EFFECTIVE DATA STORYTELLING

How to *drive change* with data, narrative, and visuals

BRENT DYKES



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To my family (and Jackson, who we miss dearly)

To Dad, Stan, and Hans—thanks for sharing the power of storytelling

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Foreword

The companies that are best able to turn their data into insights, and their insights into knowledge, will outsmart and outperform their competition. In this data-driven world, storytelling is a vital enabler that will help organizations succeed.

We now live in a world with more data than ever before. Our data volumes are measured in zettabytes, which is an unimaginably vast quantity. One zettabyte is a number with 21 zeros at the end and contains one billion terabytes (one terabyte being the capacity of a stateof-the-art home computer). It is predicted that by 2025, we will have more than 175 zettabytes of data in the world, an exponential growth from the around 10 zettabytes we have in the world today. But all of that data is worthless unless businesses are able to gain insights from the data that allows them to act, make better decisions, and initiate change.

In order to make the most of the unprecedented opportunities presented by data, businesses and the individuals within them need the right skills—they need to be data literate. From my work helping companies all over the globe make better use of data, I know that the ability to tell a story from data is a core pillar of data literacy. Storytelling has been ingrained in the human way of life for hundreds of thousands of years. Throughout history, humans have used stories as an essential tool to capture people's attention, engage them, ignite their imagination, and pass on knowledge—and that ability to tell stories is as important, if not more important, in today's data-driven world as it was when our ancestors dwelled in caves.

Those who use storytelling effectively don't just present facts, they present stories that will persuade, be remembered, and told and retold within an organization. The ability to tell stories from data is a skill that will become increasingly valuable in the job market of tomorrow.

Brent Dykes has done an outstanding job of creating a practical and engaging book that will help to improve your data storytelling skills. You will learn how to take the key ingredients of data, narratives, and visuals to help explain, enlighten, and engage people, leading to better decision making and initiating change.

I am sure that after you have finished reading *Effective Data Storytelling: How to Drive Change with Data, Narrative, and Visuals,* the book will remain on your shelf as an invaluable resource and reference guide to dive back into when you need a reminder of how to make better use of data and present data in a way that makes a real difference.

—Bernard Marr Futurist and author of *The Intelligent Company*, *Big Data*, *Big Data in Practice*, and *Artificial Intelligence in Practice*

Preface

hile many data visualization principles are covered in this book, *it is not a data visualization book*. I want to set that expectation upfront, or else you may be disappointed. However, if you're looking to communicate your insights more effectively to others, you've found the right book. If you want to better understand why data storytelling is so effective, again—this is the book. If you're seeking to drive positive change with data, this book will equip you with everything you'll need (at least, from a communication perspective). As you go through each chapter in this book, you'll notice I start each one with *a story*—because that's how much I believe in the power of storytelling. Let us begin this adventure together, *once upon an insight*...

* * * *

After more than two years of intense research and writing, I'm excited to share my perspective on data storytelling. My journey toward writing this book began in 2013 when I convinced Adobe's event team to let me deliver a breakout session on "data storytelling" at our upcoming customer conference. At the time, it was an emerging topic that resonated with me. Having worked with data for the better part of my career—over 15 years in enterprise analytics—I experienced daily how critical effective data communication was. This session was my first formal opportunity to share some of the early concepts and frameworks I had developed. When the presentation went extremely well and I was asked to repeat the session, I knew I was onto something.

Over the next few years, I continued to develop and hone my ideas on data storytelling and spoke at various business and technology conferences. Repeatedly, after I presented on how to tell stories with data, attendees would ask if I had a book or offered workshops—this was my next big signal. In 2016, I wrote a popular *Forbes* article titled "Data Storytelling: The Essential Data Science Skill Everyone Needs." It has generated more than 200,000 views and is consistently listed as Google's top search result for "data storytelling"—this was the final indication I needed to write this book.

