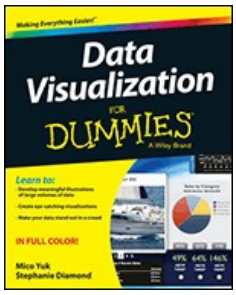

Data Visualization for Dummies

by Mico Yuk and Stephanie Diamond

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Chapter 7: Defining an Easy-to-Follow Storyboard

In This Chapter

- Business Intelligence Overview
- Identifying your audience
- Defining your goals
- Documenting your metrics
- Choosing what to build
- Developing your first storyboard

When you're applying data visualization to Big Data, storytelling is perhaps one of the easiest ways to engage your audience. As social media continues to evolve, attention spans continue to reduce from minutes to seconds. As a result, complex reports and visualizations that require lots of deep analysis are losing their relevance. Hence, it's critical that you develop the "correct" story.

This chapter provides an overview of the practice of using data visualizations to drive decision making and then covers all the steps to defining your first storyboard. We start with identifying the audience, documenting their key measures, and then finally putting those measure into a visual storyboard. Defining an easy-to-follow storyboard requires some homework, and this chapter shows you how to work through a series of steps using a proven methodology and templates.

Business Intelligence Overview

Did you know that there is an entire multi-billion-dollar industry that focuses on the practice of building and using analytics reports and data visualizations (usually referred to as dashboards) to drive the decision-making process in large and small organizations? It's called Business Intelligence (BI). BI involves creating any type of data visualization (report, dashboard, or infographic) that provides insight into a business for the purpose of making a decision or taking an action.

Many people who are reading this book have been in the BI industry for many years without even realizing it. Whether you've been consuming some type of data for professional or personal use or building a report, dashboard, or infographic for others to use to make decisions, you've been part of the BI industry.

Now that you're clear on the definition of BI, you're probably wondering why BI is so important, especially if you're not familiar with it. There are two reasons why business intelligence should be important to anyone in the data visualization arena:

- **BI drives industry trends**. Trends in BI influence trends in many other areas, such as Big Data, mobility, social collaboration, and the cloud. These trends affect you as a data visualization consumer or creator, so it's important that you stay abreast of trends in the BI industry.

  If you're a consumer, for example, the rise of mobile and social collaboration determines where you access data visualizations, how you interact with them, and how you gain deeper insights from them.

- **BI drives the evolution of data visualization tools**. The BI industry is very competitive, and chances are that any tool you choose for

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building your data visualization will be classified as a BI tool. On one hand, this competition among different software vendors to build the ultimate tool works to everyone's benefit. It drives innovation that focuses on ease-of-use, better insight, and lower cost.

On the other hand, the choice of tools is becoming so extensive that it's sometimes hard to decide on the best tool for the job. Consider the most widely used BI tool in the world: Microsoft Excel. Some members of the BI industry suggest that Excel, despite its wide adoption, is the most dangerous and least effective tool available. It's important to understand that the evolution of new software in this industry directly affects what types of tools are available to you.

After you have selected the right BI tools, it's time to develop a storyboard that will help you display the data. Throughout the rest of the chapter, we discuss the steps you need to take to set up your storyboard.

Delving Into Your Story

The most important step in building any data visualization is developing an easy-to-follow storyboard. In the BI community, storyboarding has a broad range of definitions.

For the purposes of this book, we use the Business Intelligence Dashboard Formula (BIDF) definition of storyboarding to keep it simple. This formula defines storyboarding as the act of translating user requirements into a four-part diagram that states the goal, measurements, and data visualization types. Using the BIDF storyboard, as shown in Figure 7-1, you can easily document each section discussed in this chapter to develop your story.

