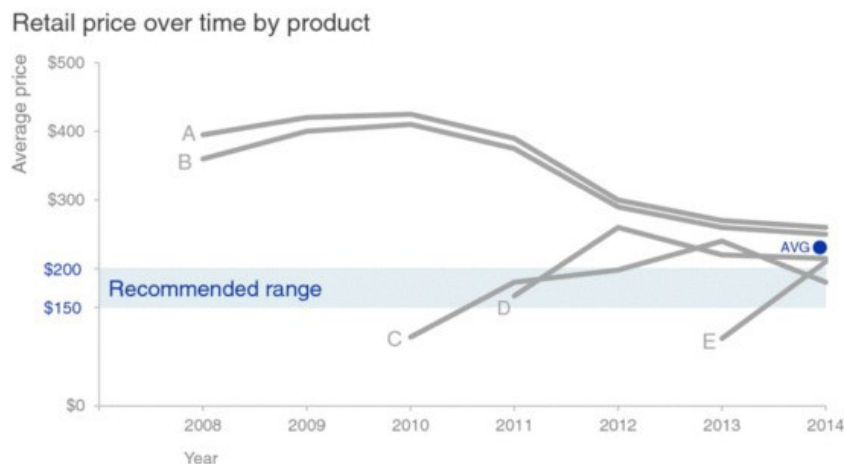


FIGURE 0.7: Example 3 (after): storytelling with data

Who this book is written for

This book is written for anyone who needs to communicate some-*thing* to someone using data. This includes (but is certainly not limited to): analysts sharing the results of their work, students visualizing thesis data, managers needing to communicate in a data-driven way, philanthropists proving their impact, and leaders informing their board. I believe that anyone can improve their ability to communicate effectively with data. This is an intimidating space for many, but it does not need to be.

When you are asked to “show data,” what sort of feelings does that evoke?

Perhaps you feel uncomfortable because you are unsure where to start. Or maybe it feels like an overwhelming task because you assume that what you are creating needs to be complicated and show enough detail to answer every possible question. Or perhaps you already have a solid foundation here, but are looking for that something that will help take your graphs and the stories you want to tell with them to the next level. In all of these cases, this book is written with you in mind.

“When I’m asked to *show the data*, I feel...”

An informal Twitter poll I conducted revealed the following mix of emotions when people are asked to “show the data.”

Frustrated because I don’t think I’ll be able to tell the whole story.

Pressure to make it clear to whomever needs the data. Inadequate. Boss: Can you drill down into that? Give me the split by x, y, and z.

Being able to tell stories with data is a skill that’s becoming ever more important in our world of increasing data and desire for data-driven decision making. An effective data visualization can mean the difference between success and failure when it comes to communicating the findings of your study, raising money for your nonprofit, presenting to your board, or simply getting your point across to your audience.

My experience has taught me that most people face a similar challenge: they may recognize the need to be able to communicate effectively with data but feel like they lack expertise in this space. People skilled in data visualization are hard to come by. 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—which, by the way, is typically the only part of the analytical process that your audience ever sees. And increasingly, in our ever more data-driven world, those without technical backgrounds are being asked to put on analytical hats and communicate using data.

The feelings of discomfort you may experience in this space aren’t surprising, given that being able to communicate effectively with data isn’t something that has been traditionally taught. Those who excel have typically learned what works and what doesn’t through trial and error. This can be a long and tedious process. Through this book, I hope to help expedite it for you.

How I learned to tell stories with data

I have always been drawn to the space where mathematics and business intersect. My educational background is mathematics and business, which enables me to communicate effectively with both sides—given that they don’t always speak the same language—and help them better understand one another. I love being able to take the science of data and use it to inform better business decisions. Over time, I’ve found that one key to success is being able to communicate effectively visually with data.

I initially recognized the importance of being skilled in this area during my first job out of college. I was working as an analyst in credit risk

management (before the subprime crisis and hence before anyone really knew what credit risk management was). My job was to build and assess statistical models to forecast delinquency and loss. This meant taking complicated stuff and ultimately turning it into a simple communication of whether we had adequate money in the reserves for expected losses, in what scenarios we'd be at risk, and so forth. I quickly learned that spending time on the aesthetic piece—something my colleagues didn't typically do—meant my work garnered more attention from my boss and my boss's boss. For me, that was the beginning of seeing value in spending time on the visual communication of data.

After progressing through various roles in credit risk, fraud, and operations management, followed by some time in the private equity world, I decided I wanted to continue my career outside of banking and finance. I paused to reflect on the skills I possessed that I wanted to be utilizing on a daily basis: at the core, it was using data to influence business decisions.

I landed at Google, on the People Analytics team. Google is a data-driven company—so much so that they even use data and analytics in a space not frequently seen: human resources. People Analytics is an analytics team embedded in Google's HR organization (referred to at Google as "People Operations"). The mantra of this team is to help ensure that people decisions at Google—decisions about employees or future employees—are data driven. This was an amazing place to continue to hone my storytelling with data skills, using data and analytics to better understand and inform decision making in spaces like targeted hiring, engaging and motivating employees, building effective teams, and retaining talent. Google People Analytics is cutting edge, helping to forge a path that many other companies have started to follow. Being involved in building and growing this team was an incredible experience.

