A Guide to Creating Dashboards People Love to Use

Part 3: Information Design
Dashboard Design Matters

Dashboards have become a standard business tool over the last decade. Dozens of dashboard building solutions have sprung up to meet the demand. Yet in the flurry of technology and enthusiasm, little attention has been paid to how to design focused, thoughtful, and user-friendly dashboards. Our three-part guide will show you the concepts and give you the best practices to create a high-impact dashboard that people love to use.

Traditional dashboard design focuses almost exclusively on defining the right success metrics, then piecing together a bunch of charts and gauges on a single page. These techniques yield dashboards with a hodgepodge appearance and confusing information.

In the early days of the world wide web, it was good enough to simply have the right information on the web page. The current industry-standard dashboards are no more ambitious. However, modern web design has moved on to seek a union of utility, usability and beauty. We must find a similar union when displaying data in business.

This document approaches dashboard design in a holistic way, beginning with general goals and evolving to specific data presentation. Part 1: Foundation helped you identify your target audience, understand what type of dashboard you want to create and why it is valuable to your organization. It concluded with guidance regarding how to focus your
message on the information and metrics that matter. *Part 2: Structure* helped you start on designing your dashboard, including what form it should take, how to design for audience understanding, and what navigation, interactions, and capabilities will make your dashboard useful and engaging. Finally, *Part 3: Information Design* dives into the details of interface and information design. You will learn how to lay out your dashboard and best practices for charting and data presentation.

**Clear presentation of information**

The third part of our dashboard design guide provides practical tips for putting information on the page in a way that communicates effectively to your audience.

We stand on the shoulders of giants in the area of information design, including visualization guru Edward Tufte, visual business intelligence critic and teacher Stephen Few, and numerous leaders in the field of web design. This paper is our attempt to synthesize some of the most important best practices while adding a few extra wrinkles.

Information presentation is a balancing act—How do you convey a lot of information without making it feel overwhelming? How do you capture attention without distracting your audience? How do you make information feel simple yet profound?

As we’ve done throughout this series, we will tackle the problem from the outside in. First we share best practices for designing a clear, aesthetically-pleasing page. Next we concentrate on the charts, table and visualizations that communicate the information. Here’s what you can look forward to:

**Section 1: Interface design**

1. Organize the dashboard page like a web design expert
2. Choose the appropriate use of color to enhance your dashboard
3. Make the right typography decisions to ensure attractive, readable text

**Section 2: Information display**

1. Pick the chart type that best fits your data
2. Style charts to be attractive and effective
3. Learn about advanced visualization and features for your dashboard
Section 1: Interface design

Simplicity is a primary goal of many well-designed websites—limiting visual clutter to help users easily navigate and understand the content. Dashboards share the same goal. It is no surprise then that we can learn a lot from the rules and tools of web design to help guide our thinking on creating dashboard interfaces. We can learn about:

Organizing the page. Where should you place the most important content? How do you lay out charts and text to enable visual rhythm? How can white space help your audience absorb information?

Color. What meaning does color bring to the dashboard? How do you pick the appropriate color palette and scheme for your situation?

Typography. Why does it matter what fonts are used? How do you consistently use fonts to enhance the interface?

Organizing the page

The little things in a dashboard can make a big difference—like where you place the key metrics, where you place charts, and how much information you try to fit into a page. Dashboards like the award-winning International Bank Dashboard (below) succeed at information design. However, its page layout leaves something to be desired. The data is compressed to fit the page and readers can’t easily determine what is the most critical information.
A few things to keep in mind when laying out your dashboard:

**Pay attention to attention**

You’ll want to position the most important information where people look first. But how to know where someone will look on the page? Fortunately, studies show that people tend to scan a page in a similar manner. Imagine the image to the right is overlaid on your dashboard page. The research indicates that users look first for information on the top and left. Users also focus their attention down the left side. The center gets a fair bit of attention as well. But the bottom and right may not be noticed by your user at all.

Juice Analytics creates dashboards that business people love to use. Check out some of our work at www.juiceanalytics.com/solutions/case_studies/. Contact us at info@juiceanalytics.com.
Grids

Many web designers use something called a grid system—a series of columns and “gutters” of certain widths—to ensure that key lines in their designs align. This approach brings a coherence and order to the page that puts users at ease.

We can overlay a grid on a well-designed site like the New York Times to see how this system gets applied in practice.

Not everything fits into one column, but it is obvious that this site has a pre-defined grid and sticks faithfully to it. The result is a clean, effective page layout. Here are two reference articles to learn more about grid layouts:

- [www.subtraction.com/pics/0703/grids_are_good.pdf](http://www.subtraction.com/pics/0703/grids_are_good.pdf)
White space

We don't just see objects themselves; we also see the space that is not there. White space in interface design is very important and too often overlooked. Maximizing dashboard real estate must also mean creating places for the eye to "rest" so that the non-white space has more impact. When we don't have sufficient spacing, everything runs together and we can't see what is most important.

