

Rich Data, Poor Data Designing Dashboards to Inform

by Stephen Few

A note about the author

Stephen Few has worked for 24 years as an IT innovator, consultant, and educator. Today, as Principal of the consultancy Perceptual Edge, Stephen focuses on data visualization for analyzing and communicating quantitative business information. He provides consulting and training services, writes the monthly data visualization column for the Business Intelligence Network, speaks frequently at conferences like TDWI and DAMA, and teaches in the MBA program at the University of California in Berkeley. He is the author of two books: *Show Me the Numbers: Designing Tables and Graphs to Enlighten* and a new book entitled *Information Dashboard Design: The Effective Visual Communication of Data*.



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The Problem with Dashboards Today

The main problem that plagues dashboards today is that they don't say enough and what they do say they don't say very well. In other words, they are not very informative. When designed properly, a dashboard provides an overview of what's going on, clearly and rapidly. To do its job, a dashboard must not only present the right measures of what's going on, it must also:

- put those measures into context by including meaningful comparisons,
- display them with timely, correct and reliable data,
- express them in a manner that directly assesses performance, and
- display them in a way that communicates clearly, accurately, and rapidly within the confines of a single screen.

Dashboards aren't for show. No amount of cuteness and technical wizardry can substitute for clear communication. This paper presents the design practices you cannot ignore if you wish to build dashboards to support monitoring that sets the stage for an informed response.

The Essentials of Business Intelligence

Sadly, not all aspects of business intelligence (BI) have been equally or adequately addressed by most software vendors. While focusing on technology—those aspects that excite engineers—little attention has been given to the actual businesspeople who use the technology; neither their goals nor their abilities. Business intelligence has made great progress in handling large volumes of data and high-speed access, but relatively little in helping people make sense of the information or communicate its meaning to others. The biggest and fastest data warehouse in the world is worthless if this final, most important step in the process fails.

To deliver on its promise to enable smart decisions, business intelligence must embody every one of the following essentials:

1. Good information (relevant, clean, accurate, comprehensive, and clear)
2. Secure information (protected from corruption and from access by those who aren't authorized)
3. Accessible information (available to those who need it, when they need it, and as fast as they need it)
4. Analytically structured information (organized in a way that supports exploration and analysis)
5. Smart tools for interacting with the information (for uncovering what's meaningful and make sense of it)
6. Effectively presented information (clearly and meaningfully communicated to decision makers)

This list might not be complete, but I know from experience that every one of these qualities is essential. Business intelligence that fails to support any one of these essentials falls short of providing real solutions. Efforts that get everything right but the last two items in the above list—the only essentials that deliver value directly—are as useful as a car with opaque windows. Sitting in the driver's seat of a muscle car without a view of the road is a recipe for disaster and a shameful waste of time and technology. I'm encouraged by the efforts of software companies, such as Noetix, that have done a great job of addressing the first four essentials in the above list, especially easy access to useful information, and are now turning their attention to effective data analysis and presentation as well.

The insights that are sought through business intelligence are not products of technology; they are products of the human brain. Computers don't think—people do. Technology does its job when it supports human intelligence, doing what computers do well (fast and accurate calculations, time-consuming procedural tasks) to augment what we do well (detecting patterns, making connections, and recognizing implications). More specifically, business intelligence technology must be designed to help us *see* what is meaningful in information and help us *think* about it without distraction in pursuit of understanding and eventually smart decisions. Business intelligence must interact with our *eyes* and our *minds*. To do this successfully, the design of business intelligence technology must be firmly rooted in an understanding of visual perception and cognition.

The Role of Dashboards in Business Intelligence

Despite the excitement about dashboards that has arisen in recent years, what they do is not new. The term *dashboard* is relatively new, but its role has been served by technology in various ways under various names for many years. Even long before the term *business intelligence* was coined by Gartner in the 1990s, people concerned with the analysis and communication of business information experimented with various methods of doing what dashboards strive to do today. Here's my definition of a dashboard, which first appeared in the article "Dashboard Confusion" (*Intelligent Enterprise*, March 29, 2004):

A dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance.

In the early 1980s, attempts to do this focused on the needs of senior managers, and were called *executive information systems* (EIS). No matter what you call it, a need existed then, exists today, and will continue to exist in the future, to present information in a way that allows people to *monitor* what's going on pertinent to their areas of responsibility. The most important defining characteristic of a dashboard, when compared to other means of presenting information, is that it is used for *monitoring*. Depending on your job, you might need to monitor strategic information daily (for example, an executive watching the organization as a whole or a line manager watching the work of a single department) or operational information that changes from moment to moment (for example, a manufacturing floor or a telesales department). It isn't the frequency of updates to the information that determines whether you need a dashboard versus some other medium of presentation, nor is it the nature of your work, be it strategic, tactical, or whatever—it is the purpose of monitoring that differentiates the dashboard. To monitor what's going on effectively, information must be displayed in particular ways. When designed correctly, dashboards produce what Joseph Berkson once called "interocular traumatic impact": a conclusion that hits you between the eyes. When poorly designed, people cannot use the dashboard to maintain awareness of what's going on (*situation awareness*) and will soon stop using it altogether.

