



## Intelligent Dashboard Design

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This is the third in a series of columns that feature the winners of *DM Review's* 2005 data visualization competition. This column focuses on a scenario that required participants to design a sales dashboard. They were given the following instructions:

*You have been provided with the raw data from which the contents of a sales dashboard should be derived. The level of detail reflected in the data need not appear on the dashboard, but ought to be presented at a level that sales executives can use to monitor sales performance on a daily basis. As a dashboard, all of the information should fit on a single screen. Prominence should be given to the major metrics and attention should be drawn to any measures that indicate poor performance in relation to the targets. The dashboard should be designed in a way that allows sales executives to know at a glance any areas of sales—both problems and opportunities—that might require their attention.*

The raw data provided included the following:

- Sales revenue (by product and sales region)
- Sales revenue in the pipeline (expected revenue divided into categories of probability)
- Profit
- Average order size
- Customer satisfaction rating
- Top 10 customers
- Market share

Most of the measures were provided monthly for the past year, along with quarterly targets and defined ranges for good, satisfactory and poor performance.

Before introducing our winning entry, let me set the stage a bit. I have some very firm and passionate opinions about dashboard design. I have not yet seen a single example from a software vendor that I believe to be effectively designed. I've spent the last few months writing a book on dashboard design, so I've given it quite a bit of thought. Dashboards can serve as a powerful medium of communication, but the vendors have focused on cute display widgets rather than taking the time to determine the most effective means to display data on a dashboard. Designing dashboards is challenging. Because they usually display a great deal of information in a limited amount of space, they can easily become cluttered. Effective dashboards display the important data that someone must monitor to do a job in a way that can be read and understood quickly and easily.

Our winning solution was submitted by Robert Allison of SAS. Robert did an exceptional job of avoiding most of the visual design mistakes that are common in dashboards. Take some time to examine his dashboard in Figure 1 and appreciate his careful design decisions.