White space can be used to delineate sections or help users see groupings of content in a dashboard. Using white space may mean sacrificing one extra chart or metric, but it can make a huge difference in user comprehension.

Color

More often than not, dashboards get lit up with color like an over-dressed Christmas tree. The color is applied indiscriminately and adds little to the meaning of the dashboard. Appropriate use of color requires restraint. In our dashboard designs, we typically start by using only grey, then we gradually add color where it conveys useful information.

Color brings meaning

Color can draw your eye to what is important and tie together similar things. For example, if we increase color brightness, it will attract attention and make a point seem more important. Similarly, use of the same color hue can be used to connect things that are related.

At a more subtle level, the color scheme we choose can evoke an emotion or feeling about the dashboard. Colors can be broken into high-level dichotomies such as “earthtones” versus “unnatural” colors. We perceive earhtones as calming (Edward Tufte...
has said that these are the kinds of colors you want to use if you just want to use color very gently on your page). In contrast, unnatural colors jump out at your audience, making them ideal for showing an alert.

**Meaning in color**

<table>
<thead>
<tr>
<th>Earthtones</th>
<th>Unnatural colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gentle browns, blues. Calming, sinks into the page</td>
<td>Alarming, unnerving. draws attention.</td>
</tr>
<tr>
<td>Cool</td>
<td>Warm</td>
</tr>
<tr>
<td>Soothing, restful, calm</td>
<td>Optimistic, active, vivid</td>
</tr>
</tbody>
</table>

Increasing color intensity

Increasing saturation and brightness draws the eye and means the point is more important

**Color to display data**

When you are using color in your graphs to represent data, there are three types of color schemes to consider:

- **Sequential** when you are ordering values from low to high.

- **Divergent** when the values are ordered and there is a critical mid-point (e.g. an average or zero).

- **Categorical** when data falls into distinct groups (e.g. countries) and therefore requires contrast between adjacent colors.
Typography

Typography is an obsession for some; it can include everything from choosing a typeface (i.e. font) to picking the right point size, kerning, tracking, and leading. In the meantime, you’ve got a dashboard to make. We conclude this section with a unique framework for making decisions that ensure quality typography in your dashboard.

Fonts are like wine

In the world of wine, we have reds and whites. The world of fonts is similarly bisected into serif and sans-serif fonts. Serif is the name for the little decorative feet that come off the end of serif letters. Sans is french for “without” so sans-serif fonts don’t have the feet. Serif fonts are like red wines. Sans-serifs are like whites.
Among serif fonts, Georgia, Times New Roman, and Palatino are generally available. Think of these as the Merlot, Cabernet Sauvignon and Pinot Noir of fonts. Georgia is a lovely font that works well on the screen, at different sizes and in bold and italics. It's our editor's choice. Palatino can be quite elegant, while Times New Roman is workmanlike.

On the sans-serif side, some common fonts are Arial, Helvetica, Trebuchet, Verdana, and Tahoma. Trebuchet is a sassy font. Verdana and Tahoma are cousins; Tahoma is a just a horizontally compressed Verdana. Helvetica had a movie made about it, so that gives you an indication its popularity.

**How we read**

According to research at Cambridge University...well, you can read the details below:

It’s amazing how quickly we can read this paragraph, given that very few letters are in the right shape. We recognize words through a combination of letter recognition and word shape recognition. The words in this paragraph all have the right starting and ending letters and they have approximately the correct word shape. This leads to an interesting conclusion: with capital letters, we do not have a distinctive word shape. All caps is less legible than regular text and generally should be avoided.

Fortunately there are lots of other ways to emphasize text. Look at the following text treatment:

“If we don’t get out of the woods soon, we’ll be eaten by a bear,” whispered Timmy.

“If we don’t get out of the woods soon, we’ll be eaten by a bear,” whispered Timmy.

What is the effect when you bold or italicize text? Italics add a sense of emphasis and urgency. Italics can also look classy. Bold text, in contrast, is urgent and loud. When bold text is part of a sentence, you’ll tend to look at it first. Here are your options for text emphasis:

You can add **italic** letters.
You can **bold** your important point.
You can **darken** your important text.
You can **use color** to emphasize text.
You can **combine** effects.

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Less effective
You can **UPPERCASE** your important text.
You can **bold-italics** your important text.
You can **use color** to emphasize text.
A simple font framework

With that background, we’d like to offer a simple framework for effective use of fonts in your dashboard. With just a few simple decisions, you can ensure that the text on the dashboard will both look good and communicate effectively. The majority of text on the page falls into four categories:

- **Body** text is clean, readable content
- **Headers** separate and name major sections of your work
- **Notes** describe additional things the reader should be aware of. These should fade into the background unless we call attention to them.
- **Emphasis** text is what we want our reader to pay particular attention to.