Information Designs for Monitoring

Presenting information to tell a story, to inform, to teach, or for analysis, each require a design that is different from those used for monitoring. The task of monitoring requires immediate comprehension, often of a large body of data. In contrast, during the task of analysis, people study data to unveil its meanings, taking their time to peel back the layers, asking a series of questions that emerge from one another in a sequence of connections in pursuit of insight. Combining a set of tables and graphs on a single screen to support analysis must be designed to support interaction with the information, such as filtering, and the ability to quickly change the display in various ways (such as changing graph types) to uncover its meaning. While this is extremely useful and important, this type of display is not a dashboard. Dashboards must be designed to support monitoring, which requires particular characteristics.

To enable effective monitoring, dashboards must be designed to support the following sequence of activities:

1. Begin by presenting a consolidated overview that can be quickly scanned to see what's going on at a high level and to rapidly identify any items that need attention
2. Provide enough information when particular items demand attention to help the person viewing it determine if further investigation and potential action is required
3. Provide the means to quickly access additional information about those items that need further investigation to determine if action is required and what action to take.

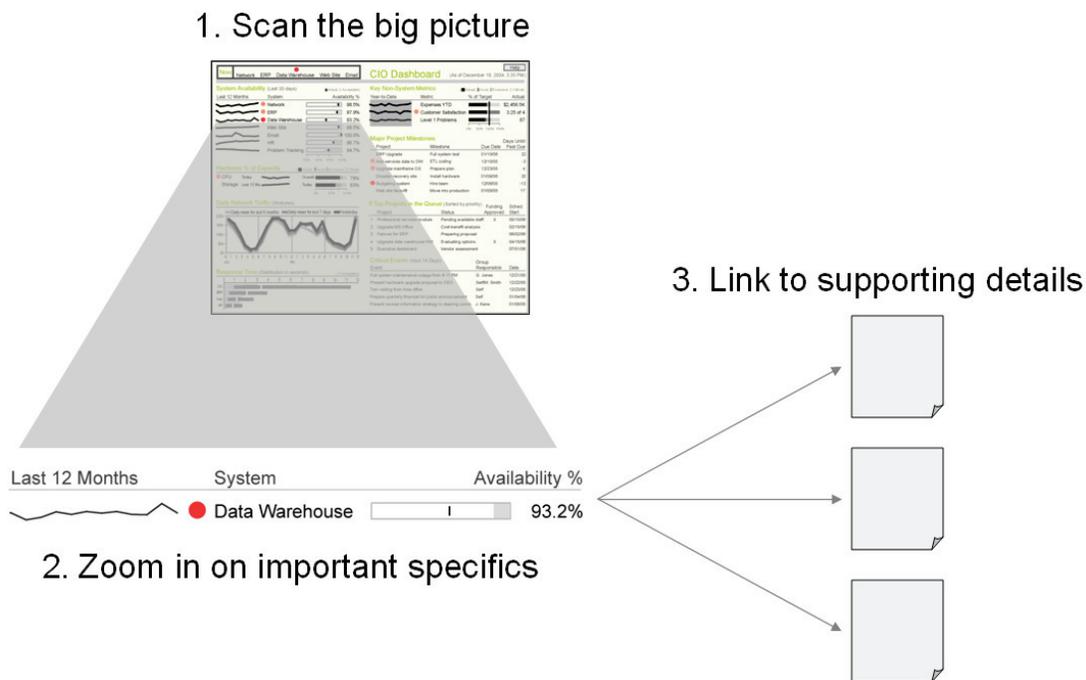


Figure 1: The stages of dashboard monitoring.

Given these goals, the information must be presented on a single screen (not including the supporting details that can be accessed from the dashboard). The big picture one needs to monitor what's going on will never be seen if the information is spread across multiple screens or can only be seen by scrolling up and down or back and forth. Short-term memory is limited to no more than about eight chunks of information at a time, so the display should be designed to augment memory by presenting as much as possible within eye span, thus reducing one's need to rely on memory. This is an example of what I mean by using technology to support human intelligence, which in this case involves the augmentation of our limited memory.

Monitoring is a cognitive activity that receives input primarily through the visual channel—our most powerful sense capable of working at high speeds of parallel input and able to detect subtle distinctions and complex patterns. It is sometimes appropriate to use auditory signals to get people's attention when they aren't looking at the screen, but we must take advantage of their eyes to perceive the rest.