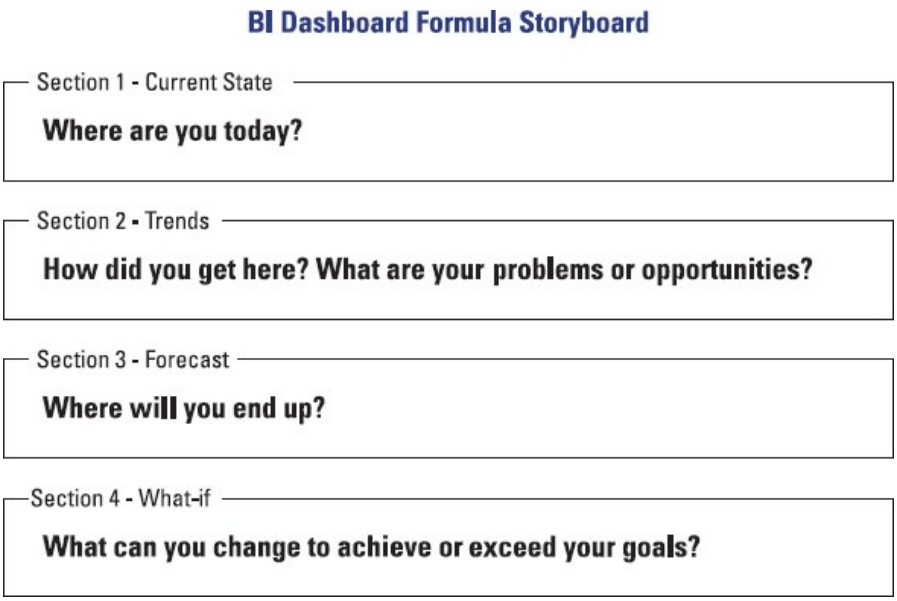

Figure 7-1: BIDF storyboard sections.

The four main sections are

- **Current State:** Where are you now?
- **Trends:** How did you get here,?
- **Forecast:** Where will you end up?
- **What-if:** What can you change to achieve or exceed your goals?

Uncovering storyboard content

Before creating your first storyboard, you must decide what will be in it. If you focus on creating an easy-to-follow storyboard composed of actionable, intelligent data that outlines a clear story, building your final data visualization is fairly simple. First, you need to identify and document some key elements of your story by following these steps:

1. **Identify your audience**.

   Knowing your audience helps you quickly establish what kind of storyboard you're building and understand how to approach gathering the users' data and visual requirements.

   If your audience is comprised of C-level executives (such as the CEO, CFO, CIO, and so) or senior managers (such as vice presidents), you should expect them to have very little time to examine great detail. Your resulting data visualization and key performance indicators (KPIs) must be very high level, summarized views that give a 360-degree view of the company or specific area while allowing the user to drill down for further details.

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2. **Document the audience's goals**.

   Gaining a clear understanding of your audience's goals and existing pain points will help you determine what to include and — more importantly — what not to include in the storyboard.

   Technical Stuff Our BIDF team once worked with the president of a sales division who was responsible for annual revenue of more than $6 billion at one of the largest consumer-food-goods companies in the world. He explained to us that his goal was to drive his organization toward a sales level that would enable the sales team to receive their bonuses. He explained with great confidence, "If we can just get our sales team to do that, everything else will take care of itself." We immediately knew that our storyboard would have to focus on the year-end sales team bonuses; anything that didn't focus on helping the sales division hit its goal wouldn't appear in the storyboard.

3. **Define the audience's KPIs**.

   Understanding the key measurements that your audience must view, monitor, or track is the last step in developing your story. We recommend keeping your KPI count to fewer than 10 items combined because attention spans have gotten smaller, as has the average computer screen size!

   Our BIDF team once worked for a global telecommunications company that does about $10 billion in sales across the Caribbean and Latin America. The company identified almost 400 KPIs at the start of the project, and our team was admittedly a bit intimidated. Using the BIDF methodology discussed in this book, however, after two weeks and some late-night scoping sessions, we reduced the KPIs to fewer than 20.

Identifying your audience

The first step in developing a clear storyboard is identifying your audience. Who you're building your data visualization for ultimately determines what kind of storyboard you develop and what level of data you display.

The easiest way to classify your audience is to look at two simple components: line of business and job roles.

