

Pervasive Hurdles to Effective Dashboard Design

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Most dashboard software cannot produce dashboards that demonstrate the effective visual design standards that I advocate. These products usually fail due to one or more of the following three problems:

1. Important dashboard display media (display widgets) are not provided
2. Display media are poorly designed for dashboard communication
3. Display media cannot be positioned on the dashboard and sized as needed

I believe that it is accurate to say, in fact, that most dashboard software still suffers from all three of these problems. Some vendors are currently only rushing to address is the first of these three problems by adding display media that are particularly useful for dashboard communication. This effort, however, is usually restricted to the most obvious omissions, such as sparklines and bullet graphs, rather than stepping back and thoughtfully asking what new display media or alterations to existing media would improve dashboards.

Few vendors have taken the time to address the second and third problems. They churn out new meters and gauges like they're candy (and most of them are), but they rarely take the time to design the visual appearance and functionality of these display media in a way that produces the clearest, richest, and most efficient communication possible. Most dashboard products also remain locked into a rigid layout structure that prevents the flexible placement and sizing of items (charts, text, icons, etc.) that is required to produce a dense information display that can be rapidly monitored.

Allow me to more precisely explain the nature of each of these problems.

Missing Dashboard Display Media

Dashboards are used to rapidly monitor what's going on. Displays that are used for rapid monitoring must be designed in particular ways, which differ from the design requirements of other forms of information display, such as PowerPoint presentations and printed reports. For instance, dashboard display media must present measures of what's going on, usually in the context of some comparison, such as a target, to express performance, and do so in a way that can be perceived and understood at a glance, even when surrounded by a dense array of other information.

This usually requires graphical media, which must often be displayed in a small amount of space. Many of the graphs that we have used for years work quite well on dashboards, including bar and line graphs, but there is a need for new display media as well. Edward

Tufte's sparklines and my bullet graphs are two such media, but are certainly not the only possible candidates. The problem is, most dashboard vendors still haven't picked the low-hanging fruit—sparklines and bullet graphs—let alone taken the time to consider what else might be useful. Vendors have the opportunity to pay attention to how their customers are using their products and to recognize when information cannot be displayed with any of the existing media that they offer.

Poorly Designed Display Media

Most dashboard software features display media that “look marvelous” but communicate poorly. If vendors invested as much time in designing display media that actually work as they invest in designing cute photo-realistic widgets that look like thermometers or automobile dashboard gauges, they would have much more to offer. They need to slow down and take the time needed to consider how dashboard display media are used and to test their effectiveness. No value is gained by making dashboard display media look like something that they are not, especially when the result is cluttered with visual decoration that distracts from the data. If the information that people need is obscured by visual fluff, the dashboard fails.

Look at this dashboard by Axiom Systems:

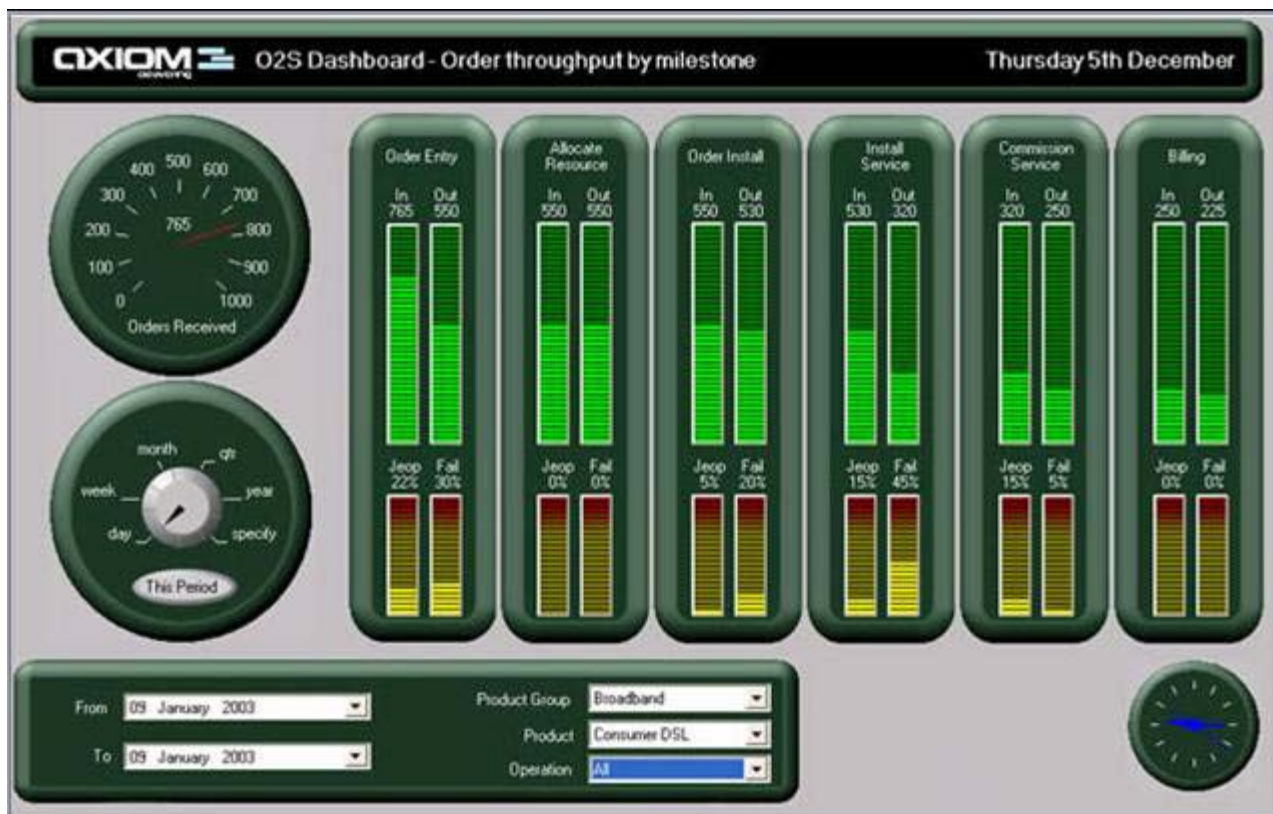


Figure 1: A dashboard for monitoring orders, designed by Axiom Systems.

Enormous effort was dedicated to the creation of display widgets that look like controls that you might find on an old electronic control board, such as one for mixing sound. Most of the measures were designed to look like LED (light-emitting diode) meters, with tall stacks of green, yellow, or red light horizontal bands of light set in a framework of burnished metal. Old

audio mixers used LED meters because that was the state of the art, the best that technology could offer at the time, but a computer screen is capable of displays that are light years beyond and much easier to read than LED meters.

Look at this pie chart that was created for a dashboard using Business Objects' product Crystal Xcelsius. Notice how the simulated reflection of light on the surface of the pie changes the colors, making it impossible to determine which slice corresponds to which item in the legend. If you don't believe me, give it a try.

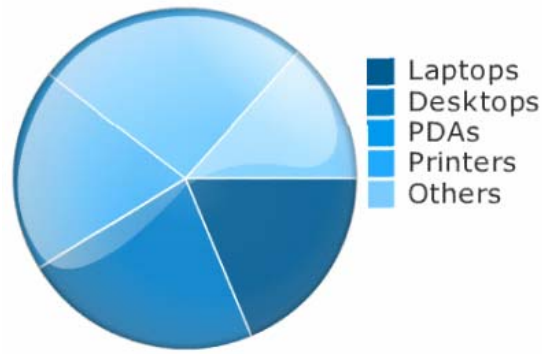


Figure 2: The lighting effects that are built into this display widget undermine its effectiveness.

When light reflects off the shiny surface of an object in the real world, making it hard to see and painful to look at, we find it annoying. Why would we ever want to duplicate this effect on a dashboard? Yet a great deal of effort went into making this effect available in Crystal Xcelsius.

I've also found that many dashboard display media are much too rigid in design, including elements that tailor them for specific types of information and interaction, which cannot be turned off. For instance, consider a line graph that adds to what's usual the following set of attributes:

- A slider control that allows you to move forward or backward through time such that only a portion of the full set of data is visible at any particular moment
- A print button that causes the line graph to be printed
- An expand button that causes the line graph to open in a separate window as a larger version of the same graph
- Large data points to mark each value along each line
- A drop-down listbox that contains the items of a categorical variable, such as regions, which is used to filter the data based on the item that is selected

Assuming that the graph is well designed, this set of controls and attributes might work perfectly well for a particular set of circumstances that match its features, but what if you don't want the slider control or the print button or one of the other features, yet there is no way to turn them off? I've seen huge (and I mean huge!) libraries of dashboard display widgets that are nothing more than slightly different, specialized variations of normal bar graphs, line graphs, and so on, which cannot be altered in any way. Developers are forced to find the one widget that does what's needed for a particular piece of information, trudging through an extensive library searching for it, often resulting in the frustrating conclusion that what's needed isn't available, and the widget that would do the job if only one or two items

could be turned off or slightly altered allows none of the necessary changes. Only a few well-designed display media, each endowed with useful features and functions (which can be turned on or off), along with visual attributes that can easily be altered, would provide a much more powerful and effective library of display media than the huge and confusing libraries that vendors promote with such pride.

