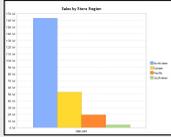


Common PITFALLS in Dashboard Design

by

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SPECIAL ADDENDUM



Avoid the Pitfalls
with ProClarity



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EXECUTIVE SUMMARY

Dashboards have become a popular means to deliver important information at a glance, but this potential is rarely realized. Even the best dashboard software in the world will not produce a useful dashboard if it doesn't incorporate effective visual design. Any dashboard that fails to deliver the information that people need clearly and quickly will never be used, no matter how cute its gauges, meters, and traffic lights. Effective dashboards are the product of informed visual design.

Based on his new book, *Information Dashboard Design: The Effective Visual Display of Data*, Stephen Few will lead you through a quick tour of the 13 most common pitfalls in the visual design of dashboards. Knowing what doesn't work will help you avoid the problems that resign most dashboards to the trash heap.

You Will Learn:

- What dashboards are, what they should do, and why they're important
- The primary goals and challenges of dashboard design
- The 13 most common mistakes in the visual design of dashboards
- The importance of designing dashboards that are aligned with the way people see and think

ProClarity sponsored this white paper to help people better understand the concept of a business intelligence dashboard and how to effectively present quantitative information in general or while using ProClarity business intelligence solutions.

INTRODUCTION

Despite their tremendous popularity and potential, many and perhaps most dashboard implementations fail miserably. A dashboard's entire purpose is to communicate important information clearly, accurately, and efficiently, but most dashboards say too little, and what they do say requires far too much effort to discern. This is a failure more of design than technology. Fundamentally, it is a failure of visual design.

Browsing the many examples of dashboards that can be found on the Internet, especially on the sites of companies that market dashboard software, you will find a bevy of flashy displays showing off cute gauges, meters, and traffic lights, but rarely will you find dashboards that really communicate. The reason examples like this dominate is simple: flash sells. But does it work? The first day that you put a dashboard of this type in front of real business people, they'll "ooooo and ahhhhh," delighted by its video-gamish appeal, but by the end of the week its superficial luster will fade and they'll stop looking at it altogether if it fails to give them the information they need in a manner that is clear, accurate, and easy to monitor at a glance.

In my work as an information design consultant, teacher, and writer, I've focused a great deal on dashboards in the last two years. In the course of this work, I've identified a list of the 13 most common pitfalls in the visual design of dashboards that you should avoid if you want yours to communicate effectively. Before we launch into this, however, let's get our terminology straight.

WHAT IS A DASHBOARD?

I began working with what we today call dashboards long before we started calling them by this name. About two years ago, I decided to pay special attention to the unique opportunities that dashboards provide for business communication and the unique challenges that they present in visual information design. I became frustrated immediately however, by the fact that a great deal was being said about them—especially a great deal of marketing hype—but no one was actually saying what they were. It's easy to claim that you have the best dashboard software when you haven't bothered to define what a dashboard is. I decided that a good working definition was needed, so I did some research and spent many hours thinking about it, and then offered one of my own that was originally published in the March 2004 edition of *Intelligent Enterprise* magazine in an article entitled "Dashboard Confusion." Here it is:

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.

I've attempted to provide a definition that distinguishes dashboards from other displays that also combine multiple pieces of information on a computer screen, as well as one that does not too narrowly limit the information that can be displayed or the viewing audience it can serve.

Dashboards consolidate onto a single screen the sometimes disparate information that someone needs to monitor to do a job. This single-screen display need not be comprehensive in and of itself, but it must provide the overview that is needed to know when action is required, and ideally should provide an easy gateway to any additional information that is needed to determine the precise action that is appropriate. Dashboards tend to be highly visual (that is, graphical) in the way they present information, not because it is cute or entertaining, but because when presented properly, pictures of data can be scanned and understood much faster than the same data presented as text.

WHAT IS SO HARD ABOUT DESIGNING DASHBOARDS?

I spend a great deal of my time teaching people how to communicate quantitative business data effectively in the form of graphs—a skill set that is not common, despite the huge production of graphs in business today. The type of graphical communication that is typically required in business is not difficult to learn how to do, but it doesn't come naturally. Designing individual graphs is simple compared to designing entire dashboards. Trying to get all that information on a single screen in a way that doesn't end up looking like a cluttered mess isn't easy. If you think it is, chances are you haven't actually tried to do it.

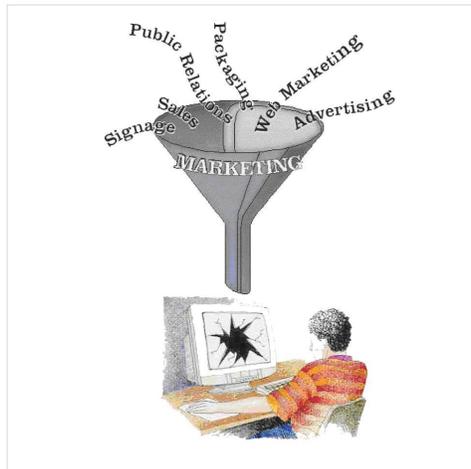


Figure 1: The greatest challenge of dashboard design involves squeezing all of that information on a single screen in a way that doesn't result in a cluttered mess.

Dashboards that communicate clearly, accurately, and efficiently are the result of careful and informed visual design. Given the purpose that dashboards serve, as defined above, they must be designed to support the following process of visual monitoring:

1. See the big picture.
2. Focus in on the specific items of information that need attention.
3. Quickly drill into additional information that is needed to take action.

Step #3 can be supported through convenient links to additional information, but steps #1 and #2 require visual design that allows viewers to scan a great deal of information quickly to get an overview, easily recognize those items that demand attention, and then get enough information about those items to assess the potential need for a response. To achieve this end, it helps to recognize and avoid the common mistakes in dashboard design that often get in the way.

13 COMMON PITFALLS IN DASHBOARD DESIGN

Knowing what to avoid isn't everything, but it's a good start. Here's a list of the 13 mistakes that I'll describe in detail:

1. Exceeding the boundaries of a single screen
2. Supplying inadequate context for the data
3. Displaying excessive detail or precision
4. Expressing measures indirectly
5. Choosing inappropriate media of display
6. Introducing meaningless variety
7. Using poorly designed display media
8. Encoding quantitative data inaccurately
9. Arranging the data poorly
10. Ineffectively highlighting what's important
11. Cluttering the screen with useless decoration
12. Misusing or overusing color
13. Designing an unappealing visual display

Let's dive in. Every one of these pitfalls is illustrated with an example from an actual dashboard that I found on the Web site of a software vendor, with the one exception of pitfall #4.

PITFALL #1: EXCEEDING THE BOUNDARIES OF A SINGLE SCREEN

Something powerful happens when information is seen together, at the same time. Not only does this provide convenience for viewers and save them valuable time, it also paints a complete picture that can bring to light important connections that might not be visible otherwise. Something critical is sacrificed when the viewer must lose sight of some data in order to scroll down or over, or move from screen to screen to see the rest. Part of the problem is that we can only hold a few chunks of information at a time in short-term memory. Relying on the mind's eye to retain a visualization that is no longer visible is a limited venture. One of the great benefits of a dashboard is the simultaneity of vision, the ability to see everything you need at once.

Besides designing a dashboard that requires scrolling around to see everything, data is often fragmented into separate screens. The dashboard below fragments the data that a sales executive might need to monitor into tiny slices selected through the use of radio buttons or list boxes. For instance, to see the seven major metrics that are displayed in the upper left corner of the screen, the viewer must select and view them separate, never together. The same is true for product revenue, regional revenue, etc. With this design, the viewer can never compare the performance of products or regions, which is a common need. Splitting the big picture into a series of separate small pictures is a mistake when seeing the big picture is worthwhile.

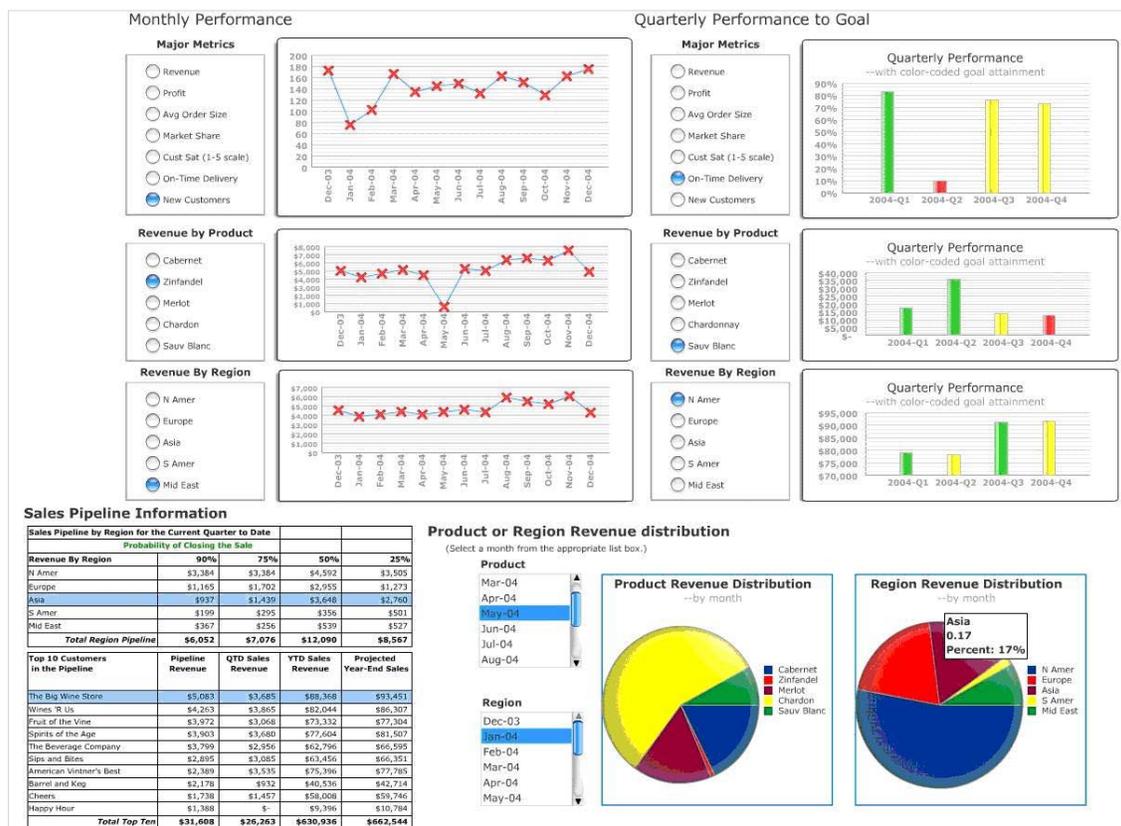


Figure 2: This sales dashboard fragments the data into many slices by requiring the viewer to select individual pieces without any means to see the whole.

