

With Dashboards

Formatting and Layout Definitely Matter

STEPHEN FEW, *Perceptual Edge*



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Dashboards can keep people well informed of what's going on, but most barely scratch the surface of their potential. Most dashboards communicate too little, and what they display, they display poorly. This is primarily a failure of design. To present information in a way that people can rapidly monitor, fully understand, and effectively respond to, we cannot format the appearance of information nor lay it out on the screen in just “any ol’ way.” Dashboards are usually required to display a great deal of somewhat disparate information in a limited amount of space (a single screen). It is challenging to squeeze all this information onto the screen without ending up with a cluttered mess. To avoid this unfortunate outcome, we must follow visual design principles for formatting and arranging information on the screen. We must organize information into meaningful groups and do so in a way that features what's most important. Even aspects of design that you might assume are unimportant, such as the positioning and sizing of items on the screen, can dramatically undermine the effectiveness of a dashboard when visual design principles are ignored.

Fortunately, the best practices for dashboard formatting and layout are easy to learn. They are also easy to implement—if you happen to use software that supports the necessary level of formatting and layout functionality and flexibility. It is a sad fact that most dashboard products do not. *CenterView* from *Corda Technologies*, however, is a pleasing exception.

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Common Failures in Dashboard Formatting and Layout

I'll begin by clarifying my use of the terms formatting and layout. Formatting involves anything we do that affects the visual appearance of a dashboard's content. Formatting can be applied to a section of text, a table of data, a graph, an icon, or anything else that appears on the dashboard. Formatting manipulates visual attributes of the things on display, such as their color, size, and thickness, as well as the presence or absence of components that may or may not be needed, such as gridlines on a graph. For instance, we might want to assign a distinct color to an alert icon and make it bright so it can be used to draw attention to particular items on a dashboard. Layout includes everything we do to position, group, or in some manner order units of content on the screen. For example, we might want to place a particular graph in a prominent location to make it stand out as important or be the first thing that people notice.

When I review the effectiveness of dashboards, which I do quite often—both those that were created by software vendors to promote their products and those created by organizations to do real work—I encounter many of the same formatting and layout problems again and again. Here's a list of nine of the most common problems I come across, which you would do well to avoid:

1. Positioning content in places that don't fit its importance
2. Positioning content in places that fail to support its use
3. Including items that serve no useful purpose
4. Sizing content larger than it deserves
5. Separating content excessively
6. Visually featuring content and other items more than they deserve
7. Failing to visually link contents and other items that are related
8. Visually suggesting links between contents that are not related
9. Enforcing a rigid symmetrical grid

In 2006, I judged a data visualization competition for DM Review magazine. Contestants were asked to create separate graphical solutions to five business scenarios, one of which involved creating a sales dashboard. I provided the data and left contestants to their own devices to create solutions, letting them know that I would evaluate them solely on their ability to communicate the information accurately, clearly, and rapidly. It was interesting to see how differently the contestants envisioned the dashboard solution. For most of the nine dashboard design problems that I'll cover in this paper, I'll use dashboard solutions submitted to this competition to illustrate what we ought to avoid.

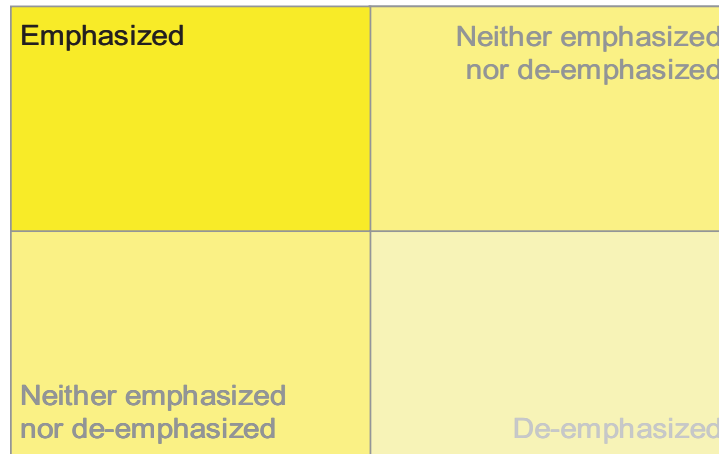
1. Positioning Content in Places that Don't Fit Its Importance

We look at some regions of a computer screen more than others. Prominent screen real estate can be used to feature important content. This opportunity is wasted when we place less important content in these valuable regions. The importance of each piece of information that will appear on a dashboard should be weighed relative to all others and this hierarchy of importance ought to be considered when deciding what goes where. In the following example, this was not done.