Storytelling with data on what makes a great manager via Project Oxygen

One particular project that has been highlighted in the public sphere is the Project Oxygen research at Google on what makes a great manager. This work has been described in the *New York Times* and is the basis of a popular *Harvard Business Review* case study. One challenge faced was communicating the findings to various audiences, from engineers who were sometimes skeptical on methodology and wanted to dig into the details, to managers wanting to understand the big-picture findings and how to put them to use. My involvement in the project was on the communication piece, helping to determine how to best show sometimes very complicated stuff in a way that would appease the engineers and their desire for detail while still being understandable and straightforward for managers and various levels of leadership. To do this, I leveraged many of the concepts we will discuss in this book.

The big turning point for me happened when we were building an internal training program within People Operations at Google and I was asked to develop content on data visualization. This gave me the opportunity to research and start to learn the principles behind effective data visualization, helping me understand why some of the things I'd arrived at through trial and error over the years had been effective. With this research, I developed a course on data visualization that was eventually rolled out to all of Google.

The course created some buzz, both inside and outside of Google. Through a series of fortuitous events, I received invitations to speak at a couple of philanthropic organizations and events on the topic of data visualization. Word spread. More and more people were reaching out to me—initially in the philanthropic world, but increasingly in the corporate sector as well—looking for guidance on how to communicate effectively with data. It was becoming increasingly clear that the need in this space was not unique to Google. Rather, pretty much anyone in an organization or business setting could increase their impact by being able to communicate effectively with data. After acting as a speaker at conferences and organizations in my spare time, eventually I left Google to pursue my emerging goal of teaching the world how to tell stories with data.

Over the past few years, I've taught workshops for more than a hundred organizations in the United States and Europe. It's been interesting to see that the need for skills in this space spans many industries and roles. I've had audiences in consulting, consumer products, education, financial services, government, health care, nonprofit, retail, startups, and technology. My audiences have been a mix of roles and levels: from analysts who work with data on a daily basis to those in non-analytical roles who occasionally have to incorporate data into their work, to managers needing to provide guidance and feedback, to the executive team delivering quarterly results to the board.

Through this work, I've been exposed to many diverse data visualization challenges. I have come to realize that the skills that are needed in this area are fundamental. They are not specific to any industry or role, and they can be effectively taught and learned—as demonstrated by the consistent positive feedback and follow-ups I receive from workshop attendees. Over time, I've codified the lessons that I teach in my workshops. These are the lessons I will share with you.

How you'll learn to tell stories with data: 6 lessons

In my workshops, I typically focus on five key lessons. The big opportunity with this book is that there isn't a time limit (in the way there is in a workshop setting). I've included a sixth bonus lesson that I've always wanted to share ("think like a designer") and also a lot more by way of before-and-after examples, step-by-step instruction, and insight into my thought process when it comes to the visual design of information.

I will give you practical guidance that you can begin using immediately to better communicate visually with data. We'll cover content to help you learn and be comfortable employing six key lessons:

1. Understand the context
2. Choose an appropriate visual display
3. Eliminate clutter
4. Focus attention where you want it

5. Think like a designer
6. Tell a story

Illustrative examples span many industries

Throughout the book, I use a number of case studies to illustrate the concepts discussed. The lessons we cover will not be industry—or role—specific, but rather will focus on fundamental concepts and best practices for effective communication with data. Because my work spans many industries, so do the examples upon which I draw. You will see case studies from technology, education, consumer products, the nonprofit sector, and more.

Each example used is based on a lesson I have taught in my workshops, but in many cases I've slightly changed the data or generalized the situation to protect confidential information.

For any example that doesn't initially seem relevant to you, I encourage you to pause and think about what data visualization or communication challenges you encounter where a similar approach could be effective. There is something to be learned from every example, even if the example itself isn't obviously related to the world in which you work.

Lessons are not tool specific

The lessons we will cover in this book focus on best practices that can be applied in any graphing application or presentation software. There are a vast number of tools that can be leveraged to tell effective stories with data. No matter how great the tool, however, it will never know your data and your story like you do. Take the time to learn your tool well so that it does not become a limiting factor when it comes to applying the lessons we'll cover throughout this book.

How do you do that in Excel?

While I will not focus the discussion on specific tools, the examples in this book were created using Microsoft Excel. For those interested in a closer look at how similar visuals can be built in Excel, please visit my blog at www.storytellingwithdata.com, where you can download the Excel files that accompany my posts.

How this book is organized

This book is organized into a series of big-picture lessons, with each chapter focusing on a single core lesson and related concepts. We will discuss a bit of theory when it will aid in understanding, but I will emphasize the practical application of the theory, often through specific, real-world examples. You will leave each chapter ready to apply the given lesson.