PITFALL #2: SUPPLYING INADEQUATE CONTEXT FOR THE DATA

As a means to monitor what's going on in the business, dashboards are usually populated predominantly with quantitative measures of what's currently going on. Measures of what's going on in the business, however, rarely do well as a solo act; they need a good supporting cast to get their message across. To state that quarter-to-date sales total \$736,502 without any context means little. Compared to what? Is this good or bad? How good or bad? Are we on track? Is this better than before? The right context for the key measures makes the difference between numbers that just sit there on the screen and those that enlighten and inspire action.

Measures of what's currently going on can be enriched by providing one or more comparative measures, such as a target or some history, as well as a quick visual means for assessing the measure's qualitative state (for example, good, satisfactory, or bad).

As an example, the gauge below could have easily incorporated useful context, but it falls far short of its potential. Other than estimating that net income is around \$3.5 million, this gauge tells us nothing.



Figure 3: Typical dashboard display media often provide little if any useful context for the measures that they present.

A quantitative scale on a graph, such as the one suggested by the tick marks around this gauge, are meant to help us interpret the measure, but it can only do so effectively if the scale is labeled with numbers. Beginning from the lower left where the beginning of this scale is labeled \$2M, can you figure out what each of the major tick marks represents? I can't. Is this amount of income good? A great deal of space is used by these gauges to tell us far too little. Much richer information can be displayed in a way that need not overwhelm the viewer with much, but just enough to make the data meaningful.

PITFALL #3: DISPLAYING EXCESSIVE DETAIL OR PRECISION

To support the purpose of rapid monitoring, dashboards should never display information that is more detailed or precise than necessary. To do so would force the viewer to process levels of data that are irrelevant to the task at hand. Too much detail or measures that are expressed too precisely (for example, \$3,848,305.93 rather than \$3,848,306 or perhaps even \$3.8M) just slow them down without benefit.

Examine the two sections in the example below that I've enclosed in red rectangles. The lower right section displays from four to ten decimal digits for each measure, which might be useful in some contexts, but doubtfully on a dashboard. The upper highlighted section displays time down to the level of seconds, which seems excessive in this context. With a dashboard, every unnecessary piece of information results in wasted time, which is intolerable when time is definitely of the essence.

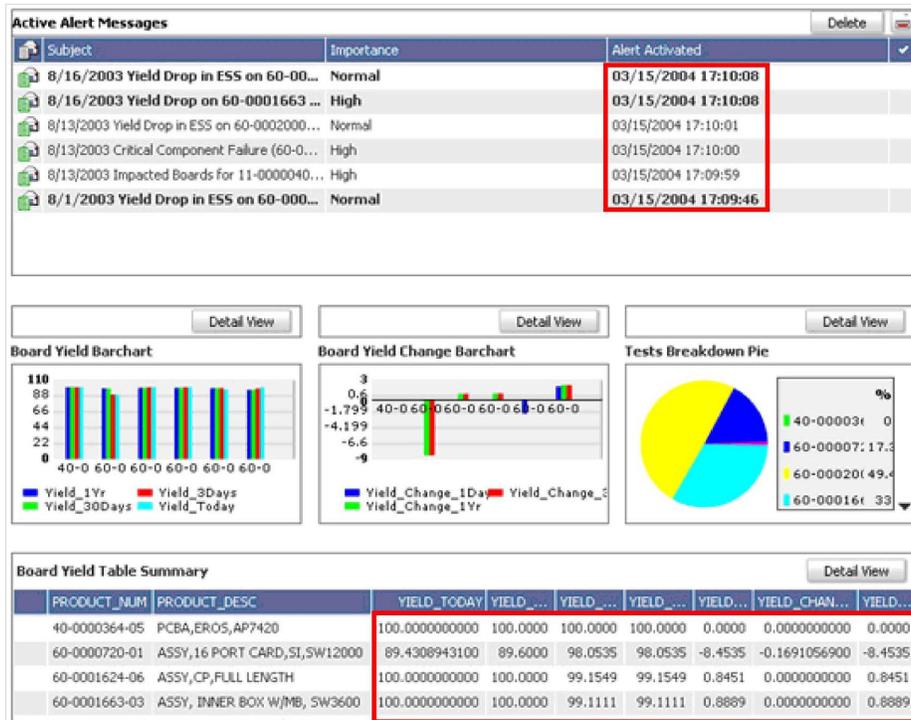


Figure 4: This dashboard displays levels of detail and precision that are excessive.

PITFALL #4: EXPRESSING MEASURES INDIRECTLY

To express measures appropriately, you must understand exactly what viewers need to see and how they plan to use the information. For a measure to be meaningful, viewers must know what is being measured and the units in which the measure is being expressed. A measure is poorly expressed if it fails to directly, clearly, and efficiently communicate the meaning that the dashboard viewer must discern. If the dashboard viewer only needs to know by how much actual revenue differs from budgeted revenue, rather than displaying the actual revenue amount of \$76,934 and the budgeted revenue amount of \$85,000 and leaving it to the viewer to calculate the difference, why not display the variance amount directly? Also, in many cases, rather than displaying the variance amount as -\$8,066, for instance, it would be more direct to simply express the variance as a percentage, such as -10%. A percentage more clearly focuses attention on the variance itself, rather than the raw difference (such as in dollars).

Percentages also make it easier to compare the variances of multiple items when their actual values differ significantly in scale, such as the variances of actual from budgeted expenses for several departments, each with its own budget. A small department's over-budget amount of \$5,000 could be more troubling than a large department's over-budget amount of \$50,000, but this might only be obvious if the variance were expressed as a percentage.

The variance graph below illustrates this point. Even though its purpose is to display the degree to which actual revenue varies from planned revenue, you must work harder than necessary to discern this information.

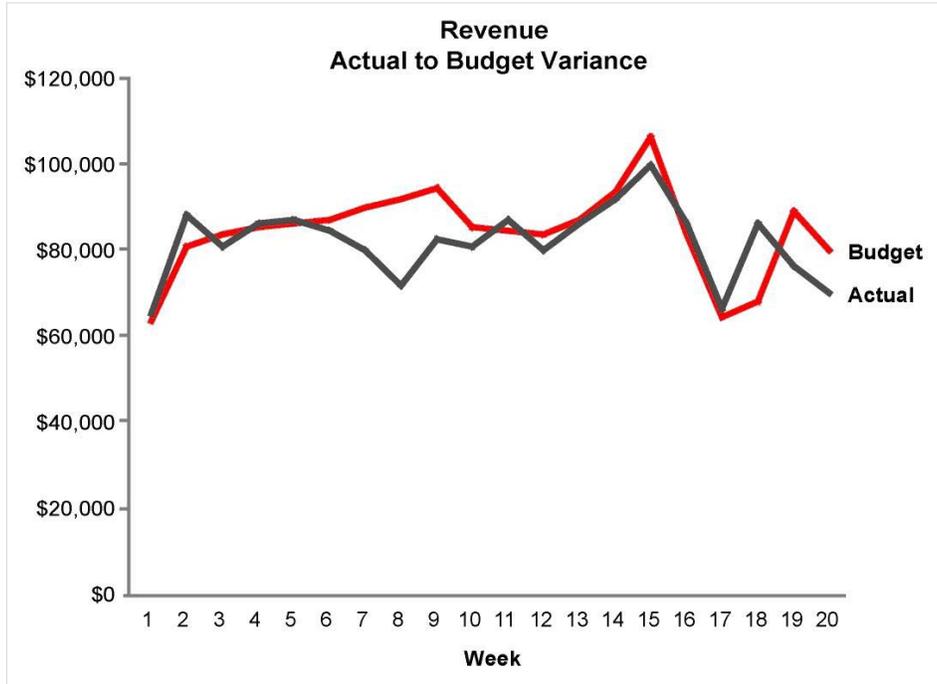


Figure 5: This graph fails to express the variance amount directly.

The variance could, however, be displayed more directly and vividly by encoding budgeted revenue as a reference line of 0% and the variance as a line that meanders above and below budget, expressed in units of positive and negative percentages.