SALES DASHBOARD - 19 December 2004							
		Actual Q1	Actual Q2	Actual Q3	To Date Q4	Forecast Q4	Target Q4
Revenue Total		\$ 154,057	\$ 165,158	\$ 199,738	\$ 206,264	\$ 225,205	\$ 215,000
by Region	<i>North America</i>	\$ 78,963	\$ 78,138	\$ 91,176	\$ 91,441	\$ 100,197	\$ 107,500
	<i>Europe</i>	\$ 30,811	\$ 33,032	\$ 39,948	\$ 41,253	\$ 45,374	\$ 43,000
	<i>Asia</i>	\$ 28,877	\$ 37,472	\$ 48,641	\$ 52,944	\$ 57,380	\$ 39,775
	<i>South America</i>	\$ 3,041	\$ 3,435	\$ 4,206	\$ 5,035	\$ 5,738	\$ 5,375
	<i>Middle East</i>	\$ 12,365	\$ 13,081	\$ 15,767	\$ 15,592	\$ 16,515	\$ 19,350
by Product	<i>Cabernet</i>	\$ 28,430	\$ 30,228	\$ 35,053	\$ 38,728		\$ 38,700
	<i>Zinfandel</i>	\$ 13,876	\$ 10,164	\$ 17,876	\$ 18,664		\$ 19,350
	<i>Merlot</i>	\$ 25,440	\$ 24,977	\$ 28,955	\$ 28,865		\$ 36,550
	<i>Chardonnay</i>	\$ 68,634	\$ 64,025	\$ 104,063	\$ 107,610		\$ 98,900
	<i>Sauvignan Blanc</i>	\$ 17,677	\$ 35,763	\$ 13,790	\$ 12,398		\$ 21,500
Profit		\$ 31,999	\$ 36,749	\$ 42,431	\$ 46,685		\$ 53,750
Avg Order Size		405	421	435	449		430
Market Share		23%	20%	19%	17%		27%
Customer Satisfaction		3.18	2.95	2.82	2.67		3.29
On-Time Delivery		83%	73%	65%	68%		95%
New Customers		346	430	447	468		450

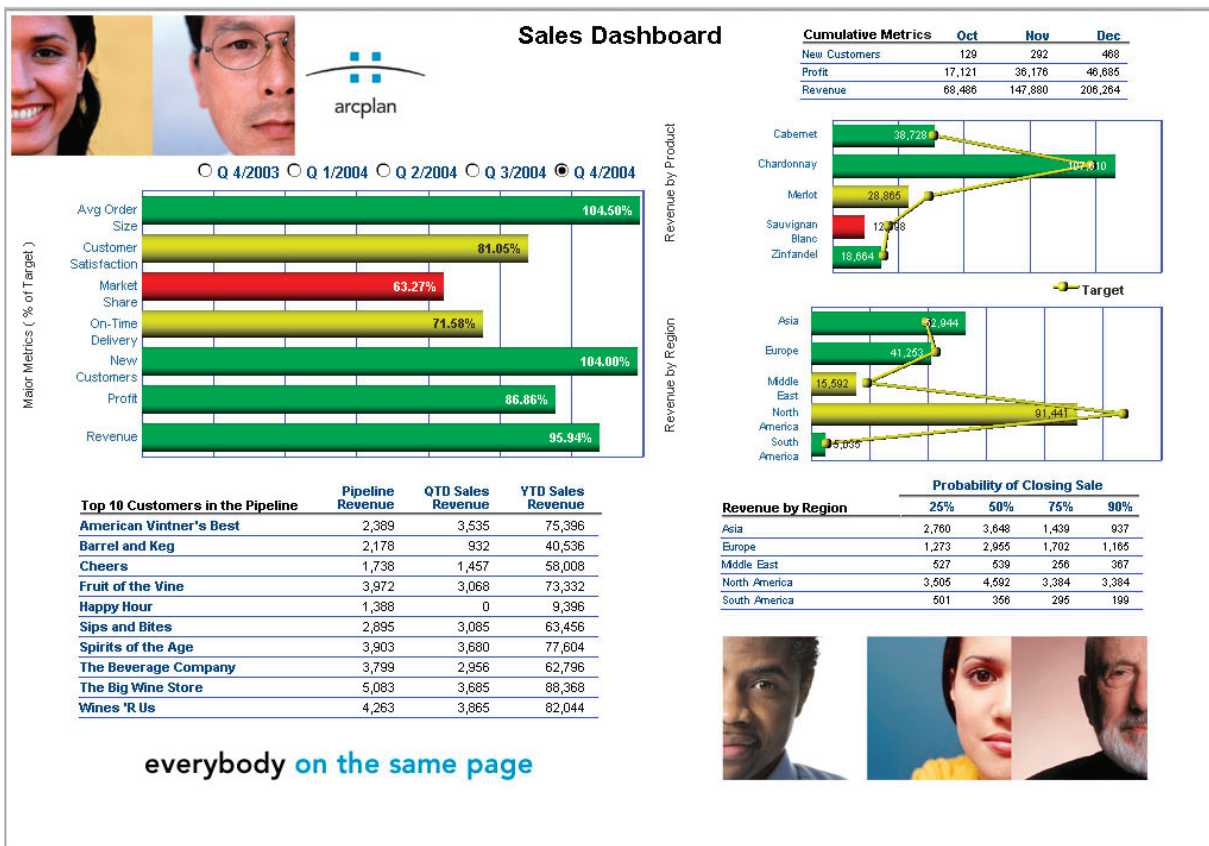
Placing a legend in the upper left corner of the dashboard—the most expensive real estate available—to explain what the colors green, orange, and red mean, gives this information prominence it doesn't deserve. Few people would need to read this legend more than once. Assuming that it must take up permanent residence on the dashboard, it would be better placed in less prominent location.