Inflexible Layout

One of the greatest challenges of dashboard design involves displaying a large amount of information in a small amount of space without creating a cluttered mess. To work, dashboard content must be organized in a way that reflects the nature of the information and that supports efficient and meaningful monitoring. Information cannot be placed just anywhere on the dashboard, nor can sections of the display be sized simply to fit the available space. Items that relate to one another should usually be positioned close to one another. Important items should often appear larger, thus more visually prominent, than less important items. Items that ought to be scanned in a particular order ought to be arranged in a manner that supports that sequence of visual attention. In other words, you usually need a great deal of flexibility in where items are placed and sized to design an effective dashboard.

Unfortunately, I've found that most dashboard products restrict layout to a grid arrangement. Some are extremely restrictive, requiring a symmetrical arrangement of panels, such as the four panel arrangement in Figure 3. (Note: Corda Technologies' CenterView software does not restrict layout to the rigid grid that you see in this old example.)

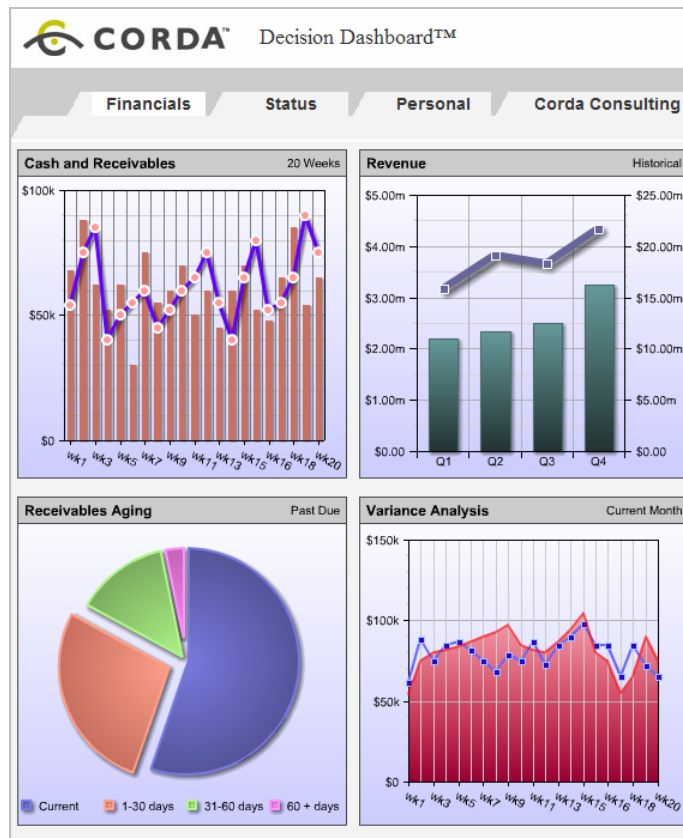


Figure 3: This dashboard was designed to fit into a rigid grid of four symmetrical panels using software by Corda Technologies.

Even when the grid supports more panels, such as shown in Figure 4, it still doesn't afford the flexibility that is often necessary avoid compromises in design that undermine effectiveness.