Line of business

Line of business (LOB) refers to an internal corporate business unit. The identified LOBs determine what kind of data to display. Human-resources data is very different from sales data, for example, in that it requires a lot of security and often the masking of sensitive employee data such as salary information.

Most big organizations have some of the following LOBs:

- Asset management
- Finance
- Human resources
- Information technology
- Manufacturing
- Marketing
- Procurement
- Research and development
- Engineering
- Sales
- Service
- Supply chain
- Sustainability

Tip Although it's common to have multiple LOBs in a single storyboard, we recommend using a maximum of two *related* LOBs per storyboard.

Warning! The "one data visualization fits everyone" approach is a common pitfall for data visualization newbies, who often find themselves with an unused data-rich Picasso, as shown in Figure 7-2.

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Figure 7-2: An example of an overdone visualization.

Job roles

This category refers to the role of a person or group of people in a given LOB and their stake in the resulting data visualization. The job titles and stakes of your audience members directly affect the level of data you should display in your data visualization.

Table 7-1 shows some of the most common job roles within an organization. Levels may vary by company size.

Table 7-1: Common Job Roles

Role	*Level of Data Display in Storyboard*
C-level (CEO, CIO, COO, CFO, and so on)	Company overview High-level data
Vice presidents and senior managers	Multi-division view High-level data
Supervisors and directors	Departmental view High-level data Drill down to details
Managers	Team view Drill down to details
Staff (individual contributors)	Operational view Drill down to details

Documenting Goals

Now that you've clearly established your audience type, you need to identify and document the audience's goals. The easiest way to do this may be to hold a small planning session that includes the executive sponsor (if there is one) and representatives of each job role in each LOB.

If the sales manager is requesting the data visualization, for example, it's important that you have that sales manager present, as well as one or two members of her reporting team to ensure that all parties agree on the identified goals. Although in-person meetings are preferable, most global organizations find it challenging to do planning sessions in person. We recommend requesting a simple conference call.

Warning! Avoid sending e-mails to accomplish this task. You'll only receive multiple, conflicting goals that take extensive time to track down and align with each job role.

Remember Although goal gathering can appear to be a simple task, chances are that it will reveal conflicting agendas and priorities across different job roles. This is why it's critical to have the executive sponsor or most senior job role present to dictate and align the goal of the data visualization. If a senior-level sponsor is missing, your audience members may be confused and may distance themselves from the rest of the process. This scenario is your worst nightmare. Don't overlook this requirement.

To guide the goal-gathering process, ask each person present the following two questions, and be sure to document their individual answers:

- **What are your problems and pain points today?**

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Tip Ask the audience members to focus on problems that can be fixed with a resolution that can be measured quantitatively. Here are examples of quantifiable and nonquantifiable problems:

- *Quantifiable problem:* If the sales manager states that sales are declining because too much money is being spent on old marketing campaigns that aren't producing results anymore, an opportunity exists. You can review historical trends, identify declining campaigns, and reallocate the spending to boost high-performing marketing campaigns, thereby increasing sales.
- *Nonquantifiable problem:* If the sales manager states that the sales have declined by 5 percent to 10 percent for the past four years due to a lack of motivation among the sales reps, you should avoid trying to measure this decline. Avoid statistical measurements that require heavy data modeling, such as regression and T-models.

- **What are your goals, and what does success look like?**

  These questions usually invoke a wealth of responses. You want to be sure to get each goal down to a simple statement and keep the count to the top three or four most important goals.

Remember In addition, the goals need to include quantifiable responses that can be measured with a defined target. Each goal should tie directly to solving one or more of the problems identified in the responses to the first question, which is the only way you'll be able to measure the return on investment of your Big Data visualization project.

Here are two examples that show you the difference between good and bad goals:

- **CFO (Chief Financial Officer):** "We want to increase our company's revenue by 10 percent in the next 12 months. This will require that we bring in an additional $500 million in revenue across all divisions."

  We consider this to be a *good goal* because it has a clear target with a set timeframe that can be measured.