The relative prominence of screen space on a dashboard can be divided into quadrants, as shown in the following illustration. Whenever possible, place information that is considered most important in the upper left hand region and that which is least important in the lower right hand corner.



2. Positioning Content in Places that Fail to Support Its Use

Some pieces of information on a dashboard belong together because they are closely related in the minds of those who view them. Positioning these pieces of information apart from one another can cause confusion and make it hard to see related facts holistically. Others pieces of information belong close to one another because they need to be compared. Positioning them apart from one another complicates this process. The following example illustrates a simple, surprisingly common, but easily avoided example of this problem. Look at the two bar graphs on the right. Now look for their titles. They are located just to the right of the bar graph on the left, much closer to it than to the graphs that they describe. Don't force people to work this hard to associate items that belong together.



Sometimes the information on a dashboard is most useful when it is viewed in a particular sequence. For instance, a dashboard that is used to monitor processes that consist of sequential steps, usually presents what's going on most effectively when it is arranged in a way that encourages people to view information in that sequence. Even when the information does not correspond to a sequential process, some facts only make sense when others are known, so they should be arranged to support the construction of understanding, one building upon the other, in this sequence.

3. Including Items that Serve No Useful Purpose

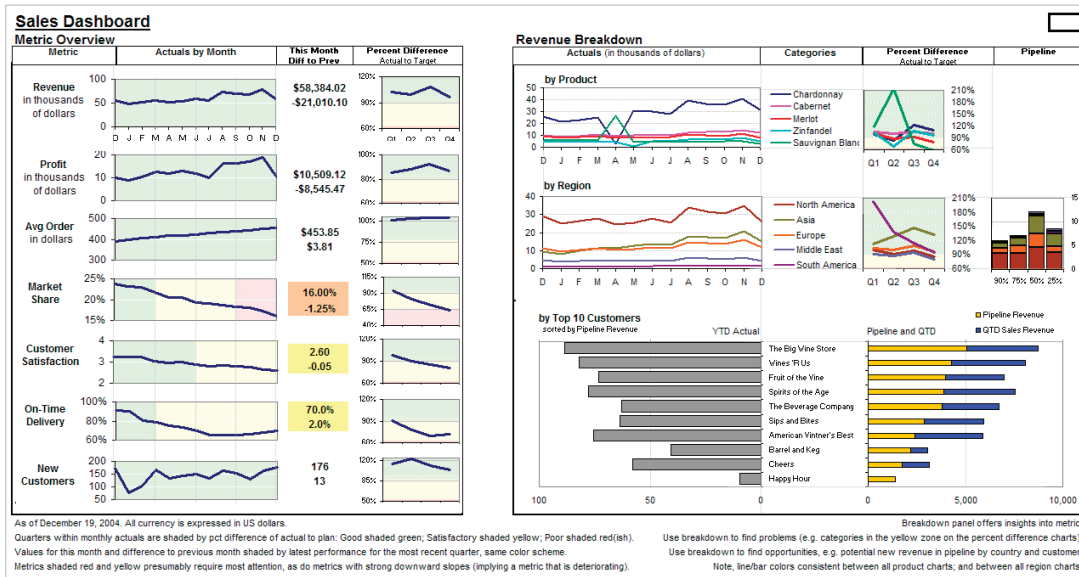
Dashboards are supposed to keep people informed about what's going on. Their purpose is not to entertain or to provide dashboard developers an opportunity to impress people with their wizardry or artistic talents. There is certainly nothing wrong in and of itself with a dashboard being enjoyable to use or beautiful to look at, but this goal should never override its ability to serve as an effective medium of communication. If the information displayed on a dashboard is important to the people who use it, more than anything else they want to acquire that information as quickly, clearly, and accurately as possible. Anything we include on a dashboard that doesn't serve this objective undermines it by wasting useful screen space and distracting from the information people rely on to do their jobs.

Take a look once again at the dashboard in the section above and notice how little actual information it contains compared to the available space, much of which was given to photos of strangers, the dashboard's title, and the cute phrase "everybody on the same page," which only a member of the marketing department could love.

Some of the frequent space wasters and eye distractors that I find on dashboards include:

The organization's logo, splashed boldly across the most prominent real estate on the screen	Assuming that the dashboard is used within an organization, do the people who use it need to be reminded that they work for Company X? When you run an internal meeting, do you spend the first few minutes telling people the name of the company for which they work? Not likely.
Decoration in the form of photographs, abstract art, background images, and so on	Art has its place, but not on a dashboard. Decoration that looks cute on day 1 becomes annoying by day 2, because it robs space from useful information.
Instructions or descriptions displayed as text, which are needed only the first time someone uses the dashboard and never again	Most dashboards are used by the same people day in and day out. If the dashboard is well designed, minimal instructions are needed on the first day to explain how to use it. Don't clutter the dashboard with text that explains something that must only be explained once and never again. Place instructions of this type in a Help document that can be easily accessed when it's needed, perhaps through a small help button located in some obscure corner of the dashboard.

