

# XCELSIUS<sup>®</sup> 2008

## DASHBOARD BEST PRACTICES

LOREN ABDULEZER

  
**Business Objects**<sup>™</sup>  
an SAP<sup>®</sup> company  
Press

## **XCELSIUS® 2008 DASHBOARD BEST PRACTICES**

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# FOREWORD

Have you ever experienced how data can change the world? How compelling presentations can get CEOs out of their seats? How a business dashboard can turn a regular business manager into an invaluable hero to a company? Or how a tool that simplifies data and makes information informative, useful, and actually fun can transform a career?

I have. It happened for me a couple years ago. My team at Business Objects was looking for a way to present a new business opportunity with key metrics, business drivers, and trends to our CEO. We had about an hour to present everything and help make a key business decision.

We had a lot of slides and spreadsheets and the usual information you'd expect. But then we summarized the entire business opportunity and how we wanted to look at the opportunity into a single dashboard. We combined all the key data that we were using to look at the business decision. Within a few hours, we turned mountains of tabular, virtually incomprehensible data into a powerful business tool. And we added the key element that every CEO wants: the power of "what-if." What if sales didn't meet expectations? What if we couldn't meet our cost-cutting objectives? And more importantly, what if it really worked!

As we were presenting, our CEO jumped out of his chair and started to "drive" the dashboard: He put his own experience and assumptions to the model. What we showed was that it was actually a bad idea to make the investment that many were asking for. The numbers didn't add up. By not making the decision, we saved the company potentially millions of dollars, countless resources, and a lot of churn trying to make something work that just didn't make sense to us or the CEO.

On the bright side, by taking advantage of the power of Xcelsius to build the dashboard, my team gained broad recognition for providing something that was simple enough, compelling enough, and actually fun enough to change the course of the business, and in the process, our careers. Having the right skills to build a business dashboard without overwhelming the audience made all the difference.

Sure, we could have shown some data in a spreadsheet, but the only reason CEOs get out of their chairs to look at a spreadsheet is because the font is too small to read. Put that data into Xcelsius and you will quickly change the way you see and monitor your business and completely change the decision-making experience.

Our challenge to you, the reader, is to go beyond the creation of a simple chart or graphic you've built in a presentation or spreadsheet tool to a real business dashboard that can have a major impact on your most important business aspects. Model your business. See how decisions impact the environment. See how pricing, promotions, and marketing impact consumer behavior. Liven up your dashboards by connecting your dashboard to real-time, live data from within your company or any web service to get up-to-the-second monitoring. Use your business data anywhere, and take your proposal from the shop floor all the way to the board room.

In my experience, the key elements that you need to effectively build business dashboards that will make a difference include the following:

- Designing a spreadsheet that clearly identifies the inputs and results for use by the dashboard. Of course, let the spreadsheet do the hard work of crunching the complex calculations!
- Mapping visual components on the dashboard to drive the inputs on the spreadsheet. You have a wealth of components to choose from—everything from sliders to dials and list boxes, and then some. You can also manage their properties so that they are truly interactive.
- Adding visual components to display spreadsheet results. Again, you have a wealth of components to choose from. Every dial, gauge, chart, map, and table can be imbued with complex properties and alerts.
- Building dashboard interactivity and managing visibility of the various components so that your dashboard keeps toe to toe with its embedded spreadsheet.

Loren's book shows how to take advantage of these features in Xcelsius 2008 to build astounding dashboards. Make sure you take some time to learn some best practices laid out in this book. Try out the samples to get you started. And make sure you share your great work with others.

Every day we see more great dashboards that are changing the world, one dashboard at a time. And remember, just as a good dashboard can improve you and your company's performance, bad data, poor layout, excessive use of unnecessary bells and whistles, and irrelevant data and information can have the opposite effect.

Good luck. Have fun. And don't be surprised when you get a welcome, yet unexpected, reaction when you share your dashboards. Done right, you've truly never seen a spreadsheet do this before!