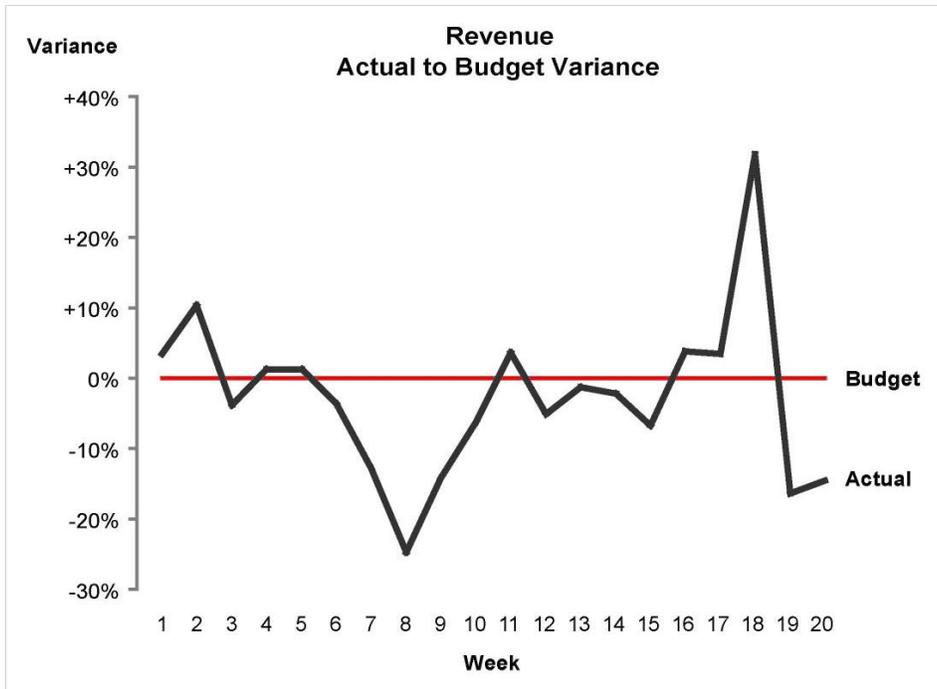


Figure 6: This graph directly expresses the variance between actual and budgeted revenue, making it much easier to see and evaluate.

PITFALL #5: CHOOSING INAPPROPRIATE MEDIA OF DISPLAY

This is one of the most common design mistakes that I encounter, not just on dashboards, but in all forms of data presentation. Using a graph when a table of numbers would work better and vice versa is a frequent mistake, but what is more common and egregious is use of the wrong type of graph for the data and its message.

Without the value labels on the pie chart below, which was excerpted from a dashboard, you would only be able to discern that opportunities rated as “Fair” represent the largest group, those rated as “Field Sales – Very High” represent a miniscule group, and the other ratings are roughly the equal in size. If you must read the numbers to determine how the slices of a pie chart relate to one another, you might as well use a table instead. We use graphs when the picture itself reveals something important that couldn’t be communicated as well be a table of numbers. The slices of this pie cannot be interpreted in a useful way without reading the associated numbers, so what use is the picture?



Figure 7: A pie chart often does a poor job of showing how individual items relate to one another and the whole.

The bar graph below, however, tells the same story as the pie chart above, but does so clearly, because it is a better medium of display for this information.



Figure 8: This bar graph is the appropriate choice for quickly communicating the relationship between these individual items as they relate to one another and the whole.

PITFALL #6: INTRODUCING MEANINGLESS VARIETY

This mistake is closely tied to the one we just examined. I've found that people often hesitate to use the same medium of display (bar chart, etc.) multiple times on a dashboard out of what I assume is a sense that viewers will get bored with the sameness. Variety might be the spice of life, but if it is introduced on a dashboard for its own sake, the display suffers. You should always select the means of display that works best, even if that results in a dashboard that is filled with nothing but multiple instances of the same type of graph. If you are giving viewers the information that they desperately need to do their jobs, the data won't bore them if it's all displayed in the same way, but they will definitely get aggravated if you force them to work harder than necessary to get the information that they need due to unnecessary variety. In fact, consistency in the means of display whenever appropriate allows viewers to use the same perceptual strategy for interpreting the data, which saves them time and energy. The dashboard below illustrates variety gone amok.

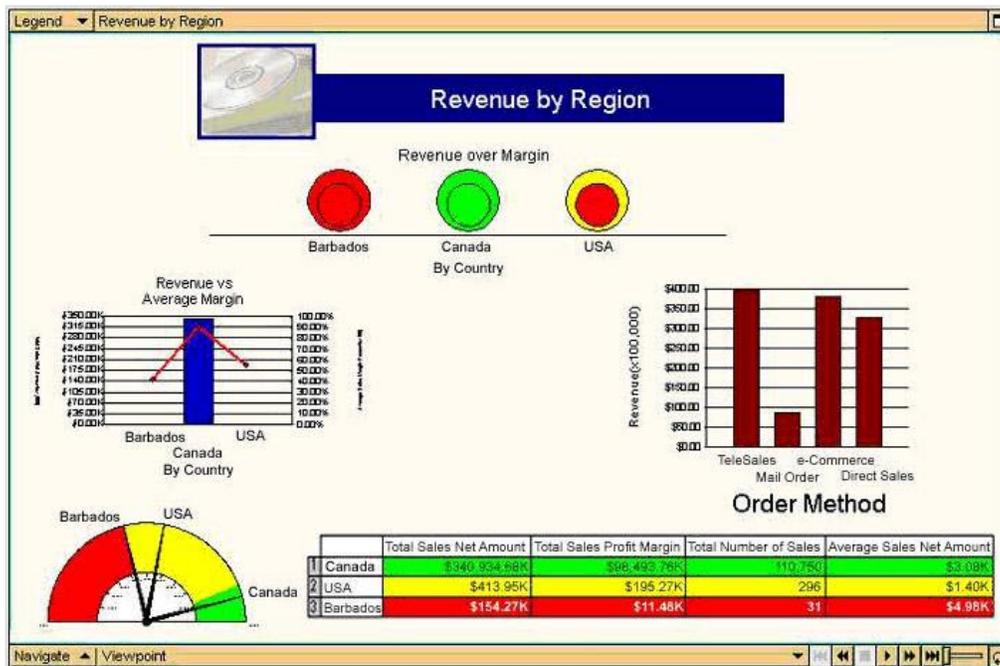


Figure 9: The display media on this dashboard appear to have been chosen for the sake of variety rather than based on clear choices of the most appropriate medium for each type of data.

PITFALL #7: USING POORLY DESIGNED DISPLAY MEDIA

Once you've chosen the right means to display the information and its message, you must also design the components of that display to communicate clearly and efficiently, without any distraction.

The graph below illustrates several design problems to hinder communication:

- The bars' colors are distractingly bright.
- The 3-D effect makes the bars hard to read.
- The purpose of the graph is to compare actual to budgeted revenue for each of the four regions, but something about its design makes this difficult. Given its purpose, the bars for actual and budgeted revenues for each region should have been placed next to one another to make it easier to compare them.

Simple design mistakes like this can significantly undermine the success of a dashboard.

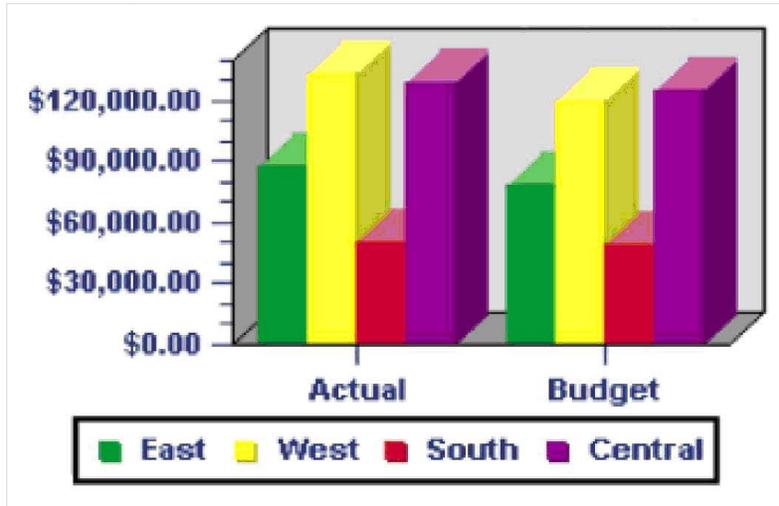


Figure 10: This graph, taken from a dashboard, illustrates several problems in design that hinder communication.

PITFALL #8: ENCODING QUANTITATIVE DATA INACCURATELY

When you use a graph to communicate quantitative data, the values are encoded in the form of visual objects, such as the bars on the graph below. These visual objects should accurately encode the values so you can compare them to one another as a means to compare the values and understand the relationships.

Sometimes graphical representations of quantitative data are actually mis-designed in ways that inaccurately display the quantities. The quantitative scale along the vertical axis was improperly set for a graph that encodes data in the form of bars. The length of a bar represents its quantitative value. The bars that represent revenue and costs for the month of January suggest that revenue was about four times costs. An examination of the scale, however, reveals the error of this natural assumption: revenue is actually less than double the costs.

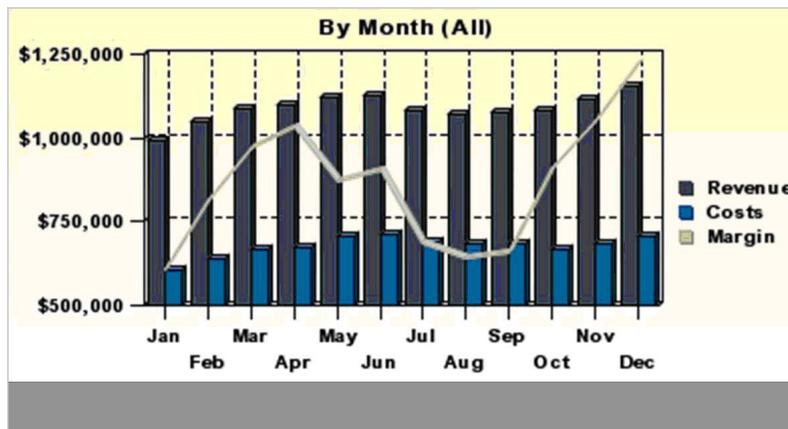


Figure 11: The heights of the bars in this graph do not accurately encode the values they represent.