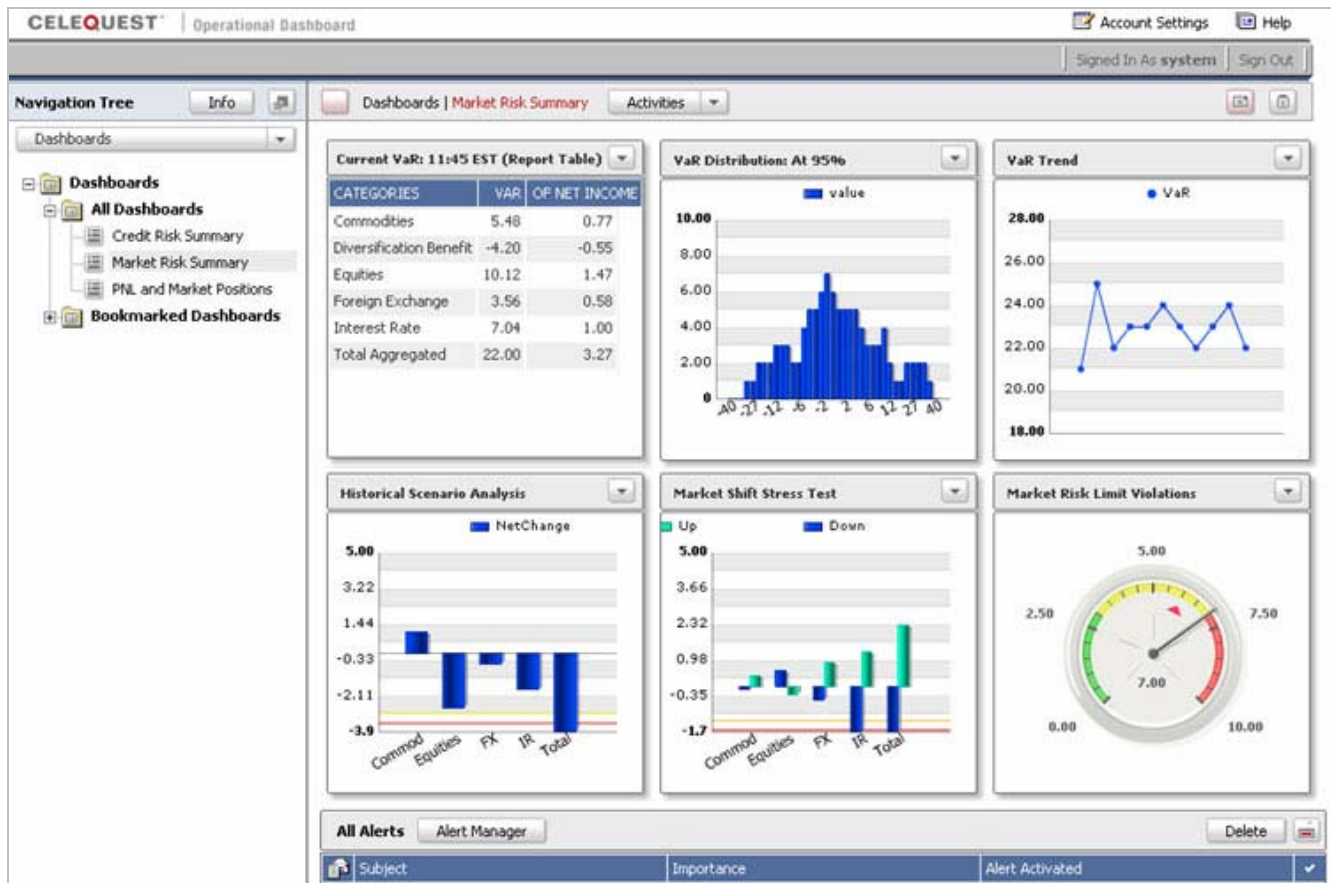


Figure 4: The dashboard by Celequest also appears to conform to a grid layout, which in this case is more complex than the layout of Figure #3, but nevertheless still too restrictive for effective dashboard design.

Many dashboard vendors promote a self-serve approach to dashboard design, advertising the ease with which business people can throw together their own dashboards. Using a rigid grid system of layout does make it easier for people who lack design skills to place a few display widgets on the screen. Unfortunately, while this approach may be appropriate for portals, which serve as conduits to information and tasks, and require less design expertise to serve their purpose, a dashboard, which is used to monitor what's going on, does require design expertise to work effectively. I suspect the reason that most dashboard products use the rigid grid layout, however, has less to do with the self-serve model and more to do with the fact that it is much easier to provide grid layout functionality than the flexible layout functionality that is needed. The TeleSales Dashboard example in Figure 5 from my book *Information Dashboard Design* would be difficult to reproduce with most dashboard products, despite its simplicity, because its layout doesn't fit into a rigid grid.