- **Sales Manager:** "We hope to influence when our product hits the sales shelves, to drastically improve our ability to sell more, and therefore to hit our target of a 10 percent revenue increase in the next 12 months. However, because we are distributors and have no actual control over the shelving process in the stores, our sales rep will be required to visit the store managers twice as much each month to build the relationships, hopefully influencing our products hitting the shelf sooner."

  This is considered to be a *bad goal* because the sales manager is seeking to increase his revenue by reducing the time it takes for products to hit the shelf — an action that he today has no influence over. This is a typical case of users wanting to view data that is not intelligent (unactionable).

Tip When you're able to document one to four solid goals, your aim is to gain consensus for each goal among the entire group to prevent confusion going forward.

Table 7-2 shows the answers that members of a sales team provided when they were asked to complete the BIDF Planning Guide.

As you can see, some of the problems listed in Table 7-2 refer to cultural issues and broken processes, which is common for most customers. This confirms the need for a data visualization that provides a single version of the truth.

Table 7-2: BIDF Planning Guide Sample

Questions Asked	*Responses*
What are your problems or pain points today?	Too many analytical touch points (users spending too much time building reports) Data hoarding by analysts prevents identifying new opportunities Conflicting sales priorities
What are your goals, and what does success look like?	Hit the target to receive bonuses Effectively manage campaign budget to increase profitability

The good news is that these goals are very quantitative. After you confirm the expected target, bonus, and increase in profitability for each person, you can create the storyboard easily. We discuss this topic more in the next chapter.

Documenting KPIs

After you've documented the high-level goals, you need to capture and document your audience's KPIs. In simple terms, a *KPI* is a core measurement that ties directly to the company's goals. In the sales-team example, the sales manager might identify revenue as a KPI, as it's critical that this number is tracked on a regular basis to ensure it will hit the company target.

Conducting scoping workshops

The best way to work with your audience to document their KPIs is to conduct a series of scoping workshops. These workshops can be done virtually or (preferably) in person, like the planning sessions.

For the purposes of this book, we use the BIDF definition of *scoping:* an event where a group of identified super users from each LOB gather (physically or remotely) to openly discuss and define their business requirements.

Although conducting these workshops may seem to be innocent, if not handled properly, they can quickly turn into a never-ending list of requirements that will never fit into a single data visualization.

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After all of the KPIs are identified and documented, it's important to ask the following question about each one: Does this KPI help the user achieve one or more of the goals listed in the Planning Guide?

If the answer is yes, proceed to collect and document the next KPI. If the answer is no or undecided, question the relevance of the KPI to this data visualization project and try to discourage group members from putting any useless information in the data visualization.

Remember A data visualization should tell a clear story. Like any story in the multimedia world, it should have a clear narrative that includes a plot (in this case, achieving goals).

We recommend using the BIDF BI Blueprint (which you can download online for free at www.dummies.com/extras/datavisualization), shown in Figure 7-3.

Purge KPIs			Execution - Key Metric Identification					Data Collection		Monitor				Status
Final	Available	Priority	#	Existing Report	Area	KPI	Metric	Owner	Source	Viewing Period	Reporting Period	Alerts	Security	as of 02/01/2013
Y or N	X or Blank	1-3, Phase 2	1	SalesReport.xls	Sales, Marketing, Finance	Margin	Cost of Goods Sold	CFO	Sap Module, Excel Sheet, Universe e.g.	Daily	Weekly, Monthly, Quarterly, Annually	1 to -1 = Yellow / 0 = Green / <-1 Or <1 = Red	HR Only	Data sheet submitted to Mico
			1	SalesReport.xls	Finance	Sales	Sales	CFO	SAP Sales Module					2/1/13 - John said it will be available on 3/31/13
			2	SalesReport.xls	Finance	Sales	Cost of Goods Sold							
			3	SalesReport.xls	Finance	Margin	Margin							

Figure 7-3: BIDF BI Blueprint.

Warning! Understanding the key measurements that must be viewed, monitored, or tracked by your audience members is a vital but tricky process. Most users want to see more data than they actually need to address their problems.