PITFALL #: ARRANGING THE DATA POORLY

When designing a dashboard, you cannot put the pieces of information together in any old way that they seem to fit. If a dashboard isn't organized with appropriate placement of information based on importance and desired viewing sequence, along with visual design that segregates data into meaningful groups without fragmenting it into a confusing labyrinth, the result is a cluttered mess. The goal is not simply to make the dashboard look good, but to arrange the data in a manner that fits the way it's used. The most important data ought to be prominent. Data that requires immediate attention ought to stand out. Data that should be compared ought to be arranged and visually designed to encourage comparisons.

Notice on the dashboard below that the most prominent position—the top left—is used to display the vendor's logo and navigational controls. What a waste of prime real estate! As you scan down the screen, the next information you see is a meter that presents the average order size. It's possible that average order size might be someone's primary interest, but unlikely that out of all the information that appears on this dashboard, this is the most important. Notice also that the line graph in the top center position displays the historical trend of order size, which logically relates to the average order size data that appears in the meter on the left, so why isn't it next to the meter so their relationship can be easily seen? This dashboard lacks an appropriate visual balance based on the nature and importance of the data.



Figure 12: This dashboard exhibits organization that is haphazard and ill suited to its use.

PITFALL #10: INEFFECTIVELY HIGHLIGHTING WHAT'S IMPORTANT

Take a look at the dashboard below to see what catches your eye.

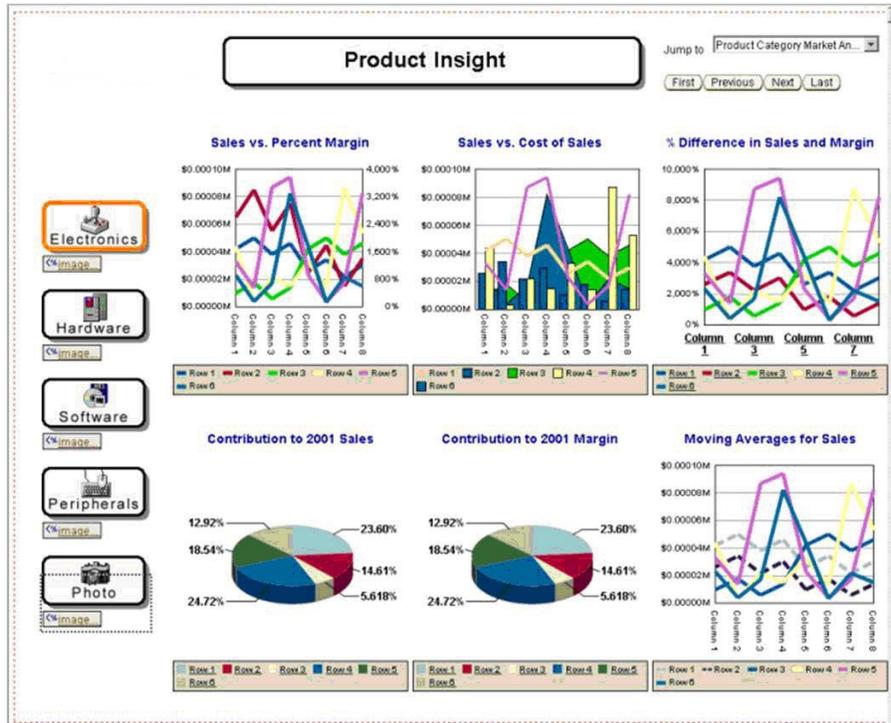


Figure 13: With everything visually prominent, this dashboard gives your eyes no clue where to focus.

If you're like me, because everything in this dashboard is visually prominent and vying for your attention, nothing in particular grabs your attention. When this happens the dashboard has failed. You should be able to look at a dashboard and have your eyes immediately drawn to the information that is most important. When everything is visually prominent, nothing stands out. All of the data displayed on a dashboard ought to be important, but not all data are equally important. When you are monitoring the business, your eyes must be drawn to those items that most need your attention right now.

The logo and navigation controls (the buttons on the left) are prominent, both as a result of their position on the screen and the use of strong borders, but they aren't data and should therefore be subdued. Then there are the graphs, where the data resides, but all the data is equally bold and colorful, leaving us with a wash of sameness and no clue where to focus.

PITFALL #11: CLUTTERING THE SCREEN WITH USELESS DECORATION

Due to their visual nature, dashboards tend to get dressed up by their designers in silly ways. I say "silly" because the decoration that finds its way onto many dashboards, often to make it look like something it isn't (such as an automobile dashboard), becomes an absurd distraction from the task at hand. Dashboards found on vendor Web sites are especially prone to this error. I get the impression that vendors either hope that we'll be impressed by their artistry or assume that the decorative flourishes are necessary to keep us entertained. I assure you, however, that even people who enjoy the decoration upon first sight will grow weary of it in a short time.

The makers of the dashboard below did an exceptional job of making it look like an electronic control panel. If the purpose were to train people in the use of an actual control board by simulating its use, then this would be great, but that isn't the purpose of a dashboard. Notice the vertically-oriented meters in the center that are designed to look like LED (light-emitting diode) displays and the time period selector that looks like a manual switch. Graphics dedicated to this end are pure decoration, visual content that the viewer must process to get to the data.



Figure 14: This dashboard suffers from useless decoration; visual flourishes that serve merely to distract from its actual purpose.

PITFALL #12: MISUSING OR OVERUSING COLOR

Color can be used in powerful ways to highlight data, encode data, or create a relationship between individual items on a dashboard, but it is commonly over-used and misused. Color choices must be made thoughtfully, based on an understanding of how people perceive color and the significance of color differences. Some colors are hot and demand our attention while others are cooler and less visible. When any color appears as a contrast to the norm, our eyes pay attention and our brains attempt to assign meaning to that difference. When colors in two different displays are the same we are tempted to relate them to one another. We merrily assume that we can use colors like red, yellow and green to assign important meanings to data, but in doing so we exclude the 10% of males and 1% of females who are color blind.

A common problem is the use of too many colors, especially bright colors. Because dashboards are often densely packed with information, the visual content must be kept as simple as possible. The use of too many colors can be visually assaulting. When overused, color loses its power to highlight what's most important.

The graph below, taken from a dashboard, misuses color in several ways but there is one problem that stands out as most egregious. What is the meaning of the separate color for each bar? The correct answer is that the colors mean nothing. There is no reason to assign different colors to the bars for they are already labeled along the Y axis. Nevertheless, time is wasted as our brains—whether consciously or unconsciously—search for the nonexistent meaning of these differences. It is best to keep colors subdued and neutral, except when you are using color to highlight something as especially important.

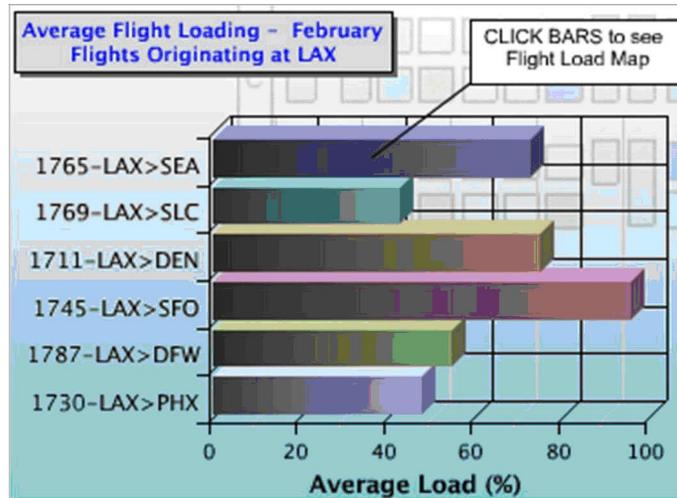


Figure 15: This graph illustrates a gratuitous use of color.

PITFALL #13: DESIGNING AN UNAPPEALING VISUAL DISPLAY

Not being one to mince words for the sake of propriety, let me say that some dashboards are just plain ugly. When we see them we're inclined to avert our eyes. Hardly the reaction you want from a screen that is supposed to regularly supply people with important information. You might have assumed from my earlier warning against decoration that I have no concern for dashboard aesthetics, but that is not the case. When a dashboard is unattractive—unpleasant to look at—the viewer is put in a frame of mind that is not conducive to its effective use. I'm not advocating that we add touches to make dashboards pretty, but rather that we attractively display the data itself without adding anything whatsoever. There is a difference.

It appears that the person who created the dashboard below made an attempt to make it look nice, but just didn't have the visual design skills necessary to succeed. In an effort to fill up the space, some sections such as the graph at the bottom right were simply stretched. Although shades of graph can be used effectively as the background color of graphs, this particular shade is too dark. The image that appears under the title "Manufacturing" is clearly an attempt to redeem the dreary dashboard with a splash of decoration, but even it is rather ugly.