A dashboard communicates information about a domain of knowledge that is already familiar to the person who views it. This person is usually an expert in the domain. As such, this person has built an internal mental model of the domain, a way of organizing and thinking about the domain to make sense of it and to track changes in what's going on. A dashboard is only as effective as its ability to display information in a way that fits this internal model. The more you know about how people understand and organize their knowledge of a domain and the way it is represented in their minds, the more you will know how to design a dashboard that can be used to plug changing information into this mental model. A display that doesn't fit this model requires people to laboriously examine the pieces individually and then plug into the model over a period of time. This can fragment the process, making it difficult or impossible to fully update the model. These internal models consist of particular items and relationships between those items. Given the visual nature of dashboard displays, it is often useful to get those who will use the dashboard to draw pictures to illustrate how they think about and organize the domain. This will help them to externalize the model and will give you direct hints for how the information should be presented. The better the match between the dashboard presentation and the internal model, the faster, more accurate, and more comprehensible the monitoring update that results.

Rich Information Displays

The task of monitoring what's going on in the domain mostly involves information about performance, measures of how well something is doing. Consequently, dashboard information (with some exceptions) consists mostly of quantitative measures. Numbers that measure what's going on all by themselves, however, are not enough. For instance, a quarter-to-date sales revenue of \$1,347,384 on a sales dashboard is not very useful in and of itself. To monitor performance, measures must be presented with enough context for people to determine how well things are going.

Many dashboards—perhaps most—are data poor. They report numbers, but don't express them meaningfully enough for people to gain the level of understanding needed to respond appropriately. To be effective, dashboards must be data rich. This is achieved by comparing measures of what's going on to related measures (for example, a target, a standard, or a norm) to assess performance. When monitoring what's going on, people usually need answers to these questions:

- Are we doing well or poorly?
- How well or how poorly?
- What has led to what's happening today?

To answer these questions, the context that is required consists of one or more *comparisons*. There's an old joke that goes something like this: During a therapy session, the therapist asks his female patient, "How are things between you and your husband?" to which she responds, "Compared to what?" Alright, this isn't all that funny, but it makes an important point: when assessing something, such as the quality of one's marriage or the health of your business, comparisons must be made. Sales revenue for the last quarter totaling \$1,347,384 would be phenomenal for some companies but the sign of impending bankruptcy for others. Only a comparison can reveal the distinction. Compared to a quarterly revenue target of \$1,000,000, you did well, but a target of \$2,000,000 would tell a different story.

Targets (for example, the sales revenue plan) are often the preferred comparator, but other comparisons are also useful for monitoring performance. Here’s a list of several comparisons that are commonly useful in business:

Compared to	Example
Plan (or budget)	Actual expenses compared to the expense budget
Forecast	Actual sales compared to the sales forecast
Standard	Number of manufacturing defects compared to a defined standard
Norm	Number of abandoned calls compared to the average number of abandoned calls
The past	Headcount today compared to headcount a month ago or a year ago
Other members of the same category	Average time to ship orders from warehouse A compared to warehouse B
Competitors	Your company’s share of the market compared to your competitors’ shares
Consecutive intervals of time in the past	Last month’s profits compared to profits in each of the preceding 12 months

The last of these comparisons—consecutive intervals of time in the past—reveals a special kind of context called a *historical trend*. Knowing what preceded what’s happening today is often required to assess performance and is certainly needed to predict what will likely happen in the future.

While defining the requirements of a dashboard, you must not only determine the measures that are needed to monitor performance, but the comparisons that are needed to make them meaningful. Sometimes, more than one comparison is required to assess the performance of a particular measure, but resist the temptation to say too much on the dashboard. Remember, the dashboard doesn’t tell the entire story, it only reports what’s needed to monitor what’s currently going on at a high level. There is a fine line between giving people enough context to make the information meaningful and giving them too much to absorb and make sense of at a glance. Usually, it is best to choose the one best comparison (excluding trend information, which should always be included when it’s useful) for each measure to keep things simple; two comparisons at most.

Direct Expressions of Performance

Successful dashboards don’t only display the right information, they also present each item in the way that most directly expresses performance. In the section above, I talked about the power of comparisons to communicate performance in a meaningful way. In many cases, rather than giving people the individual numbers needed to determine performance, such as sales revenue and sales plan, you can more directly and efficiently serve their needs by using measures that are comparative by their very nature. Look at the two presentations of sales performance for five products in Figure 2. The one on the top expresses actual and planned revenues as separate bars that must be compared, but the one on the bottom more directly expresses revenue performance as variances to the plan, and as a percentage variance, which makes it much easier to compare the performance of the various products, even when their revenues differ significantly.