With the growth in data usage across small and large organizations, people must increasingly be bilingual in data. However, my urgency to write this book increased when I realized how poorly understood the concept of data storytelling was and how the term was in danger of becoming just another empty buzzword. Despite its immense potential, it was frequently positioned as just an extension of data visualization. Furthermore, the narrative aspect of data storytelling was largely ignored or treated as simply a sidekick to the visuals. While many were advocating the virtues of data storytelling, very few people explained how and why it worked. If that weren't enough, during the course of writing this book, I've seen facts abused, twisted, and disparaged on a daily basis. Instead of using the rich levels of data to our benefit, we're sliding back to a time when facts didn't matter. Under these difficult circumstances, we need data storytellers more than ever before.

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hen you write a book, you realize how important it is to have the support of family, friends, and colleagues. I want to start by thanking my wife, Libby, and our five children (Lauren, Cassidy, Linden, Peter, and Josh). Without their love, support, and patience, this book wouldn't have been possible. I'm also grateful to my father, who has inspired me with his storytelling throughout my life, and to my mother, who endured all of my dad's stories.

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Chapter 1

Introduction to Driving Change through Insight

Any powerful idea is absolutely fascinating and absolutely useless until we choose to use it.

-Richard Bach, author

mildly traumatic experience taught me one of my first lessons about data storytelling. Early in my career, after completing the first year of my Master of Business Administration (MBA) program, I secured an internship at a well-known, multichannel retailer based in the Midwest. At the time, the economy was in the middle of a tough recession, and many US corporations weren't interested in hiring international students like me who would incur additional fees to sponsor. Fortunately, my online marketing experience in Canada appealed to this retailer, and I was offered an intern position in its acclaimed ecommerce department.

As one of several MBA interns vying for a job offer at the end of the summer, I had an important midpoint presentation coming up with the senior vice president (SVP) of ecommerce. It afforded me a crucial opportunity to ensure my project was heading in the right direction before my final presentation. With a pregnant wife and two young kids counting on me to secure a full-time position, I was feeling substantial pressure to make a good impression on this influential executive.

The SVP in question wasn't your typical business leader. He was a former military captain and special forces helicopter pilot. If his austere demeanor wasn't intimidating enough, he was also extremely sharp and had graduated from a top-tier business school. Over the years, many MBA interns saw their carefully crafted presentations shot to pieces in review sessions with this senior executive; it was not uncommon to see shell-shocked faces and tears after his meetings.

Not intending to become one of his many casualties, I worked diligently to prepare for my midpoint presentation. I was pleased with the progress I had made on my project, and I was confident in my ability to present what I had accomplished so far. However, during the course of my project, I had stumbled across an interesting data point while reviewing customer survey responses. The data indicated a commonly held practice related to order shipping wasn't as important to customers as the ecommerce team supposed. Even though this insight wasn't central to my project, I decided it was worth sharing because if the data turned out to be true, it could have a significant impact on the ecommerce team's approach.

When the day came for me to present, everything went well until I got to the slide with the customer survey insight. It generated a reaction from the SVP . . . but not the one I expected. He leaned forward and blurted out "*Bullshit*"—not under his breath but forcefully for everyone in the room to hear. His emphatic response ensured no one in the room would challenge his authoritative opinion on the matter—including me. It felt like I had just stepped on a landmine—a cultural one. A paralyzing feeling of panic swept over me as I realized how ill-prepared and exposed I was at that exact moment. Luckily, a daring mentor jumped in to provide some needed cover fire so I could recover and stumble through my remaining slides. While my ego was a little shaken, I survived the meeting and left the boardroom with a valuable insight of my own.

As I reflected on the experience, I realized I had made a serious miscalculation. In my naive excitement to add value and contribute a potentially meaningful insight, I assumed the potential *merit* of the insight would ensure its acceptance and further investigation. Unfortunately, sheer merit alone wouldn't be enough to safeguard its adoption. Like so many other promising findings that have never seen the light of day, my insight was dismissed. It died in the boardroom that day. While noble and aspirational, the meritocracy I ascribed to was an illusion. People and organizations aren't always open to new findings deliberately or unintentionally—that can better their performance or position.

Many factors contributed to the demise of my insight: my poor delivery, the executive's closed-mindedness, and cultural inertia. However, a key contributing factor that sealed the insight's fate was the level of change it would incite. Insight and change go hand-in-hand. Whenever we uncover an insight, it inescapably leads to changes if the data is acted upon.