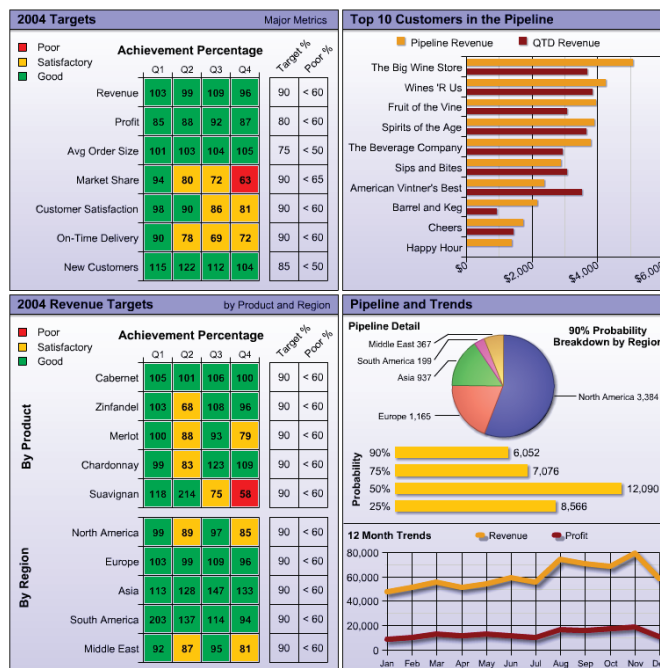
The dashboard below illustrates the last of the three types of unnecessary content mentioned above: instructions that are seldom needed.



As with all forms of communication, when people need information, it works best to tell them what they need—no more and no less.

4. Sizing Content Larger than It Deserves

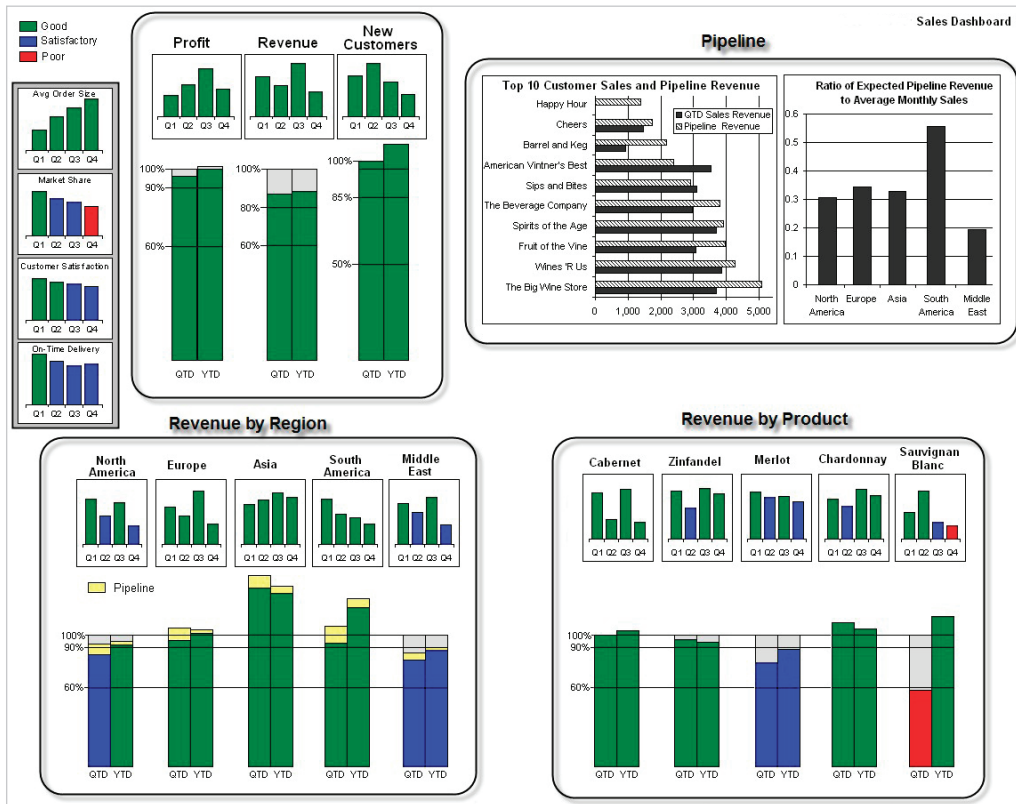
The size of something on a dashboard serves as a strong visual cue to its importance. If a particular section of information is relatively less important than others, try to give it less space. In the following example, the sales organization's seven key metrics occupy the upper left quadrant of the dashboard, which they rightly deserve, but the bar graph of the top customers, which is much less important, has been given the same amount of space.



Begin by sizing each section of content as needed to be easily seen. Then, when everything has been laid out on the dashboard, adjust the sizes of various sections to visually reinforce their relative importance.