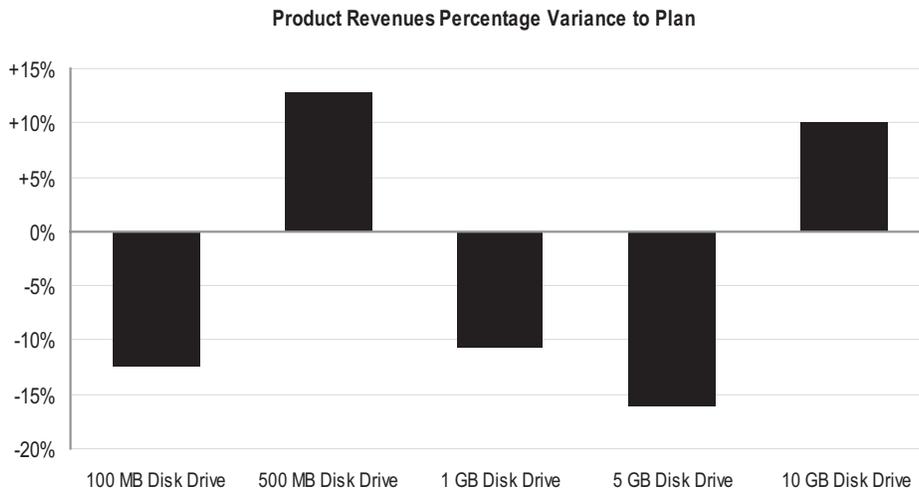
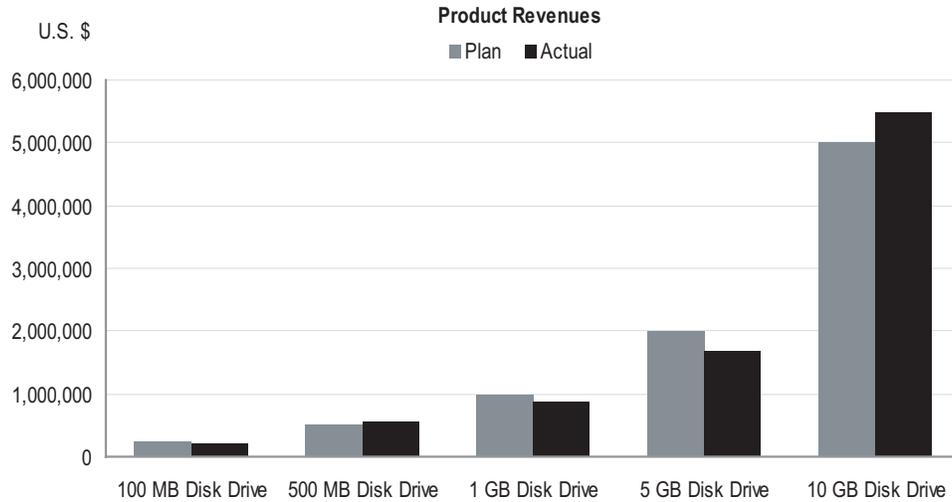


Figure 2: Two ways to express revenue performance, the one on the bottom more directly than the other.

Ratios are often the best ways to express performance, because they are the result of a comparison (one value divided by the other and expressed as a rate or a percentage). It is up to you to find out how people will use the data and to express it in the way that most directly supports this use. This will save them time and eliminate errors that people sometimes make when performing calculations in their heads. With dashboards, these time savings add up.

Graphical Display Media for Monitoring

When people think of dashboards, they often imagine a screen filled with meters and gauges. Dashboards in automobiles and cockpits in airplanes—the displays that supplied the metaphor for computer-based dashboards—use a variety of meters and gauges to help drivers and pilots monitor what’s going on. These are designed to report what’s going on right now in a way that can be quickly scanned and understood. In concept, meters and gauges are appropriate for computer-based dashboards, but they need not be designed to look just like those that are found in cars and planes. For dashboards, they ought to be designed to display what’s going on with the appropriate amount of context in a way that is as clear and easy to read as possible, even when looking at a screen

full of information. The best display media for computer-based dashboards require fresh thinking in light of their purpose, how they are used, who they serve, the kinds of information they display, and the strengths and limitations of computer screens.

Many of the display media that work well on dashboards are the same old graphs that are already familiar to most businesspeople, especially simple bar and line graphs. Bar graphs work well when people need to compare the magnitudes of multiple values, such as expenses for multiple departments or sales for multiple products. The example in Figure 3 makes it easy to compare sales in the current quarter across five regions.

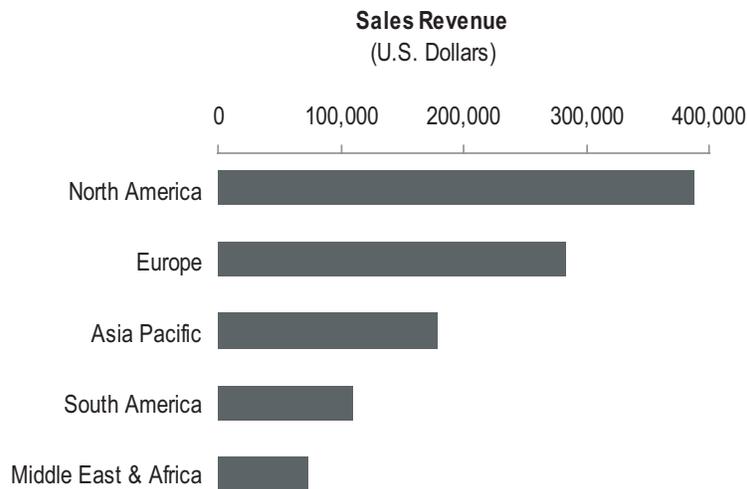


Figure 3: This bar graph compares current sales in five regions.