Often, the potential value of a discovery is directly proportional to the level of resistance it will face. While we may want to believe insights are harmless gifts, they can have subtle-to-significant repercussions that may be difficult for people to accept. Generally, the bigger an insight is, the more disruptive it will be to the status quo. People can struggle with giving up what's routine and familiar. When a new insight isn't well understood and doesn't sound compelling, it will have no chance of overcoming resistance to change. After this experience, I discovered if you want to be insightful and introduce change, you can't just *inform* an audience; you must *engage* them.

Why Change Is Important

I cannot say whether things will get better if we change; what I can say is they must change if they are to get better.

-Georg C. Lichtenberg, scientist

The ancient Greek philosopher Heraclitus viewed change as being central to the universe and is attributed with the saying "change is the only constant in life." We live in a constantly evolving world that is more random, noisy, and unpredictable than we want to admit. It's important for individuals and organizations to be adept at adapting to shifting environments. As former General Electric CEO Jack Welch said, "Change before you have to." Instead of becoming stagnant or settling for less, we often search for new ways to improve ourselves and the world around us.

Throughout time, mankind's innovations have been driven by people seeking to *make things better*—faster, cheaper, safer, more efficient, more productive, and so on. Groundbreaking innovations such as the printing press, telephone, automobile, computer, and internet have introduced significant change. These scientific breakthroughs necessitated the tearing down of established beliefs, skill sets, and systems in order to replace them. Change becomes an unavoidable byproduct of progress. If you want to advance and improve, you must pursue new insights and implement new ideas that inevitably introduce change.

Not all change has to be massively disruptive. Post-war Japanese manufacturers developed the *kaizen philosophy* ("change for better"), where employees were encouraged to continuously introduce small, incremental improvements throughout their factories. Eventually, the culmination of these small process refinements over the years helped Japanese firms such as Toyota and Sony gain a major competitive advantage in terms of product quality and manufacturing efficiency. Today, most innovative startups and even large companies embrace a similar *lean methodology* that involves incremental experimentation and agile development.

An essential underpinning of both the kaizen and lean methodologies is data. Without data, companies using these approaches simply wouldn't know what to improve or whether their incremental changes were successful. Data provides the clarity and specificity that's often needed to drive *positive* change. The importance of having baselines, benchmarks, and targets isn't isolated to just business; it can transcend everything from personal development to social causes. The right insight can instill both the courage and confidence to forge a new direction turning a leap of faith into an informed expedition.

Everyone Becomes an Analyst

Data helps solve problems.

-Anne Wojcicki, entrepreneur

For the greater part of the past 50 years, data has been primarily entrusted to only two privileged groups within most business organizations: an *executive* who required data to manage the business; or a *data specialist*—a business analyst, statistician, economist, or accountant who gathered, analyzed, and reported the numbers for management. For everyone else, exposure to data has been fairly limited, indirect, or intermittent.

In today's digital age, data has become more pervasive, exposing more people to facts and figures than ever before. The volume of data is expected to grow 61% each year, reaching 175 zettabytes by 2025 (1 zettabyte is a trillion gigabytes) (Patrizio 2018). Much of this explosive growth can be attributed to the increasingly connected world in which we live and the additional data that is being created by machines—not just by humans or business entities.

Data has rapidly become a key strategic asset, shifting from being "nice-to-have" to essential at most organizations. For example, for tech giants such as Amazon, Google, Facebook, and Netflix, data has become an integral foundation of their business success—both in terms of how it powers their operations and the immense strategic value it offers. From the data-powered recommendation engines of Amazon and Netflix to the data-rich ad networks of Google and Facebook, these data-savvy companies have carved out formidable competitive advantages through data and technology. However, acumen with data is no longer just the domain of industry leaders—innovative companies of all sizes are reaping its benefits. For example, I met a small, Oregon-based home builder that was able to gain unparalleled data transparency into all of its approval and review processes, giving it a distinct advantage over local competitors that were saddled with inefficient paper-based processes.