5. Separating Content Excessively

Dashboards should be seen more as a whole than a collection of individual parts. People use dashboards to construct an overview in their heads—the big picture of what’s going on. We shouldn’t make this difficult by fragmenting the information into little independent pieces. Many dashboards fragment onto separate screens what ought to be shown together. Even information that all appears on a single screen is often visually segregated unnecessarily. This is commonly done using borders—often quite dark and heavy—drawn around each graph, each cell of a table, and so on. Notice the heavy-handed way the following dashboard has been separated into little groups.



Besides borders, another way that content is sometimes divided is by using different fill colors in the backgrounds of various sections. The following example illustrates this practice, which in this case is done to great and unpleasant visual excess.

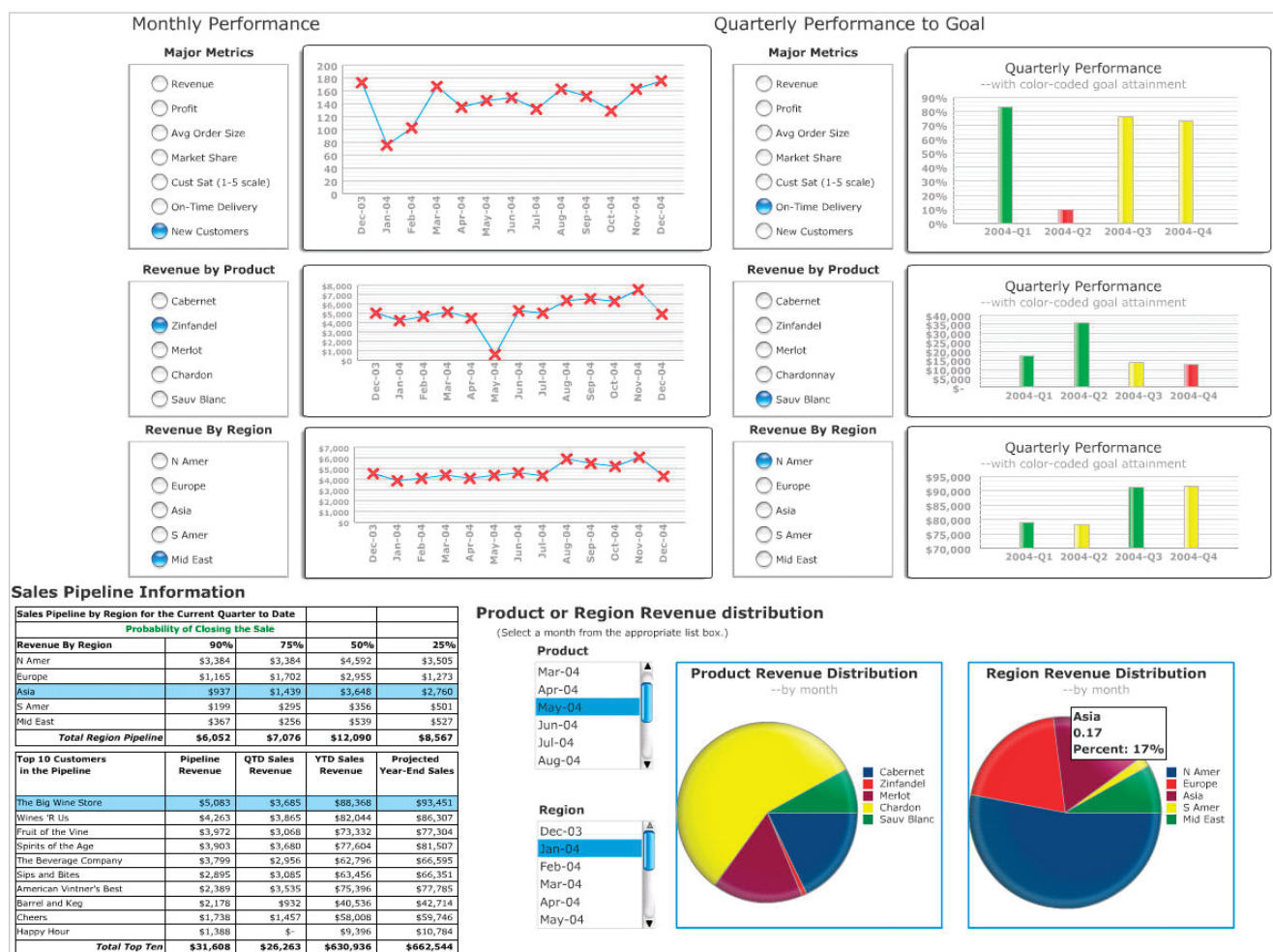


We should only separate sections of content into groups when doing so enforces a meaningful relationship that assists people's understanding, visually joining information that makes most sense when viewed together. When they're needed, apply visual separators such as borders or fill colors with a gentle hand, making them just visible enough to do the job and no more.

6. Visually Featuring Content and Other Items More than They Deserve

I previously mentioned how we should regulate the size of sections of information to suggest their relative importance, but visual attributes besides size can be also be used to achieve this effect. For instance, if we present most information using relatively soft and neutral colors, we could make particular sections stand out by using bright colors. We could also put a border around a particular section, because all forms of visual enclosure, borders especially, cause content to pop out, when used sparingly.