**James Thomas**

Vice President, Product Management

Business Objects, an SAP company

# PREFACE

A broad and growing community of professionals regularly prepares or needs to prepare dashboards and interactive visualizations and reports. Like many of those other professionals, I have used Excel to create useful reports and dashboards. The problem is that unless I incorporated extensive amounts of one-off code, Excel lacked some essential features that I was looking for:

- The ability to design a dashboard interface by dragging and dropping components on a canvas
- The ability to map visual components to a “live” spreadsheet built using my Excel models
- The ability to deploy simple, self-contained dashboards that are suited for visual data analysis by ordinary users

Those capabilities existed in Xcelsius 3.0. Two product generations later, Xcelsius 2008 has undergone a metamorphosis; Xcelsius now includes a well-honed and highly integrated spreadsheet and dashboard design environment, significantly greater spreadsheet functionality, more visual components and interface options, a revamped and expanded framework for data connectivity, and the ability to create entirely new custom-designed components on equal footing with built-in components.

This is great stuff. It sounds like everybody ought to be using Xcelsius 2008, for anything and everything. But Xcelsius 2008 isn't intended to be a jack-of-all-trades. First and foremost, Xcelsius 2008 is a serious tool for building interactive dashboards and intelligent visualizations. The secret to its power is how it is joined at the hip with spreadsheets.

Xcelsius 2008 is remarkably easy to use. From a dashboard layout perspective, everything is point and click. You don't need much in the way of spreadsheet prowess to start doing interesting and useful things with Xcelsius. This quick bang for the buck is like kindling wood in a furnace: It's enough to get a flame started, but it won't heat up the room. To get a roaring and self-sustaining fire, you need to take things to the next level.

So what is stopping you from building better dashboards? The biggest challenge holding most people back is lack of time. If you are busy worrying about monitoring and meeting production quotas, or allocating budgets among competing projects, you are probably not going to spend a lot of time improving on a dashboard design once you get it working. Maybe for an occasional dashboard, that's smart thinking. If your dashboard serves you well, you will no doubt use it to do more things. Who knows? Maybe you need to enable weekly or daily analysis in addition to monthly analysis.

Say that you want to add a second product line, monitored by a dashboard. You start with your already working dashboard design as your template and add more features. As you keep cloning, you are stepping up your maintenance responsibilities and possibly bloating your dashboard. At some point not far down the road, the dashboard capabilities plateau. It is not nearly agile enough to keep up with changing requirements or expectations. This is

where best practices come into play. I know that time is premium for you. It is for everyone. To save you valuable time, I have worked out a wealth of best practices and techniques so that you don't need to reinvent the wheel.

In this book, I do a few other things:

- Introduce you to the features you need to know. I get you started with setting up your Xcelsius workspace. I introduce you to essential components and show you how to use them. I help you build up your spreadsheet skills in an Xcelsius-centric way.
- Show you how to use the new and important features of Xcelsius 2008 so that you can quickly transition to this newer technology.
- Cover the essential components you will regularly be using in dashboards, from charts to dials, gauges, sliders, and maps. I cover the standard features such as drill down and alerts.
- Show how to turbo-charge the various dashboard components so that they do things you wouldn't ordinarily expect. For instance, you'll learn how to use a single dial on a dashboard to set the values of dozens or hundreds of variables.
- Show how to design simple and effective dashboard interfaces. When these need to be scaled up to do complex things, the designs don't change, and they don't break down.
- Describe how the preparation and processing of data, including techniques for validating and structuring of data, play a central role in dashboard best practices.
- Devote whole chapters to constructing spreadsheet formulas embedded in dashboards, statistical analysis, financial analysis, and working with less-than-optimal data.
- Show how to utilize features of Xcelsius 2008 for remote data connectivity, such as XML maps and Web Services.
- Explain how to construct custom components.

The undercurrent that runs through this book is empowerment. Every step of the way, I show how you can work smarter by using best practices.

*Loren Abdulezer*

*December 2008*



## In this introduction

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One of the first things that caught my attention about Xcelsius is that it is fundamentally a paradigm-shifting technology. Xcelsius intentionally blurs the distinction between spreadsheets and presentation-layer dashboards.

Back in 2005, when the product first started getting traction, it was ahead of its time. Most of all, Xcelsius needed to catch up to its own revolutionary ideas. Back then, the spreadsheet portion and the canvas lived in parallel but disjointed universes. They could be tethered by statically linking component properties to fixed cell coordinates. This was a great proof of concept and prototype but wasn't always practical.

From time to time, spreadsheet models do need to get updated. With early versions of Xcelsius, if you inserted or deleted a row or column, it sometimes completely derailed the Xcelsius component-to-spreadsheet-cell mapping. At the cost of increased spreadsheet design complexity, I developed a solution to this problem. This opened the floodgates so that I could redesign imported spreadsheets with impunity and not have to worry about upsetting the mapping between components and spreadsheets. In effect, it gave me a three-year head start in developing effective techniques and best practices that are applicable to Xcelsius 2008.