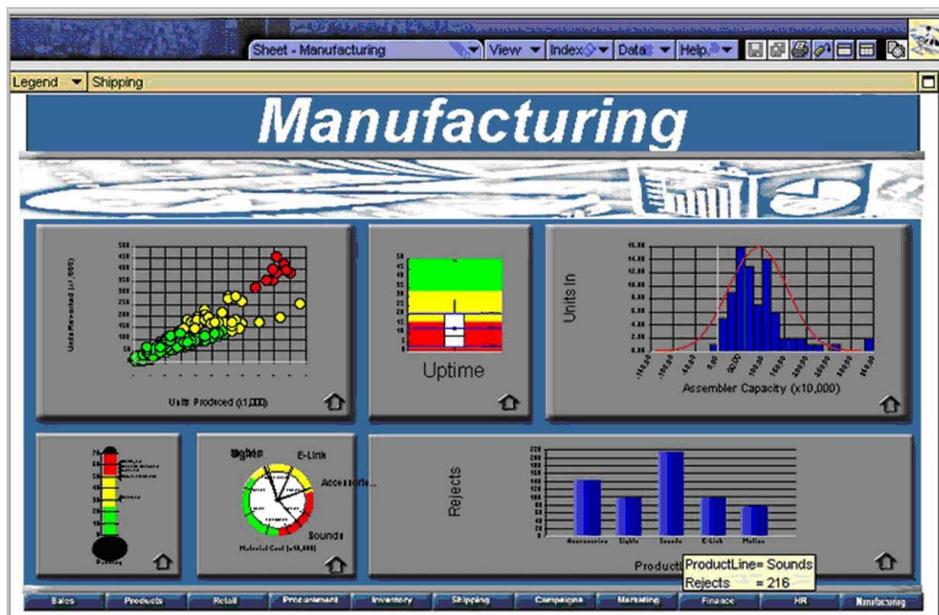


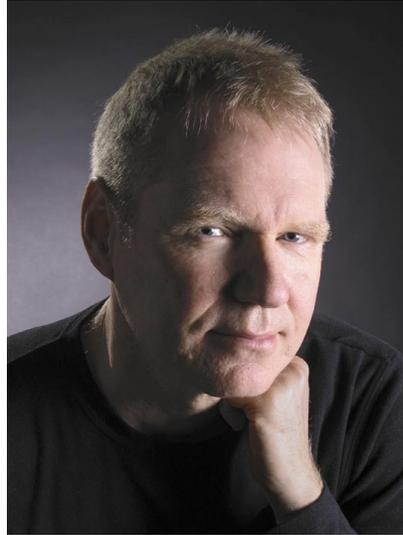
Figure 16: This dashboard, despite the efforts of its designer, is just plain ugly.

THE KEY TO DASHBOARD EFFECTIVENESS

Visual communication is only effective when it is aligned with the way people see and think. Put differently, to work effectively, we must primarily understand people, not computers. Business intelligence can only be achieved by applying technology to the needs of business in ways that engage and stimulate the most valuable resource of the business: human intelligence.

Henry David Thoreau once penned the same word three times in succession to emphasize an important quality of life that applies to design as well: "Simplify, simplify, simplify!" I don't always get it right, but I strive to live my life and to design all forms of communication according to Thoreau's sage advice to keep things simple. Elegance in communication is often achieved through simplicity of design. Too often we smear a thick layer of gaudy makeup over data in an effort to impress or entertain, rather than to communicate the truth of the matter in the clearest possible way. When designing dashboards, you must include only the information that you absolutely need, you must condense it in ways that don't decrease its meaning, and you must display it using visual display mechanisms that can be easily read and understood, even when quite small. Keep these principles in mind and you'll be off to a good start.

Note: The content of this white paper is based on a chapter in the new book *Information Dashboard Design: The Effective Visual Communication of Data*, Stephen Few, O'Reilly Media, 2006. Whereas this white paper features pitfalls to be avoided, the book goes on to explain what can be done to design dashboards that communicate information clearly and at a glance.



ABOUT THE AUTHOR

Stephen Few has 24 years of experience as an IT innovator, consultant, and educator, specializing in business intelligence and information design. Today, as principal of the consultancy Perceptual Edge, he focuses on data visualization for the effective analysis and communication of quantitative business information. He writes the monthly data visualization column in *DM Review*, speaks frequently at conferences like those offered by The Data Warehousing Institute (TDWI) and DCI, and teaches in the MBA program at the University of California in Berkeley. He is also the author of the books *Show Me the Numbers: Designing Tables and Graphs to Enlighten* and *Information Dashboard Design: The Effectual Visual Display of Data*. More information about his current work can be found at www.perceptualedge.com.

PROCLARITY ADDENDUM: AVOID THE COMMON PITFALLS OF DASHBOARD DESIGN WITH PROCLARITY ANALYTICS 6

In his white paper, “Common Pitfalls in Dashboard Design,” Stephen Few leads the reader through the 13 most common pitfalls in the visual design of dashboards. Knowing these pitfalls and how to avoid them is one step in the process of designing effective dashboards. Having the tools that enable a dashboard designer to apply lessons learned from these pitfalls is another important element in dashboard design. The ProClarity Dashboard provides the features and the flexibility that allow for effective visual design. As you will see in the following examples, ProClarity Analytics 6 can enable dashboard designers to avoid some of the most common pitfalls in dashboard design.

AVOID PITFALL #1 (EXCEEDING THE BOUNDARIES OF A SINGLE SCREEN) WITH PROCLARITY CUSTOM TEMPLATES

In his white paper, Stephen Few cautions that a dashboard should not exceed the boundary of a single screen. This is because the dashboard needs to paint a complete picture that brings to light important connections that might not be visible if users have to scroll down. ProClarity dashboards offer the ability for users to create custom, fixed-size dashboard templates. This allows dashboard authors to create dashboard pages to fit a given screen resolution, guaranteeing that dashboards will not exceed the boundaries of a single screen.

Design for the Appropriate Screen Resolution

ProClarity dashboard templates are fixed in size and specified in pixels. Before starting on dashboard design, you should have a good feel for your users’ screen resolution settings. If your organization has standardized on a single screen resolution, you can easily create dashboard templates that will work well for that resolution.

However, many organizations have a wide variety of screen resolutions to take into consideration. Some departments may have large, high-resolution workstation monitors while the remote employees may have laptops with significantly smaller, lower resolution screens. In this case, you should design templates for the lowest resolution to ensure that the dashboard will be displayed properly on all computer screens. Or, you can design your dashboard templates for one particular resolution and advise the end users on the proper resolution to use to best view the dashboard.

Create Custom Templates

Before discussing custom templates, we should first understand the structure of a ProClarity dashboard. ProClarity dashboards consist of pages, groups, and views, as shown in Figure A-1. The page boundary is shown in blue, and additional pages are represented by tabs across the top of the dashboard. The displayed page consists of two groups, as shown in red. The top group, or Group 1, consists of three views. The bottom group, or Group 2, consists of a single view. View boundaries are shown in green.



Figure A-1: ProClarity Dashboards consists of pages, groups, and views.

Dashboard authors can create custom, fixed-size templates for pages and groups. Dashboard templates are managed in the Dashboard Studio. To launch the Dashboard Studio, click on the “Dashboard Studio” link in the dashboard toolbar, as shown in Figure A-2.



Figure A-2: The Dashboard Studio may be launched from the ProClarity Dashboard.

In the Dashboard Studio, select Templates from the Tools menu to launch the Template Manager as shown in Figure A-3.



Figure A-3: The Dashboard Studio includes a Template Manager.

A sample page template is shown in Figure A-4. The page templates establish how the groups are displayed on the page. Each gray box in the “Layout” pane represents a group.

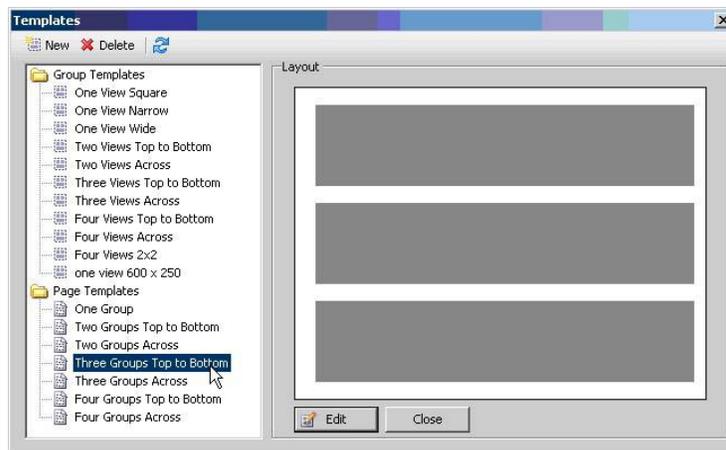


Figure A-4: The designer may select an existing group template, edit a group template, or create a new group template.

Dashboard authors can select an existing page template, edit an existing template, or create a new template. The page template editor shown in Figure A-5 allows dashboard designers to specify how the groups will be arranged on the page. Note that there are no pixel sizes shown in the page template; pixel sizes are specified on a view-by-view basis in the group templates.

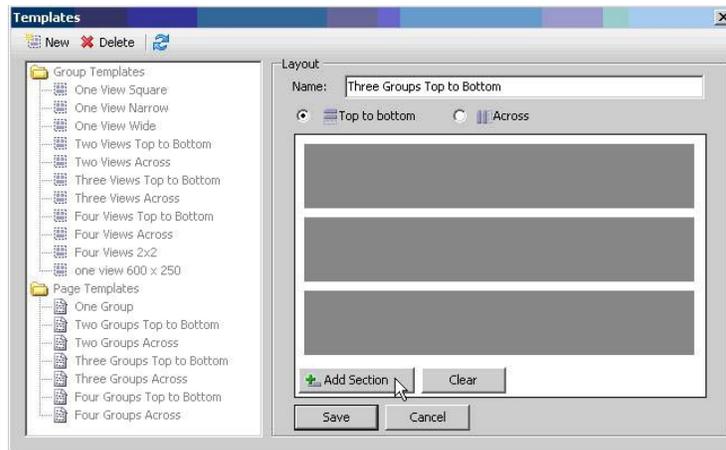


Figure A-5: The page template editor allows the designer to select how groups are arranged on the screen.