The following table describes an approach for deciding how to display each of these text types. The yellow highlights indicate where you need to make decisions.
### Juice’s Simple Font Framework

You need to make three basic decisions:

1. Choose size and font of the body text

2. Decide if the header is going to flip to serif or sans-serif—and whether it is going to have any style

3. Decide what to do about emphasis—color or (bold or italic)

A few things things don’t fit neatly into one of the four text categories listed above, such as table headers and graph titles. We tend to use a combination of styles to handle these exceptions. Stick to this framework and we guarantee your dashboard will look better.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Size</th>
<th>Font</th>
<th>Color</th>
<th>Style</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body</strong></td>
<td>Clean readable text, 50-80% of your text will look like this.</td>
<td>10-16pts</td>
<td>sans-serif: Arial, Tahoma, Verdana serif: Georgia, Times</td>
<td>Neutral</td>
</tr>
<tr>
<td><strong>Header</strong></td>
<td>Separate and name major sections of your writing.</td>
<td>150–200% of body</td>
<td>Same as body or flip serif/sans-serif</td>
<td>Neutral</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Additional things a user should be aware of, data sources, metric calculations. “Fade into the background”</td>
<td>85% of body</td>
<td>Same as body</td>
<td>De-emphasized, lower contrast</td>
</tr>
<tr>
<td><strong>Emphasis</strong></td>
<td>Draw the eye to key points you need to make.</td>
<td>Same as body</td>
<td>Same as body</td>
<td>High impact color</td>
</tr>
</tbody>
</table>

Choose one or both
Section 2: Information display

Your dashboard needs to tell a story with data. To do so, you’ll need to create charts and tables that highlight the right information and are easy to read. Your audience is probably distracted and doesn’t love looking at data (as much as you do), but with the right choices about information display you can still reach them.

This section starts by addressing the age-old question: What is the right chart to show my data? Next we provide tips and tricks for better chart and table design. Finally, we have compiled a set of best-in-class resources and hints for advanced data visualization techniques.

Choosing the right chart

We are often asked “what is the right chart for my data?” Unfortunately there is no secret decoder ring to point at data and see what kind of chart would work best. While we wait on that invention, let’s use an understanding of data types and chart types to uncover some of the mystery.

Types of data

There are two major types of data: categorical (i.e. dimensions) and quantitative (i.e. measures or metrics). If you were analyzing a zoo, categorical data would be the different species, gender, and grouping by furry, feathery, or scaly. Quantitative data would include the number of animals, animal weight, number of teeth, etc. The following table describes the different data types:
Data types gives us the first piece of the puzzle for choosing the right chart. Let’s add a couple additional pieces:

- **Use charts that maximize user comprehension.** There are things that people can judge very accurately—the length of a line and position in 2D space. Then there are things that people can judge only semi-accurately—width, area, color intensity, radial distance. You want to use charts that support quick comprehension of values (e.g. line, bar) and avoid charts that are hard to interpret (i.e. pie, 3D scatterplots).

- **Don’t lie with data.** A couple simple rules for accurate representation of data: 1) lines connect things that are related; 2) the length of bars is directly proportional to the values behind graphed (if a number is 2x bigger, the bar should be 2x bigger). The same goes for the proportionality of areas.
Choosing the right chart type

Now we can combine these rules and our understanding of data types to show how to choose the right chart for your data. In the following table, the rows are your quantitative data type and the columns are your categorical (or quantitative) data type.

For another perspective on this problem, see Andrew Abela’s “Chart Suggestions” diagram (extremepresentation.typepad.com/blog/2006/09/choosing_a_good.html).
Fundamentals of chart and table design

Out of the box, most charting programs break the rules for good chart design. We’ve used examples from one of the chief offenders, Microsoft Excel, to show how you can get to clean, readable charts.

1. **Reduce chart-junk and increase data-to-ink ratio.** These are the first two commandments of Edward Tufte. Reduce chart junk by removing elements that are decorative or ornamental. Three dimensional chart effects, for example, add nothing of value to your chart. Increase data-to-ink ratio by making every pixel tell a story about your data.
2. Maximize contrast. Maximize the contrast between your data and the background. The standard Excel default chart, for example, makes it more difficult than necessary to distinguish the line from the background. A white background and de-emphasized gridlines can help.
3. **Readable labels.** Whenever possible, avoid rotated labels; they are hard for people to read and distract from focusing on the numbers.