What I'm trying to say is that differences in the visual salience of items on a dashboard—anything visual that makes something stand out—should never be arbitrary. Don't highlight something that doesn't deserve a high level of attention. Notice, when looking at the following example, where your eyes are drawn.



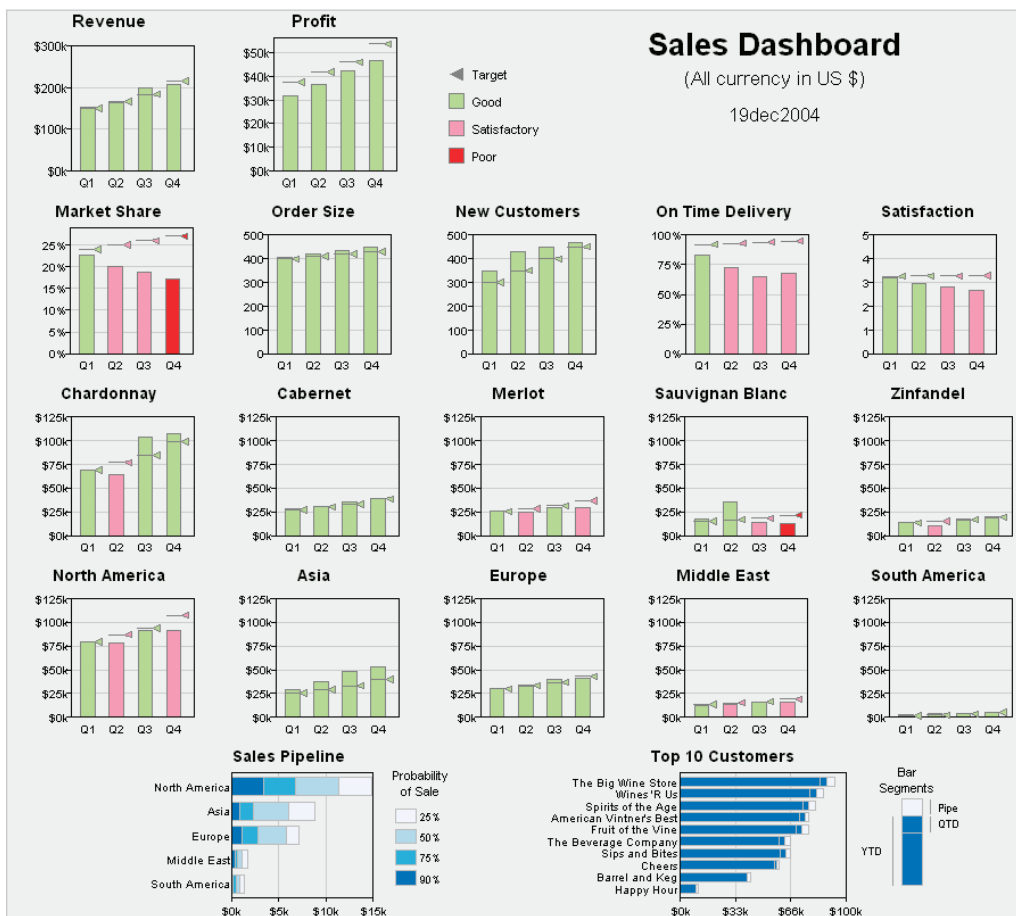
No care was taken to balance the salience of items on the dashboard such that what's most important stands out above the rest. Perhaps your eyes were drawn to the pie charts because they're so colorful. If so, that's unfortunate, because other information is more important. If you're like me, your eyes were powerfully drawn to the red X's in the three line graphs. The purpose of the X's is to mark the location of each value along the line—something that isn't even necessary to see the patterns of change through time, and definitely not something that deserves to be highlighted.

I frequently come across dashboards that display nearly everything in a visually salient manner. Bright colors, 3-D effects, dark borders, and other visual attributes are turned up to such a high level that my eyes can't decide where to look because everything competes for my attention. When everything is yelling, no voices stand out, and the result is noise that no one wants to hear.

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7. Failing to Link Content and Other Items that Are Related

We can't always place items next to one another that are related or ought to be compared. In such situations, however, we can make it easy for people to see these connections by visually linking the items, such as by using common colors or subtle borders. Despite the fact that much is done right in the following dashboard, most everything looks so much the same that items that ought to be grouped together are not linked in an obvious way.