Line graphs are especially useful for comparing several sets of values across time, such as expenses of several departments or sales of several products for the last four quarters. The example in Figure 4 supports a quick comparison of the historical trends in sales of four regions leading up to the present.

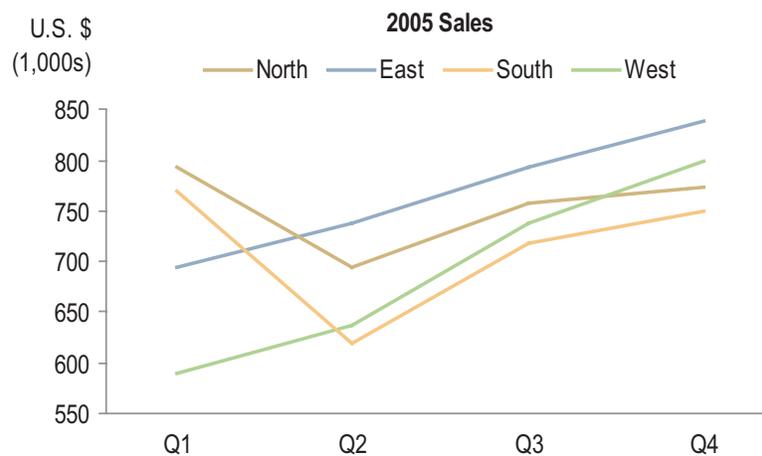


Figure 4: This line graph compares sales during the past four quarters in four regions.

Gauge-like displays come in handy when you wish to show one measure compared to one or two others. For instance, if you need to display current quarter-to-date sales revenue compared to the sales target, rather than using a bar graph with only two bars (one for actual sales and one for the sales target), a means of display that uses less space and can be quickly scanned to get the needed information is preferable. Unfortunately, most of the gauges and meters that are available in dashboard products don't do this. They use up far too much space and say too little. The example in Figure 5 is a typical gauge, which looks cute and is a lot like the gauges found in cars, but doesn't meet our requirements for an effective dashboard display.



Figure 5: A typical dashboard gauge, which uses up too much space and presents too little information.

It is the circular design of this gauge that causes it to use more space than necessary. A gauge with a linear design would require much less space. There might be occasions when circular display media would work effectively, such as a whole panel of circular gauges designed such that needles pointing directly up in every case is optimal, and anything else is a problem, which could be scanned very quickly to assess performance. If you have plenty of space, a set of circular gauges designed in this manner might be appropriate. Ordinarily, however, space must be conserved to fit everything that's needed, so linear designs work better, and in any case, they are just as easy to quickly scan and understand. In Figure 6, there are two collections of gauge-like objects, called *bullet graphs*, that take up much less space than their circular cousins due to their linear design, with no loss in information, clarity, or efficiency.

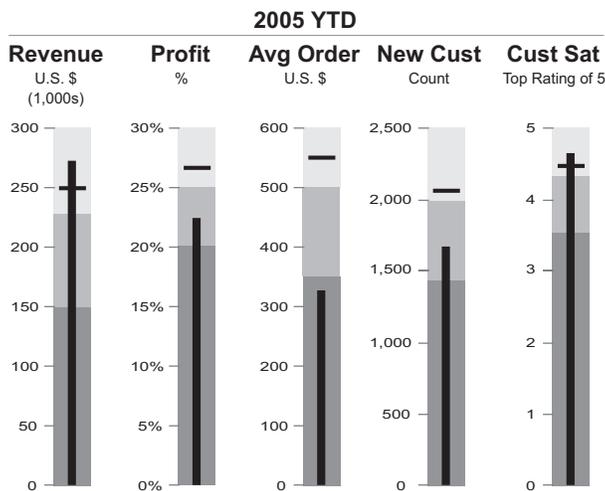
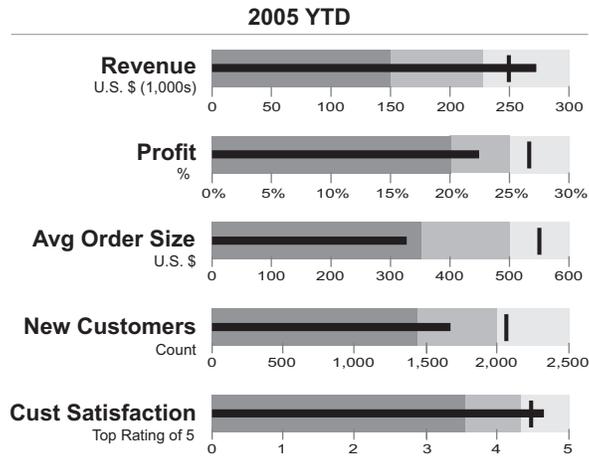


Figure 6: Two sets of bullet graphs, one arranged vertically and the other horizontally.