A sample group template is shown in Figure A-6. The group template displayed in the Layout pane consists of two stacked views. The view width and height (in pixels) are shown for each group. In this case, each view is 800 pixels wide and 280 pixels high. One might think that a dashboard page with the layout shown in Figure A-6 would be suitable for 800 by 600 screen resolution, but this is not the case! The screen real estate required by the Web browser and the dashboard toolbar must be taken into account. This particular dashboard page would likely require a screen resolution of 1280 by 1024 to safely display without scroll bars. Some experimentation will be required to figure out how to account for the extra pixel space required by your organization’s standard configuration of Internet Explorer.

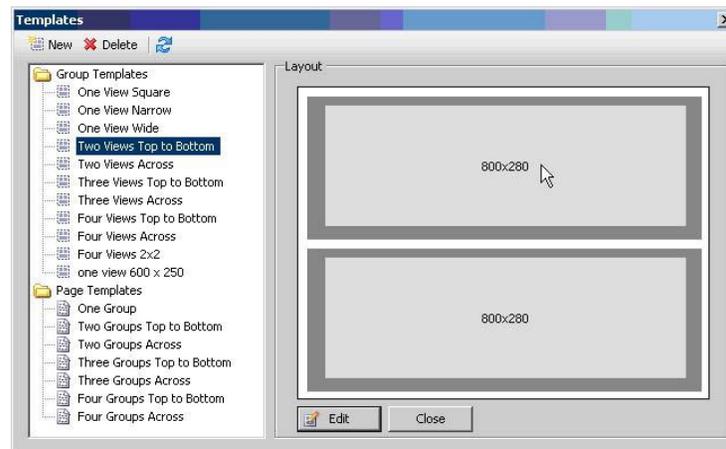


Figure A-6: A sample group template showing view width and height (in pixels) for each group.

AVOID PITFALL #4 (EXPRESSING MEASURES INDIRECTLY) WITH PROCLARITY KPI DESIGNER

In his description of Pitfall #4, Few states, “A measure is poorly expressed if it fails to directly, clearly, and efficiently communicate the meaning that the dashboard viewer must discern.” To design effective dashboard visualizations, the dashboard designer should know exactly what the users need to see and how they intend to use the information.

Example: Budget Variance

Consider Few’s example of a chart that is intended to convey the variance between budget and actual amounts, as shown in Figure A-7. Recall that what the users really need to know is how far above or below the budget they are. With the line chart in Figure A-7, it is relatively difficult to determine how far the actual values are above or below budget.

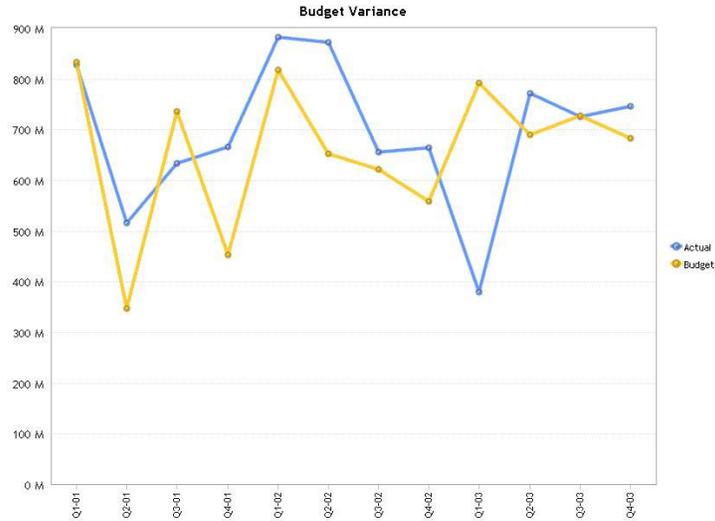


Figure A-7: This line chart makes it difficult to determine the relationship between budget and actual.

To determine budget variance, users must:

- Refer to the legend to find out which series shows actual and which shows budget
- Read the left axis to find out the approximate value of each series
- Subtract the two values to get the absolute difference
- Divide the absolute difference from budget to get a rough idea of the variance percentage

The budget variance is better expressed directly as a percentage. Now consider the line chart in Figure A-8. This line chart has a single data series that represents percentage variance from budget. This chart makes it very clear how far actual values are above or below budget, and it eliminates the manual calculations that the chart in Figure A-7 requires.

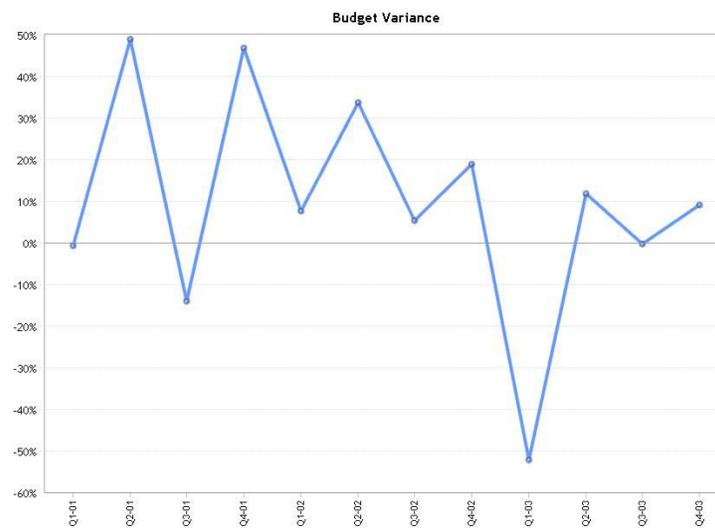


Figure A-8: This budget variance line chart clearly displays the relationship between actual and budget.

The variance calculation in Figure A-8 was created using the ProClarity KPI Designer. The KPI Designer simplifies the process of creating calculated measures, such as Percent Variance, by walking the user through the setup with a wizard that creates the calculation.

ProClarity KPI Designer

The KPI Designer is launched within the ProClarity Professional client by clicking on the KPI Designer toolbar button as shown in Figure A-9.

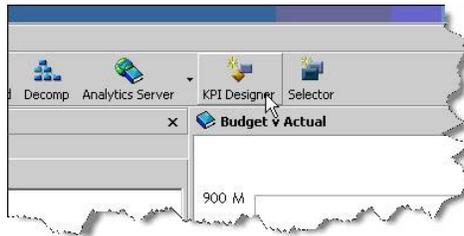


Figure A-9: The ProClarity KPI Designer is launched from the ProClarity Professional client.

The KPI Designer wizard starts with a welcome screen, followed by a list of KPI templates. The template we used to create the variance calculation is called “Percent Markup,” as shown in Figure A-10. A help link (“How can I use this KPI?”) is provided for each KPI to explain the formula and how it may be used. The formula for the budget variance is quite simple: $[(Actual] - [Budget]) / [Budget]$.

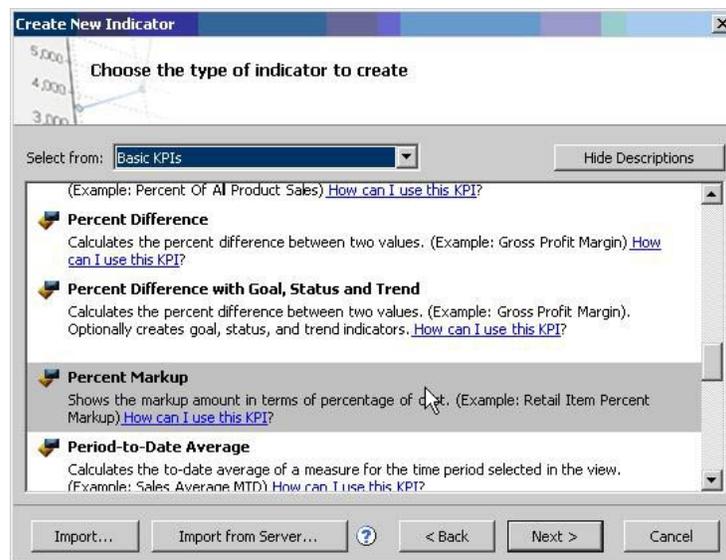


Figure A-10: ProClarity KPI templates include the template used for budget variance.

NOTE: ProClarity KPIs are based on XML templates, so they are extensible. The “Percent Markup” template may be renamed “Variance %” and the wizard screens modified, if desired. Please refer to the ProClarity SDK for more information.

The KPI Designer wizard walks users through selecting which measure in the OLAP cube represents actual amount and which measure represents budget. Figure A-11 shows how we selected the actual amount measure to represent revenue in our KPI.

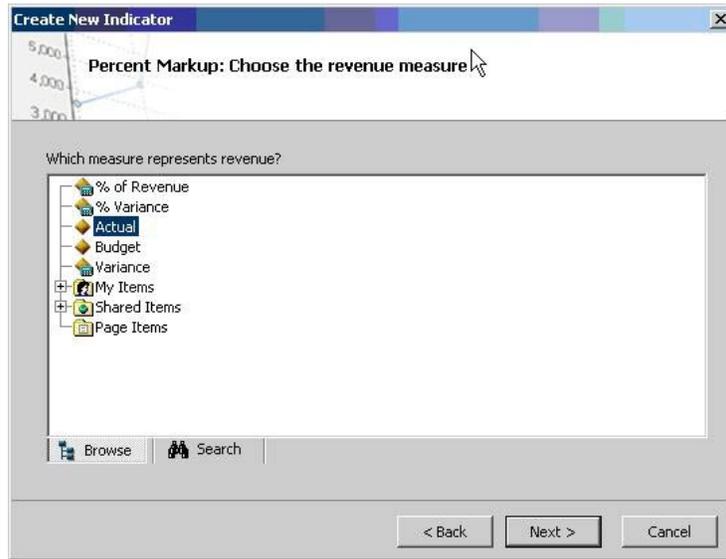


Figure A-11: The KPI Designer wizard makes it easy to select the measure that represents revenue.