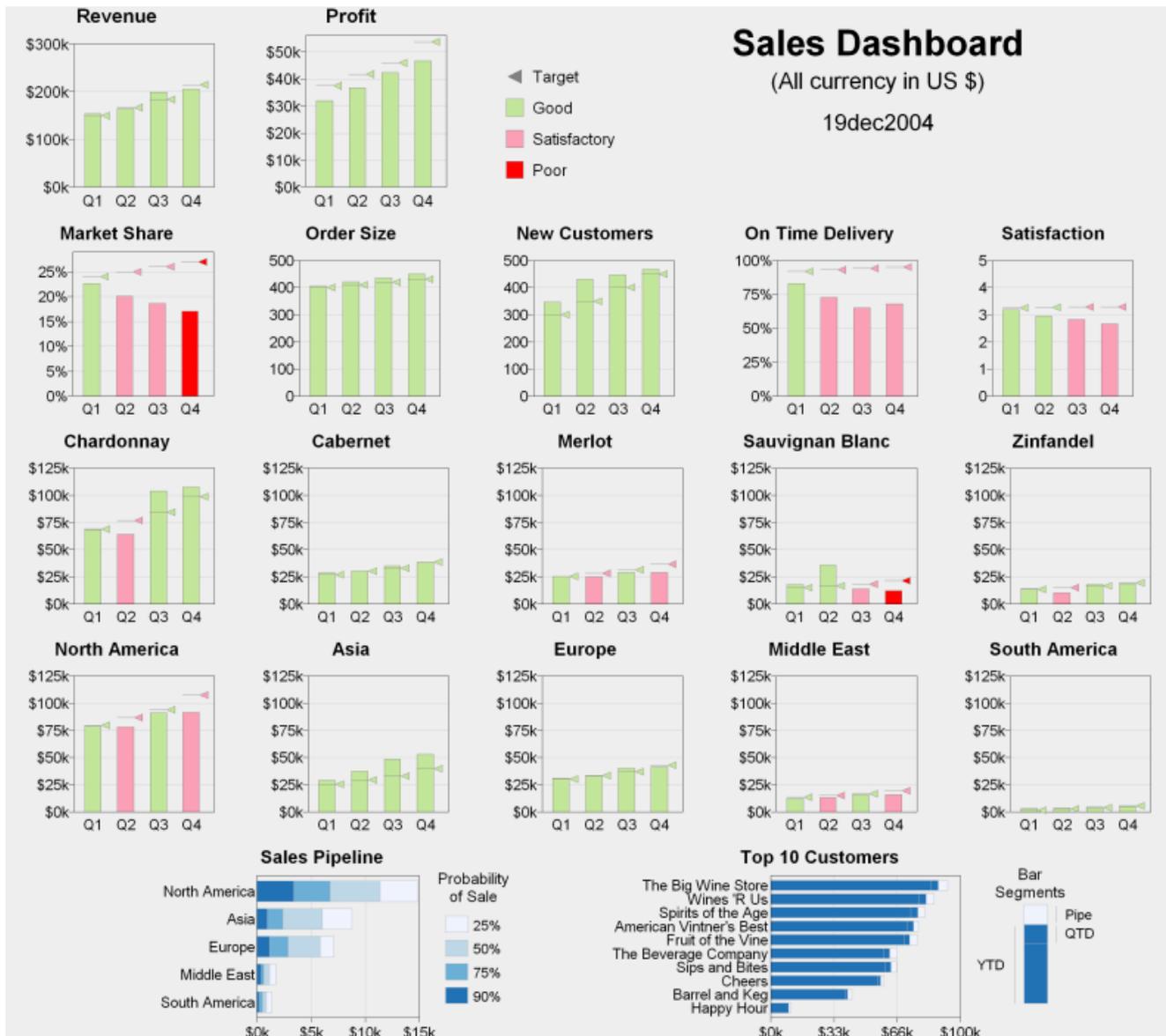


Figure 1: Winning sales dashboard submitted by Robert Allison of SAS.

Notice that this dashboard is not cluttered, even though it is rich in information. Robert resisted the temptation to oversimplify the dashboard by breaking it up into multiple screens. Separating the products, regions or quarters onto different screens would eliminate the means to compare them, which is an essential step in monitoring sales. Notice also that the arrangement of data on the dashboard is not arbitrary. Groups of related data have been placed together, and the key measures have been placed in the prime real estate on the upper left.

Whenever you display data visually, as in a graph, you must be careful to minimize visual content that doesn't represent actual data. Unless non-data content supports the data in some essential way, it is nothing more than material that viewers must scan without reward.

Especially on a dashboard where a great deal of data must be communicated in an instant, there is no room for meaningless visual content. Robert has accomplished this nicely. You'll find no mere decoration anywhere on the screen. Also, your eyes are not assaulted by a variety of bright colors. Only a single hue stands out as intense, and that is the bright red, which is intentionally bright to draw attention to critical areas of concern. If you wish to quickly find all areas of concern, you only need to scan for the one color—red—and you can easily distinguish the critical from the less severe conditions.

A problem that I often find on dashboards is senseless variety in the choice of display mechanisms. When deciding how to best display each section of data, you should ask, "Which means of display will communicate this data most effectively and efficiently?" Many dashboards look as if the designer instead asked, "Which type of display have I not already used on this dashboard?" and then selected something new for the sake of variety. The dashboard in Figure 1, however, uses the same simple bar graphs repeatedly because they work. The fact that they function and look the same in every case means that the viewer can use the same method of interpretation throughout, thus speeding perception. Notice also how the graphs that compare sales by product and those that compare sales by region use the same exact quantitative scale. This was intentional, because any adjustment in the scale from graph to graph would make them difficult to compare.

Stacked bar graphs are often misused, but the two examples at the bottom of this dashboard do the job nicely. Sales executives viewing this dashboard would primarily want to get a sense of the overall sales pipeline and would only secondarily want a sense of how the pipeline is divided into different estimates of probability. The part of the pipeline that is most reliable—the 90% probability section—has been placed at the beginning of each bar, which makes it the easiest to interpret in relation to the quantitative scale. The stacked bars in the Top 10 Customers graph work similarly. In both of these graphs, the choice of horizontal rather than vertical bars made it easy to include the long labels without resorting to the use of vertically oriented text, which is difficult to read.

Robert did excellent work. I would like to round out this review, however, with a few suggestions for how his dashboard might be made even better:

- Given the purpose of a dashboard to monitor some aspect of the business, current data is usually of greater interest than historical data. It is often quite useful to display some history as meaningful context for the current measures, but the current measures ought to stand out more prominently than the history. The graphs that include historical context in this dashboard, however, give the same visual weight to the current quarter and past quarters.
- Coloring the bars as green (good), light red (satisfactory) and dark red (poor) reveals the status of each measure, but not the degree to which it falls within that range. For example, we can tell that quarter 4 profits are good, but not how close they are to being merely satisfactory.
- This dashboard is visually fairly clean, but distractions from the data could be further reduced by removing the grid lines in the graphs altogether, and by removing the triangles connected to the target lines and adding a bit more visual weight to these lines so they stand out clearly on their own.
- The visual mechanisms of display that dominate this dashboard allow viewers to quickly scan for problems and compare performance to targets, but a sales executive

would probably also want to see some of the measures expressed more precisely as text, such as year-to-date and current quarter revenues and profits.

- The consistency of the graphs—where appropriate—could have been perfected by always left-justifying or centering the titles, by including the top value on the quantitative scale in the profit and market share graphs, and by adding dollar signs to the quantitative scale on the order size graph.

As you can see, designing a dashboard can be challenging, but the principles can definitely be learned. I'm glad that folks such as Robert Allison are taking time to think through the issues.

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## About the Author

Stephen Few has worked for over 20 years as an IT innovator, consultant, and teacher. Today, as Principal of the consultancy Perceptual Edge, Stephen focuses on data visualization for analyzing and communicating quantitative business information. He provides training and consulting 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*. You can learn more about Stephen's work and access an entire library of articles at [www.perceptualedge.com](http://www.perceptualedge.com). Between articles, you can read Stephen's thoughts on the industry in his blog.