The bullet graph is a simple design that I created to fit the unique requirements of dashboards. Linear gauges could be designed somewhat differently and still offer the same benefits, but most that I've seen are embellished in meaningless ways to make them look like familiar objects such as thermometers. These cute visual flourishes break a cardinal rule in dashboard design: Do not include any visual content on a dashboard that doesn't communicate information or is not necessary to support the display of information. Any visual content that isn't necessary to present the data is content that people must process without benefit. In other words, it wastes people's time.

Individual dashboard display media (gauges, graphs, tables, etc.), to work effectively for monitoring information, should exhibit the following characteristics:

- Context rich (includes the comparisons that are needed to assess performance)
- Simple (includes no more information than is needed for the task of monitoring)
- Emphasize the most important data (focus the viewers' attention predominantly on the primary measure)
- Space efficient (capable of being displayed in a small amount of space)

- Fluff-free (includes no visual content that isn't actual data or isn't necessary to support the presentation of the data)
- Clear image (not fuzzy and therefore difficult to read)
- Visually balanced (neither more nor less visually dominant than necessary to communicate; doesn't clutter the dashboard with unnecessary uses of color, especially vibrant color)
- Uses visual means (not text alone) to support quick scanning to assess performance

The last characteristic in this list is important due to the speed of perception that is usually required when monitoring information. The faster one must assess what's going on, the more you should rely on graphical means to display the information. Text must be read, which is a relatively slow, serial process. Certain visual properties, however, can be perceived at a glance, without conscious thought. For instance, if color has been used sparingly on a dashboard and the only time that red appears is when something is wrong, items that need attention can be spotted immediately. Color is not the only visual property that works in this way. Others, such as the comparative lengths of simple objects (such as bars on a bar chart), lines that are sloping up or down (such as lines in a graph), a border around particular information (to highlight something or group a set of items), or even a simple object (such as a icon) that only appears when attention is required, are all visual properties that can be used to communicate performance information, highlight particular items, or organize groups of items. Dashboards should be highly visual (graphical) in their design, not because this is pretty, cute, or entertaining, but because properly designed graphical displays can be quickly scanned and understood.

Techniques for Highlighting What Needs Attention

Because the monitoring task demands quick assessments, dashboards should be designed to highlight those items that require special attention, whether because a problem is occurring that must be fixed or an opportunity has arisen that should not be missed. This gives the person using the dashboard the option of looking only at those items that require attention. When time is of the essence, which is often the case, you must clearly highlight items that must be noticed, using visual means to draw people's eyes to them, thereby making them easy to pick out from all else.

The best way to highlight items that are always important and therefore should always be examined is to place them in the area of the screen to which people's eyes are most dominantly drawn, which is in the upper left corner. The prominence of this part of the screen is not inherent to visual perception, but a result of how we read. Languages that are read from left-to-right and top-to-bottom predispose us to begin with the upper left corner of the page or screen. Whenever a particular set of information on a dashboard is considered the most important, not just now because something noteworthy has occurred but always, then there is no better way to feature it than by placing it in the upper left corner.

What about information that is important, not always but now because something has occurred, such as a drop in sales or an opportunity to contact a prime customer who is ripe for the picking? You can't rearrange the dashboard to place these items in the upper left-hand corner, but you can use visual properties to draw people's eyes to them.

Ordinarily, there is no better way to highlight such an item than the presence of an icon next to it in a color that stands out clearly in contrast to the norm. Something as simple as the red circle that appears next to one of the key measures in Figure 7 works quite effectively.

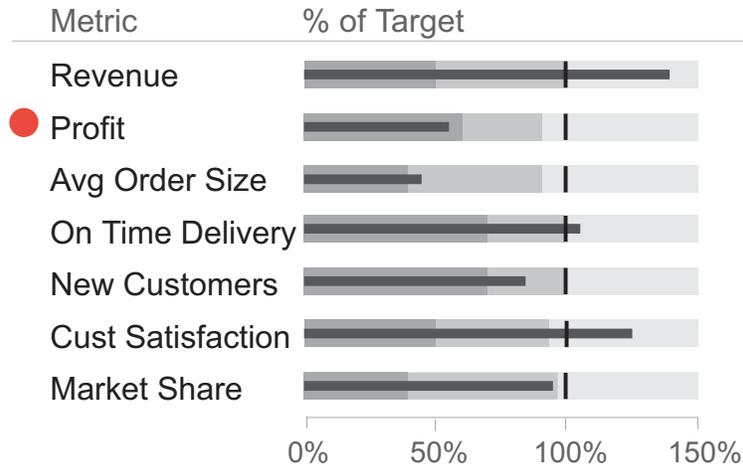


Figure 7: Colored icons can be used to highlight items that need attention.