Recall that our KPI formula uses a budget amount. Figure A-12 shows how we selected the budget measure to represent this value.

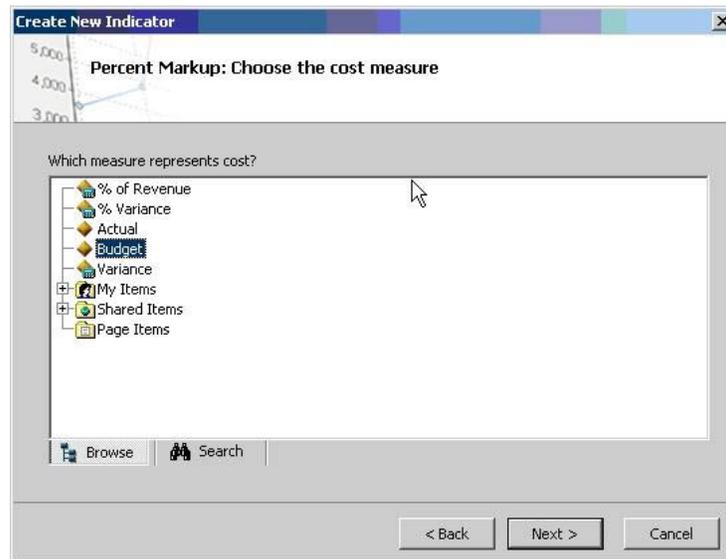


Figure A-12: The KPI Designer allows us to select the budget measure to represent the budgeted amount.

Now that we have selected a KPI template and the measures to represent the values in the KPI formula, we need to name the KPI, determine the display format, and save it, as shown in Figure A-13.

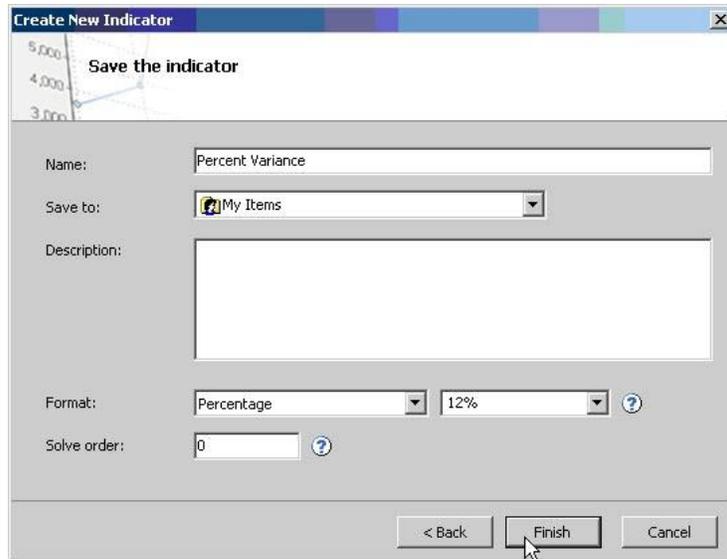


Figure A-13: As a last step, the KPI Designer wizard prompts users to name, format, and save the KPI.

Once complete, a new KPI can be used to create a chart such as the budget variance chart shown in Figure A-14.

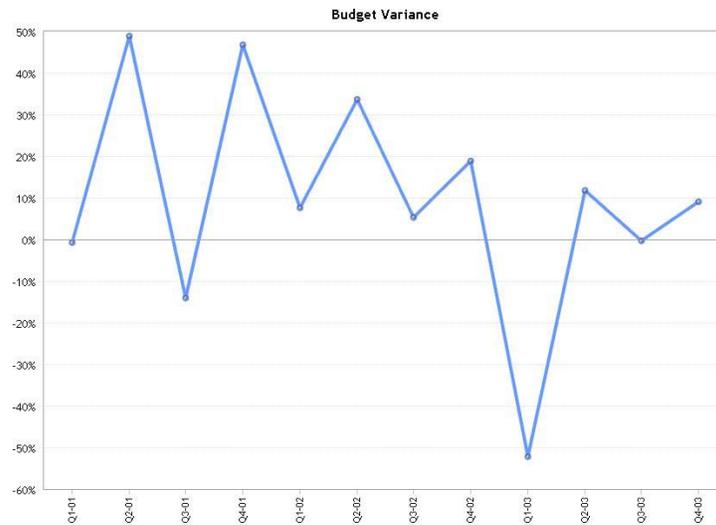


Figure A-14: This budget variance chart clearly displays the relationship between actual and budget.

When Magnitude is Important

The magnitude of the actual and budget amounts may be important. For example, a 10% variance above budget may not be significant if the actual amount is only \$1,000. But it may be very significant if the actual amount is \$1,000,000. In this case, two stacked line charts may be used to display both the variance percentage and variance amount as shown in Figure A-15. Here, the variance is shown as a percentage in the upper chart, and in dollar amounts in the lower chart.

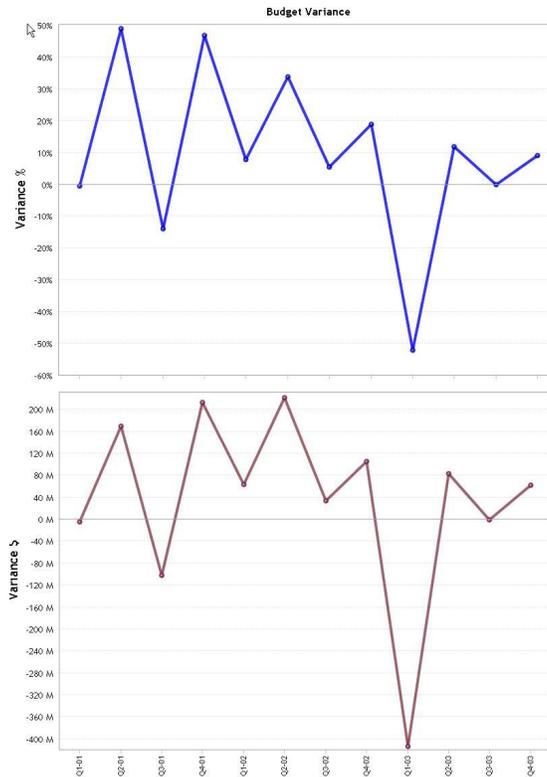


Figure A-15: Stacked charts may be used to display both percentage and amount variance.

Chart Selection and Formatting

Stephen Few asserts that several common pitfalls in dashboard design may be avoided with proper chart selection and formatting. Two such pitfalls are:

- Pitfall #5: Inappropriate Media of Display – selecting the wrong type of graph for the data and its message
- Pitfall #8: Encoding quantitative data inaccurately – graphical representations of data that inaccurately displays the quantity

ProClarity includes a wide array of business charts and formatting options that allow the dashboard designer to select the right chart for the right job. The next section will give a brief introduction on how to apply chart formatting with ProClarity to avoid some of the pitfalls described above.

AVOID PITFALL #5 (INAPPROPRIATE MEDIA OF DISPLAY) WITH PROCLARITY CHARTS AND FORMATTING OPTIONS

Knowing which graph type to apply to a particular dataset that best communicates the intended message is a skill that does not come naturally to many people. Volumes have been written by experts such as Stephen Few to help dashboard designers learn this skill.

ProClarity offers the standard business charts and subsequent formatting options needed to use appropriate graph and chart types to convey information. As shown in Figure A-16, a pie chart can be used to display sales amount broken out by state. However, depending on what needs to be conveyed, this may not be the best chart type to display sales comparisons.

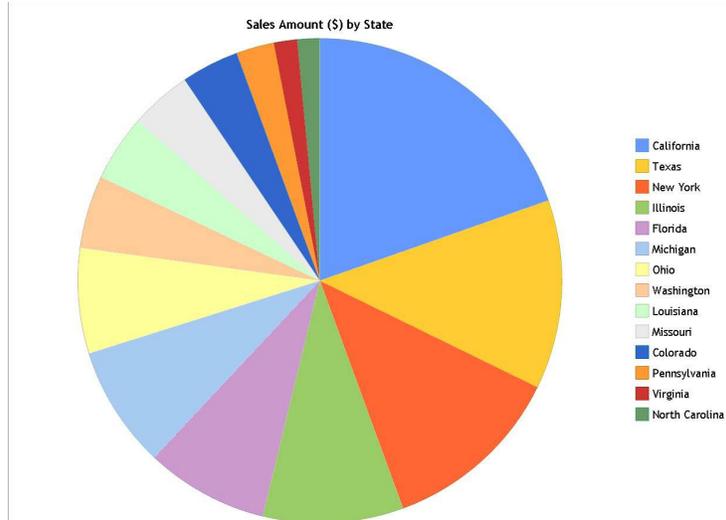


Figure A-16: This pie chart is likely not the best graph to show the relationships between the data series.

Assuming that the relationship between the data values for each state is important, a better chart type to use is a horizontal bar chart, as shown in Figure A-17. This particular chart makes it easy to see both how the states compare with each other and sales amounts.