In today's dynamic, fast-paced business environment, limiting information to a narrow set of executives and data specialists no longer makes sense. Forward-thinking organizations look to empower more of their workers with data so they can make better-informed decisions and respond more quickly to market opportunities and challenges. To democratize data and foster data-driven cultures, companies rely on various analytics technologies—everything from the ubiquitous spreadsheet to advanced data discovery tools.

You no longer need to have the words "data" or "analyst" in your job title to be immersed in numbers and be expected to use them on a regular basis. Data is now everyone's responsibility. In fact, the Achilles' heel of any analyst is a lack of context—something most business users have in spades. A sharp analyst can miss something in the data that is easily spotted by the seasoned eyes of a business user, who can draw on years of domain expertise. Data doesn't care who you are or what your analytical skill level is—it's willing to yield up insights to whoever is diligent and curious enough to find them. Greater data access means valuable insights can be discovered by people of all backgrounds—not just technical ones.

Outside of work, you may not realize how much analysis you're performing in your "free time" as data is increasingly integrated into various aspects of our lives. For example, when you plan a vacation or evaluate different products online, your decisions are most likely informed by a certain type of data—the recommendations and ratings of complete strangers. In fact, 89% of consumers indicated that online reviews influenced their buying decisions (PowerReviews 2018). If you're an avid sports fan, you're regularly consuming statistics throughout the season on your favorite team's performance (or in some cases, the lack thereof). Furthermore, you might be among the almost 60 million people in the United States and Canada who enjoy competing in fantasy sports that are powered entirely by data.

Closer to home, my wife never thought she would touch the world of analytics and data—until she started running marathons and competing in triathlons. Now, she is constantly analyzing her fitness level and training performance with her trusty Garmin GPS watch. Through hard work, determination, and data, she has been able to accomplish her fitness goals, including completing a full Ironman race and the well-known Boston Marathon. Whether we're pursuing personal fitness or business goals, the recent surge in digital data—along with its growing utility and importance—is pushing everyone to become more data savvy.

Data Literacy Is Essential in Today's Data Economy

The ability to take data—to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it—that's going to be a hugely important skill in the next decades.

-Hal Varian, Chief Economist at Google

Even though data is being thrust on more people, it doesn't mean everyone is prepared to consume and use it effectively. As our dependence on data for guidance and insights increases, the need for greater data literacy also grows. If literacy is defined as the ability to *read and write*, data literacy can be defined as the ability to *understand and communicate data*. Today's advanced data tools can offer unparalleled insights, but they require capable operators who can understand and interpret data. Just as a library comprised of the finest literary works in the world will be relatively worthless to someone who can't read, the same applies to a rich repository of data in the hands of someone who doesn't know how to use it.

Fortunately, you don't need an advanced English degree to be literate in English. Similarly, to be data literate, you aren't required to have advanced statistical knowledge and programming skills in Python or R. However, you will need some basic numeracy skills such as being able to understand, process, and interpret a standard data table or chart. Because you're reading this book, I will assume you already possess the requisite numeracy skills to discover insights. Either through the good fortune of education, work experience, extracurricular activities, or just an innate curiosity, you've been able to develop this ability. Now, you're looking to improve the other half of being data literate—*the ability to communicate or share data effectively*.

As Google's Chief Economist Hal Varian has emphasized, the ability to find a valuable insight and then be able to share it effectively is going to be a "hugely important skill in the next decades" (McKinsey & Company 2009). In other words, much of the value that's going to be generated from data will depend on these essential skills. The potential value hidden within your data will remain dormant if you are unable to understand and interpret what the numbers mean. If you are able to find a valuable insight but are unable to communicate it effectively, there's still the possibility it won't deliver on its potential. As inventor Thomas A. Edison highlighted, "The value of an idea lies in the using of it." If your amazing finding is confusing or not compelling to others, they won't be motivated to act on it. The more people who are capable of driving action from their insights, the more positive change and value we'll see from data. Without action, insights are just empty numbers.

What Is an Insight?

Intuition is the use of patterns they've already learned, whereas insight is the discovery of new patterns.