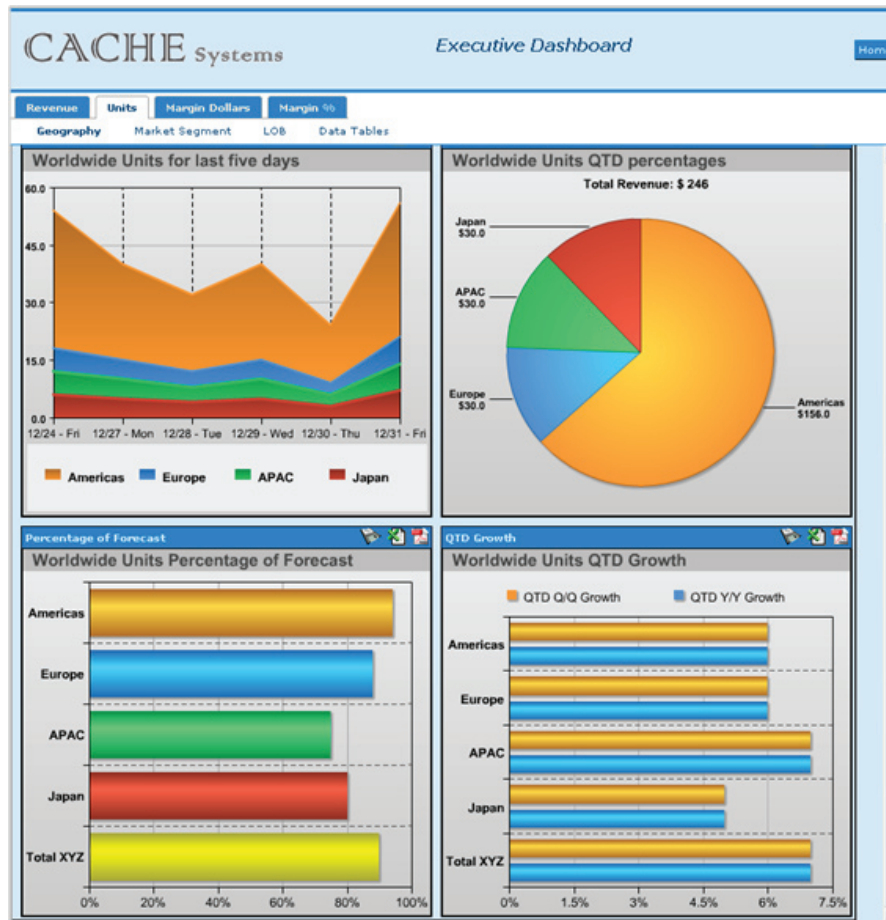


The top two rows of bar graphs display the key sales metrics, the third row the products, and the fourth row the regions. Especially because all of these bar graphs look so much alike, something is needed to delineate these three groups of objects. Something as simple as gray horizontal lines could have been use to make these groups clearly visible and enforce the connections between related items that help people isolate what they're examining from the rest when they wish.

As much as possible, whenever things share the same meaning or belong together in some way, make the relationship obvious by placing them together, enclosing them together, or giving them a similar appearance that is unique.

8. Suggesting Links between Content that Is Not Related

This problem is the flipside of the one above. When different items on a dashboard look alike in some way, people tend to see them as related. We should be careful not to suggest relationships that don't actually exist in the data. In the following example, notice the orange and blue colors that appear in all four graphs:



(Note: This is the one dashboard example, which I'm using to illustrate poor design practices, that was not submitted as part of the DM Review 2006 Data Visualization Competition. It was provided by Corda.)

The sameness of these colors suggests shared meaning. These two colors do in fact share the same meaning in three of the graphs—orange represents the Americas and blue represents Europe—but not in lower right-hand graph, where orange represents “QTD Q/Q Growth” and blue represents “QTD Y/Y Growth.” This problem could have been easily avoided by using different colors in the “Worldwide Units QTD Growth graph.”

We can't always assign a different color to everything on a dashboard that means something different, because doing so would often cause the dashboard to become colorful to a visually overwhelming degree. We can work around this problem, however, by using neutral colors, such as black and various shades of gray, when we don't want people to associate the same meanings with every instance of those colors. People tend to assign common meanings primarily to colors that stand out as distinct, which would not be the case with black and grays if they appear frequently throughout a dashboard.

9. Enforcing a Rigid Symmetrical Grid

In the context of layout, grids are often used to divide a page or screen into specific rectangular regions for specific purposes. Grids can be quite useful for creating consistency from page to page in a book or screen to screen in a computer application or website. While it is useful for most dashboards in an organization to be consistent in many aspects of their appearance (fonts, colors, the location of the Help button, the action