Identifying example KPIs

Table 7-3 shows some KPIs derived from the sales team in our continuing example.

Table 7-3: KPIs and Definitions

KPIs	*Definitions*
Sales	Expected revenue based on all customer transactions
Annual goal	Sales revenue target that determines bonus
Probability of hitting annual goal	Calculates the chances of the sales rep hitting their annual goal
Deductions	Expected revenue not paid by customer
Available trade spend	Amount of money available to use in customer promotions

The KPIs listed in Table 7-3 are well defined and include concise definitions that resonate with all the business users.

By now, you should have a clear idea of what your audience members need to see to accomplish their goals. Pat yourself on the back. At this stage, 40 percent of the heavy lifting is done. But before you can proceed to create a mock-up (the first-draft preview of your data viz), you need to choose what kind of data visualization to build.

Building Your First Storyboard

Although the concept of storyboarding isn't new, the approaches and tools available to create storyboards continue to evolve. Mico recalls building her first storyboards with pencil and paper or on whiteboards with dry-erase markers. Over time, she scanned and moved those sketches to Microsoft PowerPoint. Fortunately, a plethora of tools specifically geared to this task is available now.

This book uses the BIDF storyboard section for section outline shown in Figure 7-1, earlier in this chapter, to make the process easy to follow.

Section 1: Current State

Section 1: Current State of the storyboard describes the user's current state. It should answer two simple questions: What is the current status of the main goal(s)? What is the likelihood of hitting or missing the main goal(s)?

In the continuing sales example, the sales managers identified their overall goal as hitting their bonuses. Therefore, you determine that Section 1 should display the information shown in Figure 7-4.

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BI Dashboard Formula Storyboard

Section 1 - Current State

Where are you today?

1. Probability to hit sales bonus
2. Trending status of sales
3. Actual sales

Figure 7-4: Sales Storyboard Example Section 1: Current State.

Tip Time is relative to the actual KPI. "Where you are now?" could mean today, yesterday, last quarter, or last year. It really is based on how it makes sense to measure that goal.

In the sales storyboard example, you're tracking whether the sales team will hit its bonuses. So your main KPIs would be

- **Probability to hit sales bonus:** Likelihood of the sales reps actually getting their bonuses
- **Trending status of sales:** Comparison of behavior of sales over a specified period
- **Actual sales:** Current sales amount

Although the data is being updated and viewed on a daily basis, it's being tracked on a monthly and yearly basis to keep track of the long-term goal. Bonuses are paid at year-end, but viewing them on a monthly basis breaks the tasks into smaller, achievable milestones, which makes it more digestible for the user.

Tip When developing the KPIs for this section and all other sections, it's important to focus on the behavior of your typical user, who is likely to have less than a minute to scan his or her status before a big meeting. This section should let the user see at a glance whether things are going well or badly.

Section 2: Trends

Section 2: Trends of the storyboard describes how the user got to the current state. For example, if the current state shows that the main goal is off target, then the trends area should display a set of measurements that show exactly what factors contributed to missing the target. Conversely, if the current state shows that the main goal is on or above target, then the trends area should display a set of measurements that shows the factors that contributed to this success.

The description of the measurements that will be shown in the sales storyboard is shown in Figure 7-5. Assume that the probability of the manager hitting his goal is low. Your next step is to work with the users to determine the top reasons why sales managers may or may not hit their goals and the effect of those measurements on the overall goal.

BI Dashboard Formula Storyboard

Section 2 - Trends

How did you get here?

1. Marketing campaigns (show 12 months of ROI variance, mark highest negative variances)
2. Unshipped items (show dollar amounts)
3. Customer missed targets (show top 5 highest missed customer sales targets MTD)
4. Speed to shelf (show retailers with most delayed speed-to-shelf times)

Figure 7-5: Sales Storyboard Example Section 2: Trends.