-Gary Klein, psychologist

Throughout this book, I will repeatedly use the term *insight*, so it's important that we begin by clarifying its meaning. Starting with the origin of the word, insight comes from Middle English for "inner sight" or "sight with the 'eyes' of the mind" (Online Etymology Dictionary 2019). Psychologist Gary Klein defined an insight as "an unexpected shift in the way we understand things" (Gregoire 2013). These "unexpected shifts" in our knowledge can occur as we analyze and examine data. For example, we may uncover a new relationship, pattern, trend, or anomaly in the data that reshapes how we view things. While most insights are interesting, not all of them are valuable. This book will be centered around meaningful insights that offer some tangible promise of value—increased revenue, cost savings, reduced risk, and so on.

Entrepreneur Rama Ramakrishnan shared a simple example of an insight that his data science team uncovered at a large business-toconsumer (B2C) retailer. When they were analyzing the retailer's customer data by transaction amounts, they anticipated they would find a typical bell-curve distribution; however, they found an unanticipated second peak in the histogram (see Figure 1.1). The double-peaked histogram highlighted an interesting curiosity—an observation—but it quickly put his team on the path to discovering an insight.



Figure 1.1 The data science team expected the transactions to be normally distributed (left), but to their surprise, there was an unexpected double peak in the histogram.

When they investigated the second peak (which Ramakrishnan referred to as the "hmm"), they discovered it was mainly comprised of international resellers—not the retailer's typical clientele of young mothers purchasing items for their children. Because this retailer didn't have a physical or digital presence outside of North America, these resellers "would travel to the US from abroad once a year, walk into a store, buy lots of items, take them back to their country and sell them in their own stores" (Ramakrishnan 2017). This simple shift in the understanding of its customer base spurred a slew of additional questions for the B2C retailer:

- What types of products were these resellers buying?
- At which store locations were they shopping?
- How could promotional campaigns better target these individuals?
- How could this transaction data inform global expansion plans?

As this example shows, a single insight can unlock a multitude of new opportunities (or challenges), impacting a wide variety of activities. Ideally, insights don't just shift our thinking but inspire us to do things differently. They convert data into direction that takes us to new, unforeseen places. For the B2C retailer, the discovery of the hidden segment of global resellers caused the retailer to re-examine how it would merchandise, promote, and expand internationally going forward. Key insights like this one can be true game changers, but only if we know how to share them effectively with the people who will decide their fate and help make them a reality.

Effective Communication Turns Insights into Actions

The goal is to provide inspiring information that moves people to action.

-Guy Kawasaki, author and venture capitalist

When you're analyzing data for your specific job or for personal matters (budgeting or dieting), you are the audience of your analysis. You know the data intimately and are most likely in a position to act on whatever insights you uncover, as they only affect you. However, in an organizational setting, the insights you uncover can often have a much broader impact beyond just you individually. They can affect people around you in different ways such as what they believe, how they work, and what they prioritize. You may also require their involvement and support to implement whatever changes each insight evokes. This people dynamic is also shaped by your position within the group as being perceived as an insider or outsider (see Table 1.1).

For example, you may need your manager's approval to spend money, time, and effort fixing a problem you've identified. To help resolve the issue, you may need support from peers and coworkers who may have different agendas and conflicting priorities. Additionally, you may have employees whom you need to adopt and implement the changes introduced by your insight. If these individuals are expected to embrace your insight, they will need to understand it sufficiently and be convinced of its importance. Effective communication becomes the vehicle for explaining your insight in a way so others understand it and are compelled to act on it.

Too often, communication is an afterthought rather than a critical step in the analytical process. While I have strived to communicate my insights effectively as an analyst, I too have underestimated the central role it

Table 1.1 Your Relationship with the Insight



plays in deriving value from data. Through my years of experience in analytics, I have observed five key steps to driving value from analytics: *data, information, insight, decision,* and *action.* Like a line of dominos, each step plays a role in driving toward value (see Figure 1.2). It starts with

ANALYTICS PATH TO VALUE



Figure 1.2 To create value with analytics, like dominos, a sequential series of steps must occur (and be repeated over time).

collecting *raw data* to serve as the foundation for gaining knowledge on a subject. The data is organized and summarized in reports, turning raw data into *information* that's easier for more people to consume. When people examine and analyze these reports, they discover meaningful *insights* that inform *decisions* and drive *actions* that create *value*.