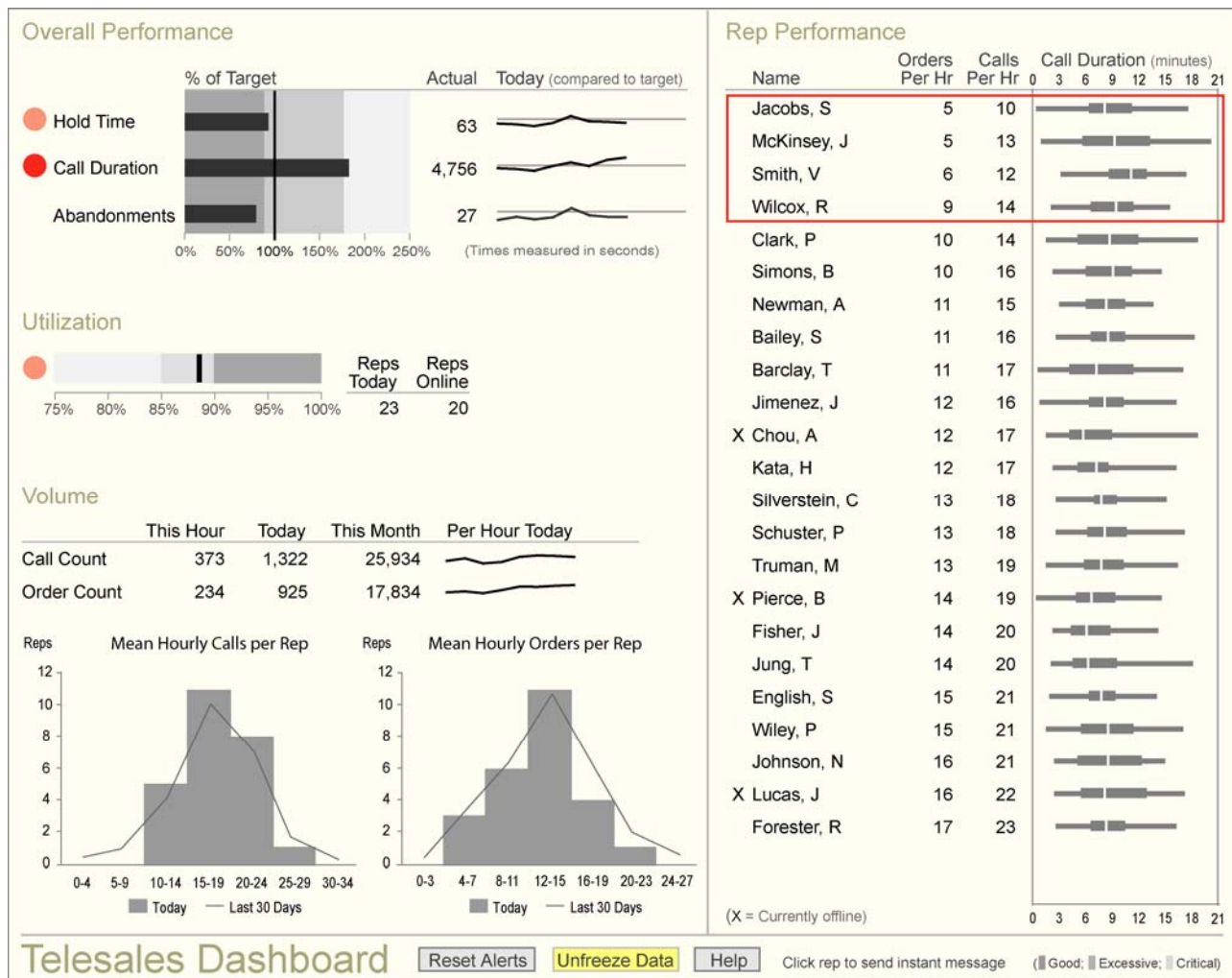


Figure 5: This dashboard, which I created for my book *Information Dashboard Design*, was not restricted by a rigid grid, which allowed me to position and size items as necessary to best arrange the information.

Surprisingly, it is actually possible to achieve the layout flexibility that I'm advocating with Microsoft Excel, a product that we think of as being quite rigid with its tabular layout model, if you happen to know some of the tricks that lie under the covers. Charley Kyd's book *Dashboard Reporting with Excel* is a good source for learning the dashboard design tricks that can turn Excel into a viable dashboard platform. Add to this the sparklines and bullet graphs that are provided by Excel add-in products such as [MicroCharts](#) from BonaVista Systems, and Excel can be used to create dashboard designs that would be impossible with most dashboard products. I'm not saying that Excel is an ideal platform for dashboards. It certainly doesn't provide all of the functionality that a good dashboard product ought to include (for example, great data connectivity), but it is a good alternative for now to many of the dashboard products that work poorly, despite their high price tags.

It is probably only a matter of time before many of the dedicated dashboard products bridge the gap that currently exists between what's needed and what they can do. In the meantime, I'll keep on preaching the same message to the vendors: take the time to understand what's needed and give us products that really work.

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. Between articles, you can read Stephen's thoughts on the industry in his [blog](#).