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Following are some of the top reasons that the main sales goal may be missing its target, which you might derive after talking with the users and studying some of the data from their existing reports:

- **Marketing-campaign performance:** Money spent on a given marketing campaign versus the ROI (return on investment) received is low.
- **Unshipped items:** Items expected to be shipped on a given date are not shipped, leading to a loss in sales.
- **Customer missed sales targets:** Projected sales targets for given retail customer(s) has not been met.
- **Speed to shelf:** The time it takes a retailer to place items on the shelf (can't be influenced by a sales manager) is delayed, resulting in a loss in sales.

There are always going to be a host of reasons why a goal is not being met. The idea is to focus on the 20 percent of the reasons that are resulting in 80 percent of the failure.

Remember Focus on metrics that are within the user's control, as data visualizations need to contain actionable data. Displaying information that isn't actionable is a waste of the user's time and leads to low user adoption. In the example, the speed-to-shelf measure, for instance, is one that should be questioned.

Warning! Don't display data just for the sake of displaying it — a common mistake among data visualization newbies.

Tip To ensure that the user understands why you're displaying these particular measures, show the cumulative and individual impact of each measure on the overall sales goal.

Warning! This is why you don't want to have low-impact or nonactionable measurements. If users can't immediately gauge the importance of the measurements as a part of the story, you lose their attention. Worse, users may proceed to do their own analysis, which defeats the purpose of providing useful information in your data visualization.

Section 3: Forecast

Section 3: Forecast of the storyboard should provide a clear projection of where the main sales goal will end up if no action is taken. It should also provide a clear view of where the main goal will end up compared with the original target and highlight any gaps.

For the sales storyboard example, you can use the metrics from Section 2: Trends of the storyboard, this time highlighting future behavior and effect on the existing goal:

- **Sales forecast:** Projections of sales figures for the next 12 months based on existing trends
- **Marketing-campaign performance:** Projection of performance for rest of month based on existing trend

Figure 7-6 shows what Section 3: Forecast of the storyboard might look like.

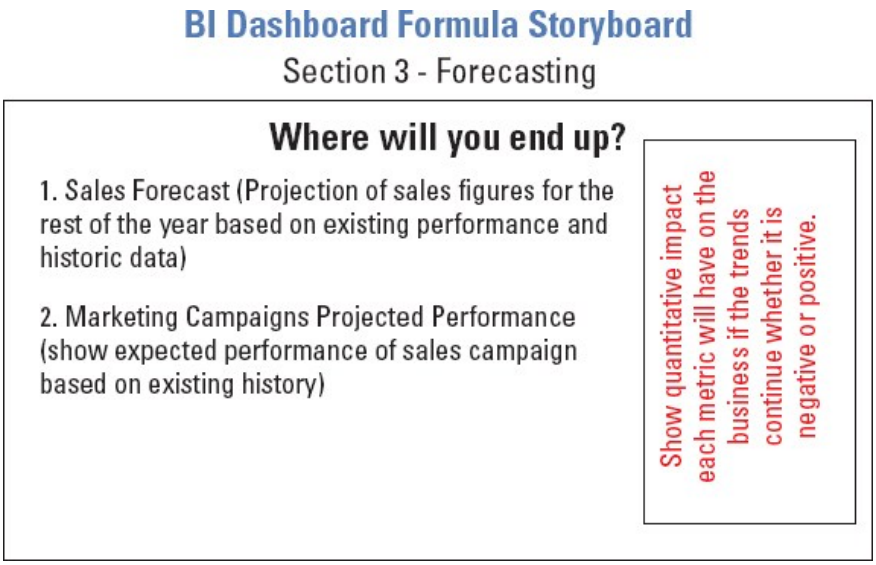

Figure 7-6: Sales Storyboard Example Section 3: Forecast.

Warning! Just like all elements of your storyboard, the forecast referred to in this book has to be actionable. It should either encourage the actions described in Section 4: What-if of the storyboard (the what-if section) or discourage the actions of the user that have led to the current outcome.

Section 1: Current State of the storyboard (refer to Figure 7-4) displays sales versus target, sometimes confused with the forecast. Therefore, including the same information in Section 3: Forecast would be repetitive. To continue the story, simply display a projection of the metrics from

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Section 2: Trends of the storyboard.