While on the surface these steps make sense, the diagram oversimplified the jump from finding an insight to influencing a decision. Facts alone will not influence decisions. As I learned from my ecommerce experience many years ago, other factors such as culture and tradition play an influential role in decision making. Only through skilled communication will an insight have any chance of persuading someone to re-evaluate their opinions and beliefs. Somehow you must figure out how your insights can break through cognitive, social, and organizational barriers to generate better decisions.

Data-driven Change Isn't Easy

Our dilemma is that we hate change and love it at the same time; what we really want is for things to remain the same but get better.

-Sydney J. Harris, journalist and author

Change is often hard—both for the ones expected to adopt the change and those advocating for it. The natural tendency for most people is to resist something new or different because it appears to be risky, uncertain, or threatening. Many individuals will be complacent with the way things are. Even though the status quo may be found wanting, it still represents "the devil they already know." Your findings may also encounter resistance if they make someone look bad. Nobody likes their poor performance, negligence, or bad decisions showcased for everyone to see. Even when your audience likes one of your insights, they may view acting on it as a lower priority or requiring more work than they can manage.

Navigating these concerns and issues adds complexity to the job of sharing insights. At times, you may even question whether it's worth the trouble to share a particular insight. You might have gone through a similar experience to what I shared at the beginning of this chapter. In these situations, you have a choice to make: keep the insight to yourself or embrace whatever communication challenges it will entail, knowing the insight will be more beneficial if it's shared. This decision will depend on how much you believe in the analysis or research. If you have any doubts about the insight's validity or usefulness, not sharing it may be the right option until you can strengthen your position. However, if you're confident in the quality of the analysis and convinced of its worth, you'll want to seize the opportunity to share your discovery with others. While you may not face the same jeopardy that whistleblowers face when reporting wrongdoing, courage and determination may be required for sharing insights that may be viewed as disruptive or unconventional.

Strive to Communicate, Not Just Inform

How well we communicate is determined not by how well we say things but how well we are understood.

—Andrew Grove, American businessman

If you are determined to have your insights understood and acted upon, you must shift your approach from simply *informing* to *communicating*. American journalist Sydney J. Harris said, "The two words 'information' and 'communication' are often used interchangeably, but they signify quite different things. Information is giving out; communication is getting through." Both approaches involve a sender (analyst) and a receiver (audience). However, there is a key difference between informing and communicating. While the goal of informing is to ensure the information is received, the purpose of communicating is to ensure the audience understands the meaning of the data (see Figure 1.3), which may often involve two-way communication between the sender and receiver to clarify the message.

When you inform someone, you're simply disseminating data in a passive, clinical manner. You expect the audience to interpret and comprehend the data for themselves. No overt message or interpretation



Figure 1.3 When you inform someone of something, you are just passing along information. However, when you communicate something to someone, you ensure they understand it as well.

of the data is passed along to the receiver—just the facts. On the other hand, communicating is about clarifying what the data means. When you communicate, you become an active, discernible participant in the delivery of the information rather than being a removed, neutral one if you are simply informing. When your goal is to "get through" to your audience, you must engage them by communicating in a way that guides them through the numbers and motivates them to act.

Storytelling is critical to effective communication. As an example, if you were to compare *informing* and *telling* someone about a recent vacation you took, you'd see a subtle difference in the two approaches. With informing, you'd just stick to the facts such as where you went, with whom you went, how long you were gone, and what you did. However, with telling (or communicating), you'd cover those same details but elaborate on why you chose to go on vacation, what you enjoyed the most, and how it made you feel. You may even motivate someone else to want to take a similar vacation based on your experiences. Where informing strives to connect with just the head, communicating seeks to touch the mind and heart.

If you're simply passing along information, and you aren't striving to make a specific point, a neutral, passive approach is fine. However, if your goal is to share a particular insight, then just informing your