This technique takes advantage of two powerful attributes of visual perception for making something stand out: a *contrasting hue* and an *added mark*. A distinct color, especially one that is bright (fully saturated), is an attention-getter, but this effect diminishes to the degree that other bright colors are also present. Notice how in Figure 8 the power of the red icon to attract attention is decreased by the presence of green icons next to the other measures. When you highlight everything, nothing stands out.

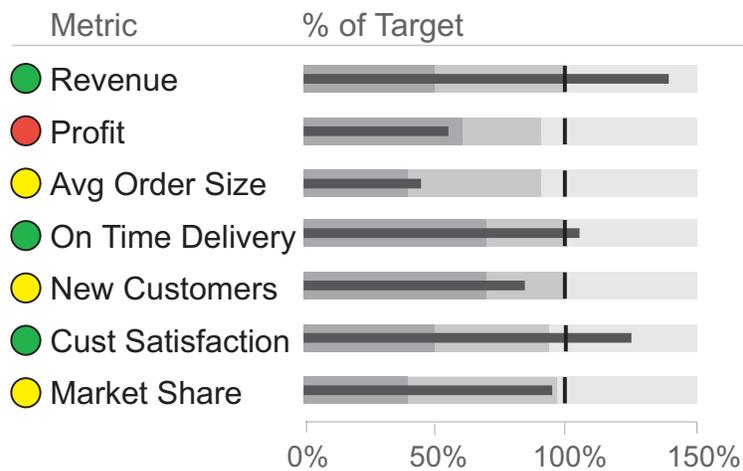


Figure 8: When too many colors are used and too many items are highlighted, it becomes harder to make particular items stand out.

For highlighting to work, it must be used sparingly. Don't use visually prominent methods to assign qualitative values, such as good, satisfactory, and bad (green, yellow, and red) to items. If you must assign qualitative values to many items, use methods that are visually neutral, such as variations in the intensities of the subtle background colors that appear in the bullet graphs in Figure 6. Reserve the use of eye-catching visual properties for those items that require attention. In other words, visually highlight only those items that people absolutely must notice.

The reason that it is useful to use an icon that appears next to items to highlight them, rather than doing something such as changing the color of the item itself, is two-fold:

1. Sometimes changing the color of the item itself makes it harder to read.
2. Objects, such as small icons, which only appear when attention must be drawn to something, are more noticeable.

In the table that appears in Figure 9, the numbers that require the most attention, those that have a red background, are the hardest to read. All data on a dashboard should be easy to read—especially those items that require special attention. Be careful to highlight in ways that make items stand out, not obscure them.

Metric	Actual	Target	Variance	Variance %
Revenue	\$8,938,884	\$9,000,000	-\$61,116	-0.68%
Profit	\$2,873,646	\$3,500,000	-\$626,354	-17.90%
Avg Order Size	\$3,764	\$4,000	-\$236	-5.90%
On Time Delivery	87%	85%	2%	2.35%
New Customers	15,838	10,000	5,838	58.38%
Cust Satisfaction	79%	90%	-11%	-12.22%
Market Share	13%	15%	-2%	-13.33%

Figure 9: Some methods of highlighting items actually obscures them.

Methods for Accessing Supporting Details

Early in this paper, I proposed that dashboards should be designed to support a three-step monitoring process: 1) To present an overview of the whole, with the items that need attention highlighted so they can be found at a glance, 2) to present information with enough context to determine if further investigation and potential action is required, and 3) to make it easy to get to additional information when necessary, such as supporting details, to determine what action to take. We've looked at ways to support the first two steps, and now we'll look at the third.

The most important design principle for giving people access to additional information is to do it in a way that doesn't change the dashboard's appearance or the data that it displays. Consider the dashboard sacred. People should be able to view it at any time and know precisely what they're seeing. Nothing should look different but the values themselves (that is, the data, which changes) and what is highlighted (again due to changing data). Don't confuse people by causing the appearance of the dashboard to change, swapping one chart (table or graph) for another, allowing data to be independently filtered in some part of the dashboard (thus disconnecting that part from the whole), or changing the data and perhaps the display media with it that appears in some part of the dashboard (such as exchanging a display of revenue for a display of expenses). Everything that needs to be monitored at a high level should appear on the dashboard without having to change anything. You should support

access to additional information when further investigation and a possible response are needed in a way that doesn't alter the dashboard.

Two means of providing additional information work quite well on a dashboard:

- Small pop-up windows for small sets of detailed information
- Links to displays that are separate from the dashboard, such as detailed reports, when more extensive information or interaction with the data is needed

In both cases, if possible, provide a means for people to access this information by directly clicking the items on the dashboard that they want to learn more about. By allowing someone to point with the mouse to a gauge or a graph to access further information (for example, by drilling down into a lower level of detail), the dashboard need not become cluttered with command buttons and the like and people need never become confused about what data will be accessed when they click one of those separate controls.