![Bad](image1)

![Good](image2)

4. **Don’t repeat yourself; repetition is bad.** It’s not necessary to have both a legend and a title for single series graphs. Likewise, the title of a chart may suffice to explain what the reader is looking at.

![Bad](image3)

![Good](image4)

A useful alternative to a legend is to label the individual data series directly.

![Worse](image5)

![Better](image6)
5. **Avoid smoothing and 3D.** Avoid adding a smoothing feature to your line; it gives the impression of data points that are not there. Similarly, glossy 3D effects are a visual that was impressive in 1999 but contributes no value to your chart.

6. **Careful use of gradients.** Use flat colors or a bare minimum gradient. Ensure that the bar endpoint is visible. When the gradient fades toward the endpoint, it reduces the ability to clearly see the length of the bar.

7. **Sort for comprehension.** Add structure and clarity to the chart by sorting by a metric of interest.
8. Use color variants. If you are displaying multicolumn or stacked charts, use variants on a hue or grey to show different data series.

Also, don’t vary the colors by point. This creates a lot of unnecessary visual noise and makes similar colors seem related. In addition, bright colors get more perceived emphasis.
Tables

While graphs allow us to see the shape of data, tables allow us to perform precise lookups and comparison between small numbers of values. Here are a few addition design tips to consider when creating tables:

- Remove gridlines
- Use lines or whitespace to separate areas that are conceptually different
- Display the smallest amount of numbers that you can to support the needs of the table
- Use consistent column and row spacing to create horizontal and vertical rhythm

Table design: before and after
Resources for advanced dashboard features

There is so much more we could cover in the area of information visualization, but your printer is short on paper. With the remaining page, we have compiled some of the best resources and best practices for more advanced visualizations and dashboard features.

<table>
<thead>
<tr>
<th>Type</th>
<th>What is it?</th>
<th>Two tips</th>
<th>Where to find out more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treemaps</td>
<td>Visualization of hierarchical data</td>
<td>Use measures that add-up for box size (e.g. sales); use rates or percentages for box color (e.g. change in sales). The data layers need to have a hierarchical structure (e.g. continents-&gt;countries-&gt;cities).</td>
<td><a href="http://www.juiceanalytics.com/writing/10-lessons-treemap-design/">10 Lessons in Treemap Design</a> Treemaps for space-constrained visualization of hierarchies by Ben Shneiderman <a href="http://www.cs.umd.edu/hcil/treemap-history/">www.cs.umd.edu/hcil/treemap-history/</a></td>
</tr>
<tr>
<td>Geographic maps</td>
<td>Heatmaps or point/bubble overlay on a map</td>
<td>Include only as much detail in the map itself as is useful for the audience (e.g. road-level detail may be distracting). Before using a map, make sure location is critical to the users understanding; sometimes a simple chart or table can be just as effective.</td>
<td><a href="http://www.perceptualedge.com/articles/visual_business_intelligence/geographical_data_visualization.pdf">Introduction to Geographic Data Visualization</a></td>
</tr>
<tr>
<td>Alerts</td>
<td>Dashboard indicators displayed when a measure exceeds a threshold</td>
<td>Avoid “over alerting”—too many flashing lights will quickly numb the users. Create actionable alerts where there is a clear next step.</td>
<td><a href="http://www.juiceanalytics.com/writing/dashboard-alerts-checklist/">A Dashboard Alerts Checklist</a></td>
</tr>
<tr>
<td>Type</td>
<td>What is it?</td>
<td>Two tips</td>
<td>Where to find out more</td>
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<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Filters</td>
<td>User configuration to set the scope of the values in the dashboard</td>
<td>Use small visualizations in filters to show the size or frequency of the</td>
<td>Scented Widgets: Improving Navigation Cues with Embedded</td>
</tr>
<tr>
<td></td>
<td></td>
<td>selectable dimension</td>
<td>Visualizations (Univ. of CA, Berkeley)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Display the filter selections in the title of the dashboard so a printed</td>
<td>vis.berkeley.edu/papers/scented_widgets/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>copy accurately describes the data</td>
<td>5 Features of Effective Filters</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.juiceanalytics.com/writing/five-features-effective-filters/">www.juiceanalytics.com/writing/five-features-effective-filters/</a></td>
</tr>
</tbody>
</table>

**Happy Dashboarding!**

Part 3 of our guide has been about giving you practical advice for laying out your dashboard and presenting the information in charts and tables. In this paper we’ve addressed these topics:

- How to organize the dashboard page for a clean, stylish layout
- Choosing and using colors to your advantage
- A simple font framework for attractive text
- Picking the right chart for your data
- Designing easy to understand charts
- Tips for advanced visualizations and functionality

This is the final part in our guide to dashboard design. We hope you’ve found it useful. Please send us feedback so we can continue to refine our best practices for building dashboards people love to use.