Tip After the correct list of measurements has been established, it's sometimes easier to display the forecast as a function of the current state or trends section. Not only is real estate of most data visualizations very limited, but including the forecast as a simple line on a chart or number display next to the KPI helps to effectively get the point across in most cases.

Section 4: What-if

The way we approach this section in the BIDF world is very different from traditional BI practice, and it truly delivers value when you're developing a Big Data visualization.

Remember What-if is defined in most data visualizations today as a scenario, often displayed as a series of sliders or dials, that enables the user to choose specific criteria and watch how they affect the goals. By modifying certain measures, the user can see how those changes will directly affect a specific KPI.

We assume that you're reading this book because you truly want to provide insight into your organization's Big Data. You want to avoid just placing charts on a sheet and calling the sheet a data visualization. We also assume that you're actually trying to develop something that folks might view as being highly intelligent.

Remember Now that we're on the same page, let us repeat that truly valuable Big Data visualizations focus on providing intelligent actionable data to users. Providing a set of sliders on the data viz that let users go on a wild goose hunt for the ultimate scenario is a waste of their time. When that happens, users will abandon the data viz for something that provides the answer so that they don't have to find the ideal scenario through trial and error.

The what-if section of your BIDF storyboard provides the missing piece of the story: a clear set of recommendations that, if followed, will help the users improve their current state. You provide the most optimal combinations of actions the users can take to have the greatest effect on achieving their goals.

Suppose that the sales manager isn't meeting her goal. From the trends, we already know what happened. In Section 4 we want to display some suggestions for improving the current situation. The suggestion may look like this:

- **Bad marketing-campaign performance:** Money spent on a given marketing campaign(s) didn't provide the expected return in sales.

  Based on the available historic and existing data, an example recommendation may be to move money from the existing campaign to a campaign that has been performing consistently for the last 5 years, though with much lower returns.

- **Missed shipped items (dollars):** Items expected to ship on a given date either shipped late or not at all.

  Based on the available historic and existing data, an example recommendation may be to immediately source the product from a warehouse that is stocked and has historically shipped on time to avoid the loss in sales.

- **Top 3 unmet customer sales targets:** Sales targets with given retail customer(s) were lower than projected.

  Based on the available historic and existing data, an example recommendation may be to focus on a set of smaller customers who have a history of great sales to make up for the missed sales targets with the other customers.

One easy way to make these recommendations digestible to the user is to provide three buckets of options with different risk levels, as shown in Table 7-4.

Table 7-4: What-if Examples

What-if Buckets	*Recommendations*
Option A Risk Level – High Impact – 98%+	Reallocate 100% of Campaign A funding to Campaign B, which has been performing in a similar region. Launch a new campaign in the East Coast region based on previous-year sales at a specific store.
Option B Risk Level – Medium Impact – 87%+	Reduce funding of Campaign A to less than 70%. Add a discount to existing promotion to make it more attractive. Focus on three smaller customers who have a solid sales history to make up the two missed customer sales targets.
Option C Risk Level – Low Impact – 60%+	Reduce funding of Campaign A to less than 30%. Add an online coupon option to existing promotion. Re-allocate the order to Warehouse A, which is fully stocked and historically ships on time.

This example gives users several options with varying levels of risks and effect to contemplate. The system has already done the analysis that would otherwise be done manually in an Excel spreadsheet and provides a clear path for users to achieve their goal and ultimately achieve success.

Give yourself a pat on the back! The process that you just went through is perhaps the most difficult part of building any data visualization. It's essentially the blueprint by which you provide true intelligence.

The sales storyboard sums up the customer's sales story by letting the sales manager know

- Whether he's going to hit his goal

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- How far he is from hitting or missing his goal
- What actions led to missing or hitting his goal (show the exact effect those trends had on the goal)
- Where he will end up if he continues down the same course (show the exact effect those trends will have on his goal)
- What actions he can take to hit or exceed his goal (show a list of actions, their risk factors, and how they will affect the goal)

Be excited. At this stage, your user is going to think you're a data visualization god!

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