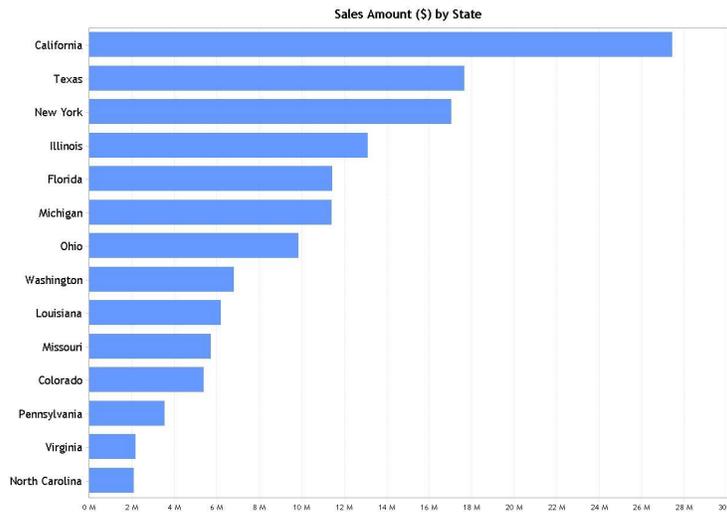


Figure A-17: A horizontal bar chart communicates the relationships between data series more clearly and effectively.

Available Chart Types

ProClarity includes a variety of standard business charts from which to choose, including:

- Area
- Bar (vertical and horizontal)
- Line
- Point
- Pie

Chart types may be specified from various menus in the ProClarity Professional client. By right-clicking on a ProClarity chart, users can launch the Chart Properties dialog box shown in Figure A-18. In addition to allowing users to select chart types, the Chart Properties dialog box contains many useful formatting options, some of which we will apply to avoid another common pitfall.

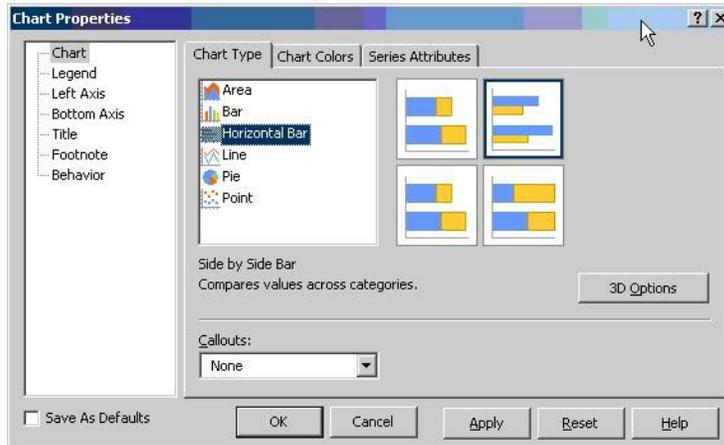


Figure A-18: The Chart Properties dialog box allows users to adjust chart types to suit their needs.

AVOID PITFALL #8 (ENCODING QUANTITATIVE DATA INACCURATELY) WITH PROCLARITY CHART PROPERTIES

Visual data should be encoded to accurately reflect the values and relationships of visual objects. Data can be misrepresented by the scaling and alignment of the axes that represent the values. To illustrate this, an example from Few's white paper is replicated in ProClarity and shown in Figure A-19.

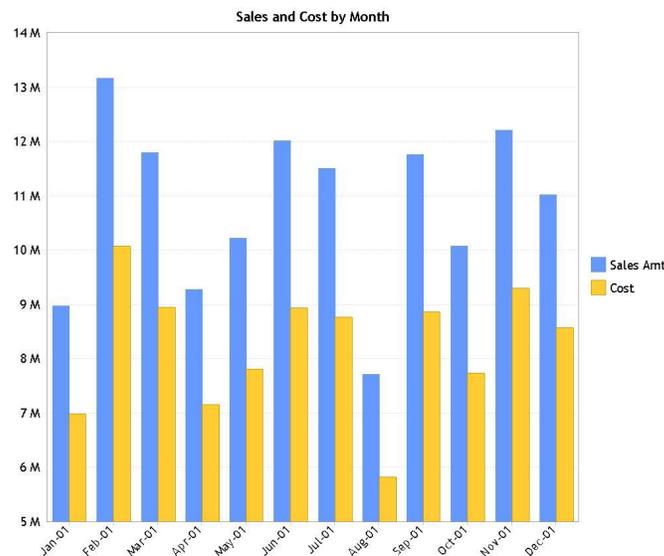


Figure A-19: Scaling and alignment settings cause this bar chart to inaccurately represent the relationship between sales and cost.

In the bar chart shown in Figure A-19, the left axis represents the magnitude of the sales and cost measures. The relationship between sales and cost should be obvious from the relative size of the bars, but this is not the case. For example, the pair of bars for Dec-01 (far right side of the chart) seem to indicate that sales (in blue) is nearly double that of cost (yellow). However, the actual values are roughly \$11M and \$9M, a difference of less than 20%. The alignment of the left axis is the problem here. Instead of starting with zero, it starts with \$5M.

To correctly align the left axis, open the Chart Properties dialog box by right-clicking on the chart. Select “Left Axis” in the left pane of the dialog box and then select the “Left Axis Scaling” tab as shown in Figure A-20. The “automatic” scaling property will select the appropriate axis scaling in most cases.

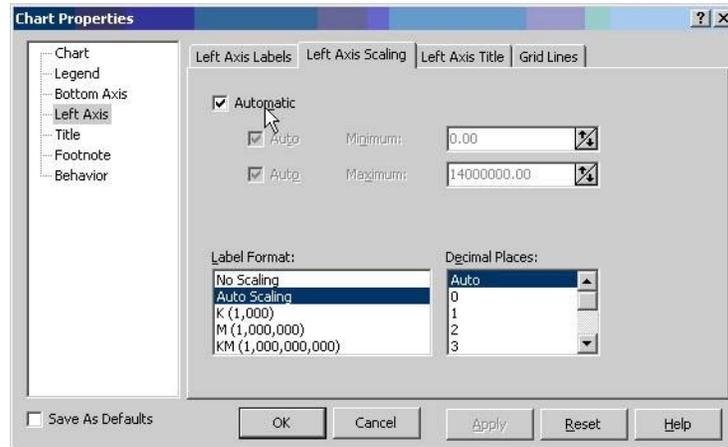


Figure A-20: Select “Automatic” axis scaling to properly align the left axis.

By applying the automatic scaling property to the chart, we get a more accurate representation of the information, as shown in Figure A-21.

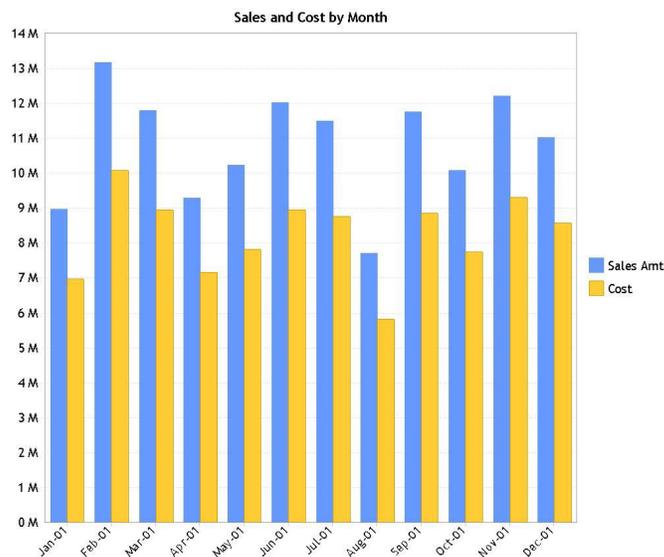


Figure A-21: The left axis in this chart starts at zero and more accurately shows the relationship between sales and cost.

If more fine-grained control is needed, minimum and maximum axis values may be selected. Use with caution! Selecting manual axis limits is a recipe for creating misleading charts, as the manual setting will not readjust as data values are changed. Selecting the automatic scaling is the best way to ensure proper axis alignment.

SUMMARY

Designing effective dashboards requires an understanding of effective visual design. Furthermore, dashboard software should enable designers to create highly effective dashboards by providing the features and flexibility that allow designers to apply lessons learned in effective visual design. ProClarity Analytics 6 may be used to help apply those lessons and avoid some of the most common pitfalls in dashboard design.

For more information on ProClarity Analytics 6, and how to use ProClarity to create highly effective dashboards, please visit the following resources.

- Analytic Dashboards Toolkit available at the ProClarity BI Resource Center: http://www.proclarity.com/sqlserver2005/toolkit_analytic_dashboards.asp
- Courses available through ProClarity University: <http://www.proclarity.com/training/>
- Information about ProClarity Dashboard Server: <http://www.proclarity.com/products/dashboards.asp>

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ProClarity is a leading provider of business intelligence (BI) software that empowers users to visualize and explore multi-dimensional data, perform root-cause analysis of business information and monitor organizational performance. ProClarity leverages the power of the Microsoft business intelligence platform to provide end-to-end, enterprise-class reporting and analytics solutions with multiple deployment options that enable organizations to make faster, smarter decisions. Headquartered in Boise, Idaho, ProClarity has regional sales and services offices throughout North America, Europe and Asia-Pacific. Founded in 1995, ProClarity supports more than 2,000 customers globally including AT&T, Barnes & Noble, Ericsson, Hewlett-Packard, The Home Depot, Pennzoil-Quaker State, Reckitt Benckiser, Roche, Siemens, USDA, Verizon and Wells Fargo.