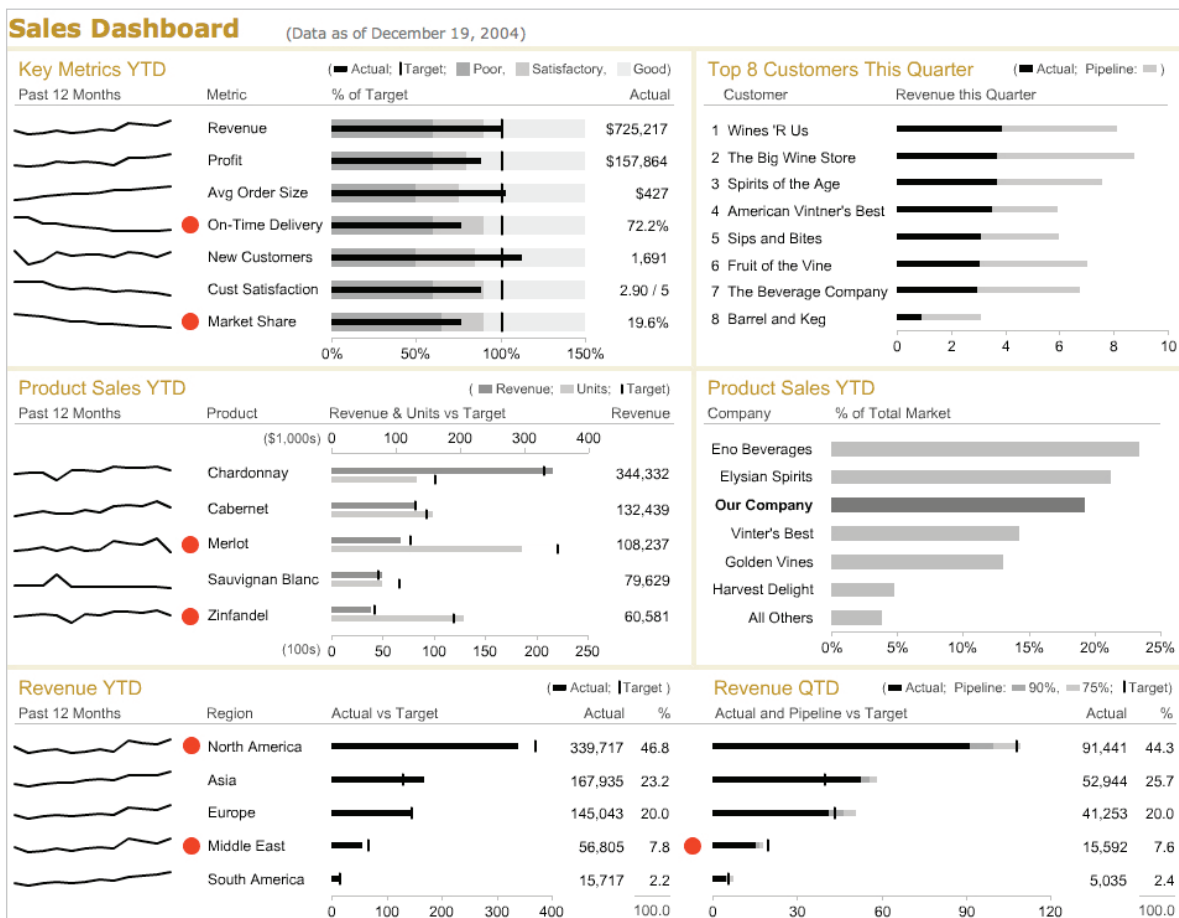
required to access details related to the high-level information that is on display, and so on), a dashboard's layout ought to be determined by the arrangement and sizing of objects that communicates the information best.

The dashboard in the section above exhibits the kind of rigid layout that is rarely useful. Everything is forced into quadrants of equal size. Many dashboard products force us to divide the screen into columns and rows of particular sizes, which cannot be altered. The result is a rigid grid into which every item must be placed, the boundaries of which they are never allowed to venture beyond. This doesn't allow the level of flexibility that is almost always required to ideally arrange the data. To design dashboards most effectively, we must be able to place and size items wherever and however needed for people to monitor it rapidly and meaningfully. Ralph Waldo Emerson wrote: "A foolish consistency is the hobgoblin of little minds." When designing dashboards, being forced into a rigid layout is a fine example of a consistency that is indeed foolish.

Alignment of items on a dashboard can be used to associate things with one another. Alignment and symmetry are pleasing to the eye. We find it annoying when things are positioned slightly out of alignment with one another when there is no reason that a nice clean line could not have been followed. Misalignment and asymmetry, on the other hand, can be intentionally used to discourage people from seeing things as connected, similar, or equal, when they in fact are not. The point is that positioning and sizing items on a dashboard should not be arbitrarily forced to conform to rigid standards nor should constancy, alignment, and symmetry be capriciously ignored. These layout and formatting choices should be intentional and meaningful.

The Results

If you avoid the dashboard formatting and layout problems that I've described and follow the steps that I've suggested to correct them, dashboards can tell their stories much more clearly, rapidly, and without distraction. This final sales dashboard example shows the same information that we've seen in several of the examples above, but in this case, formatting and layout were based on conscious choices to follow best practices of visual design.



Some of the graphical objects in this dashboard might not be familiar to you, but don't let this distract you from appreciating the quality of communication that has been achieved through thoughtful formatting and layout. Take the time to review the problems above that I've warned you to avoid and notice how big a difference it can make when you take my warning to heart.

By the way, the sales dashboard above appears in my book *Information Dashboard Design*, but the version shown here was not created by me. It was developed by the folks at Corda as a reproduction of my design to demonstrate that CenterView is capable of building well-designed dashboards that follow the principles that I teach.

About the Author

Stephen Few has worked for 25 years as an IT innovator, consultant, and teacher. Today, as Principal of the consultancy Perceptual Edge, Few focuses on data visualization for analyzing and communicating quantitative business information. He provides consulting and training services, writes the monthly *Visual Business Intelligence Newsletter*, speaks frequently at conferences, and teaches in the MBA program at the University of California, Berkeley. He is the author of two books: *Show Me the Numbers: Designing Tables and Graphs to Enlighten* and *Information Dashboard Design: The Effective Visual Communication of Data*.