The lessons in the book are organized chronologically in the same way that I think about the storytelling with data process. Because of this and because later chapters do build on and in some cases refer back to earlier content, I recommend reading from beginning to end. After you've done this, you'll likely find yourself referring back to specific points of interest or examples that are relevant to the current data visualization challenges you face.

To give you a more specific idea of the path we'll take, chapter summaries can be found below.

Chapter 1: the importance of context

Before you start down the path of data visualization, there are a couple of questions that you should be able to concisely answer: Who is your audience? What do you need them to know or do? This chapter describes the importance of understanding the situational context, including the audience, communication mechanism, and desired tone. A number of concepts are introduced and illustrated via example to help ensure that context is fully understood. Creating a robust understanding of the situational context reduces iterations down the road and sets you on the path to success when it comes to creating visual content.

Chapter 2: choosing an effective visual

What is the best way to show the data you want to communicate? I've analyzed the visual displays I use most in my work. In this chapter, I introduce the most common types of visuals used to communicate data in a business setting, discuss appropriate use cases for each, and illustrate each through real-world examples. Specific types of visuals covered include simple text, table, heatmap, line graph, slopegraph, vertical bar chart, vertical stacked bar chart, waterfall chart, horizontal bar chart, horizontal stacked bar chart, and square area graph. We also cover visuals to be avoided, including pie and donut charts, and discuss reasons for avoiding 3D.

Chapter 3: clutter is your enemy!

Picture a blank page or a blank screen: every single element you add to that page or screen takes up cognitive load on the part of your audience. That means we should take a discerning eye to the elements we allow on our page or screen and work to identify those things that are taking up brain power unnecessarily and remove them. Identifying and eliminating clutter is the focus of this chapter. As part of this conversation, I introduce and discuss the Gestalt Principles of Visual Perception and how we can apply them to visual displays of information such as tables and graphs. We also discuss alignment, strategic use of white space, and contrast as important components of thoughtful design. Several examples are used to illustrate the lessons.

Chapter 4: focus your audience's attention

In this chapter, we continue to examine how people see and how you can use that to your advantage when crafting visuals. This includes a brief discussion on sight and memory that will act to frame up the importance of preattentive attributes like size, color, and position on page. We explore how preattentive attributes can be used strategically to help direct your audience's attention to where you want them to focus and to create a visual hierarchy of components to help direct your audience through the information you want to communicate in the way you want them to process it. Color as a strategic tool is covered in depth. Concepts are illustrated through a number of examples.

Chapter 5: think like a designer

Form follows function. This adage of product design has clear application to communicating with data. When it comes to the form and function of our data visualizations, we first want to think about what it is we want our audience to be able to *do* with the data (function) and create a visualization (form) that will allow for this with ease. In this chapter, we discuss how traditional design concepts can be applied to communicating with data. We explore affordances, accessibility, and aesthetics, drawing upon a number of concepts introduced previously, but looking at them through a slightly different lens. We also discuss strategies for gaining audience acceptance of your visual designs.

Chapter 6: dissecting model visuals

Much can be learned from a thorough examination of effective visual displays. In this chapter, we look at five exemplary visuals and discuss the specific thought process and design choices that led to their creation, utilizing the lessons covered up to this point. We explore decisions regarding the type of graph and ordering of data within the visual. We consider choices around what and how to emphasize and de-emphasize through use of color, thickness of lines, and relative size. We discuss alignment and positioning of components within the visuals and also the effective use of words to title, label, and annotate.

Chapter 7: lessons in storytelling

Stories resonate and stick with us in ways that data alone cannot. In this chapter, I introduce concepts of storytelling that can be leveraged for communicating with data. We consider what can be learned from master storytellers. A story has a clear beginning, middle, and end; we discuss how this framework applies to and can be used when constructing business presentations. We cover strategies for effective storytelling, including the power of repetition, narrative flow, considerations with spoken and written narratives, and various tactics to ensure that our story comes across clearly in our communications.

Chapter 8: pulling it all together

Previous chapters included piecemeal applications to demonstrate individual lessons covered. In this comprehensive chapter, we follow the storytelling with data process from start to finish using a single real-world example. We understand the context, choose an appropriate visual display, identify and eliminate clutter, draw attention to where we want our audience to focus, think like a designer, and tell a story. Together, these lessons and resulting visuals and narrative illustrate how we can move from simply showing data to telling a story with data.

Chapter 9: case studies

The penultimate chapter explores specific strategies for tackling common challenges faced in communicating with data through a number of case studies. Topics covered include color considerations with a dark background, leveraging animation in the visuals you present versus those you circulate, establishing logic in order, strategies for avoiding the spaghetti graph, and alternatives to pie charts.

Chapter 10: 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. There is also an artistic component. Apply the lessons we've covered to forge *your* path, using your artistic license to make the information easier for your audience to understand. In this final chapter, we discuss tips on where to go from here and strategies for upskilling storytelling with data competency in your team and your organization. We end with a recap of the main lessons covered.

Collectively, the lessons we'll cover will enable you to tell stories with data. Let's get started!