The process of monitoring only occasionally requires precise details. If you are monitoring sales revenue, for instance, it is more important to see that you are well above target, right on target, slightly lower than target, or well below target, than to see the exact dollar amount of sales. This is not to say that the precise sales figure is never needed, but only that it might not need to always appear and take up space on the dashboard. Rather than cluttering the dashboard with a bunch of text, precise values that are only needed from time to time can be made available through small pop-up windows. For instance, by hovering with the mouse over a bar on a bar graph that displays the accounting department's quarter-to-date expenses compared to other departments, a small pop-up window could appear to report the exact expense amount, and perhaps other useful data such as its percentage of the company's total expenses, its percentage of the budget, and its expense amount on the same date in the previous year.

Pop-up windows work well for a limited set of details, but for larger sets of information, it is usually best to provide a link to a separate display such that people can easily return to the dashboard when finished. Using the same example as above, if someone wants to see a breakdown of accounting department expenses by category or perhaps even down to the transaction level, clicking on that same bar in the bar graph could bring up a detailed report of expenses with drilldown functionality that could be used to examine various levels.

Once people dive into the details, they are no longer monitoring information, but have started digging into it to figure out the cause of what's going on, perhaps involving an extended process of analysis. Once they leave the realm of monitoring, they have left the realm of the dashboard. The dashboard, as a means to monitor what's going on, is different from displays that are used for analysis. Dashboards ought to make it easy to pursue the path of analysis when necessary, but should do so by opening a door to that path that people can easily pass through and then return through when finished.

Dashboards that Support Business Intelligence Require Intelligent Design

If a business dashboard had millions of years to evolve, perhaps the process of natural selection could produce an elegant information display, but business runs on a faster clock. Effective dashboards require intelligent design. To fill the role of intelligent designer, you must understand what works on a dashboard, what doesn't, and at least a bit about why. Effective information displays work because they are designed to the specifications of visual perception and human intelligence. In other words, you must focus on the needs and limitations of humans, the businesspeople who will use the dashboard. Business intelligence vendors must provide tools, such as dashboard development software, that incorporate an understanding of visual perception and cognition. The best business intelligence tools become invisible when they are used, allowing people to think about information without being distracted by the technological mechanics of the task.

This vision of how it ought to be won't materialize overnight, so it is up to you in the meantime to choose the best software vendors, demand the best from them, and use their tools to create effective information designs no matter how inadequately they currently support the task. The only dashboards that will be used are those that display information in a way that effectively supports monitoring with rich data—one of the critical goals of business intelligence.

Addendum from Noetix

Building and deploying a dashboard is complex, regardless of the technology that is chosen to deliver it. As noted throughout this paper, it's critical that the dashboard be designed to inform effectively. However, populating the dashboard with relevant data is also essential. Discovering and delivering the right information is no small task. It is largely dependent upon the size and complexity of the structure of systems where the data resides. The dashboard's content must be delivered consistently, accurately, promptly, and securely in order to meet the critical needs of the organization.

The Noetix Advantage

Noetix offers a suite of products that simplifies access to enterprise data, integrates that information, and delivers intelligence to a variety of business intelligence tools (from Noetix and other vendors).

Noetix provides, through its unique Noetix Metabuilder technology, an automatic discovery process that detects configuration specific details about a customer's implementation of its enterprise applications. Noetix Metabuilder then combines this information with valuable business rules to create a semantic layer for business intelligence access to the enterprise information. Furthermore, Noetix ensures that the interfaces to that semantic layer are protected across version upgrades of those applications.

The Noetix Platform provides the capability to access information in disparate data environments by centralizing view and user access management, rapidly integrating multiple data sources in a single place. Administrators maintain control while business professionals gain single login and location transparency for all data sources.

Noetix provides the ability to deliver enterprise data into the business intelligence tool of your choice, including both Noetix products (Noetix WebQuery and Noetix Dashboard) and products from other vendors (including Oracle, Microsoft, Cognos, Business Objects, etc.).

Professional Services

Noetix offers a range of professional services that can assist during all phases of a dashboard project: from overall project management to assisting with user requirements, definition of key performance indicators, or the design of the dashboard itself, to building, deploying, and training. Our service offerings are designed to provide rapid implementations and to maximize skills transfer. Noetix has implemented successful dashboard projects in less than six weeks.

Summary

The Noetix solution accelerates the creation and deployment of dashboards by automating many of the key tasks that would otherwise have to be executed manually. Much of this automation occurs within the first few days of implementation and can dramatically reduce the project time and effort from months to a few short weeks. In addition to resulting in effective, intelligent dashboards, customers receive the added benefit of an operational and ad hoc reporting solution that can be used across the organization for day-to-day data access requirements, or to drill down from the dashboard. The Noetix approach is unique, as it focuses on the generation of relevant content based on customers' unique configurations of these applications. While the desired outcome is a simplified and powerful view of enterprise performance, the path can be a complex and arduous journey. We encourage you to consider Noetix when evaluating alternative strategies and technologies.



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