Xcelsius 2008 supports some new spreadsheet functions. One of them is an amazing and often-overlooked function called `OFFSET`. In earlier versions of Xcelsius, you could use `INDEX` to redirect data from any column or row of your choosing and pipe it into a chart or other visual component in your dashboards—a technique I call *context switching*. Thanks to `OFFSET`, this functionality can now be truly turbocharged using Xcelsius 2008.

Over the years I developed a wealth of techniques and best practices so that the data and computational side of the Xcelsius dashboards could be on par with the stunning visualizations so often associated with Xcelsius.

As Xcelsius 2008 moved past the drawing board, I reworked and substantially extended those techniques for the new Xcelsius. I often found myself more on the bleeding edge than cutting edge of this new technology.

After Service Pack 1 for Xcelsius 2008 solidified, the techniques, methodologies, and approaches to dashboard design with Xcelsius 2008 all fell into place rather naturally.

Xcelsius 2008 as a product and technology has caught up with its revolutionary ideas and is ready for primetime. That is half the battle. The task ahead of you is to use Xcelsius 2008 to catapult your dashboards and visualizations beyond toy demonstrations.

Using Xcelsius is easy when you understand the ins and outs of building and designing dashboards.

The first lesson you are going to learn in this book is that if you really want your Xcelsius dashboard to shine, you have to take responsibility for managing the data that feeds into your visualizations. This means you have to control the data, juggle it with formulas, and do what is necessary so that it is on rock-solid footing by the time it appears visually.

Why is all this really necessary? Dashboards are interactive, and Xcelsius dashboards perform live computations. The data in a dashboard is generally not static and is subject to ongoing updates and revisions. To complicate matters, the drivers and inputs in visualizations are subject to the whims of your dashboard users.

There are things you can do to keep your dashboards out of hot water. For example, say that you have three companies vying for market share—your company and two competitors. You know that 100% of the market share will never be exceeded. How can you build a dashboard to assess your competitive positioning, assign market share, and never have to worry about overallocating percentages? Best practices provide a structured methodology for dealing with issues of this kind and for taking what might be inefficient or unmanageable and keeping the process sane and contained.

#### NOTE

You can find a dashboard of this kind in Chapter 2, “Showcase of Xcelsius 2008 Dashboards,” and its implementation is covered in Chapter 12, “Smart Data and Alerts.”

## GETTING WHAT YOU NEED FROM THIS BOOK

My goal in this book is to help you quickly learn specific techniques and practices, provide information in a sensible order, and help you understand some practical matters about working with examples and your own files.

### LOCATING SPECIFIC TECHNIQUES QUICKLY



This book covers a broad range of topics in 16 chapters. The chapters are chock full of valuable techniques, tips, and strategies. The chapters are organized by subject matter rather than by best practice. To help you locate best practices, I’ve cataloged more than 100 best practice techniques and tips in Appendix C, “Xcelsius Best Practice Techniques and Hip Pocket Tips,” which lists topics and where to find them in the book. To help you locate the details within the chapters, a best practices icon appears in the margin next to each best practice.

#### NOTE

You can find the dashboard files that accompany this book on [www.XcelsiusBestPractices.com](http://www.XcelsiusBestPractices.com).

### HOW TO READ THIS BOOK

This book will be valuable to you whether you are new to Xcelsius or already have some experience under your belt. You may want to approach the text differently, depending on your familiarity with creating dashboards and using Xcelsius.

### FOR NEW XCELSIUS USERS

If you are entirely new to Xcelsius, first skim Chapter 2, which quickly introduces you to various kinds of Xcelsius dashboards. Then read through Chapter 1, “Motivation for Using Xcelsius 2008,” so that you have an idea of how your spreadsheets and dashboards work together in Xcelsius. Move on to Chapter 3, “Getting Familiar with Xcelsius 2008,” to get a foundation for working with Xcelsius. Think of Chapter 3 as your first day of on-the-job training.

If you want, you can skim through Chapter 4, “Embedded Spreadsheets: The Secret Sauce of Xcelsius 2008,” but you may be better off immediately jumping to Chapters 5, “Using Charts and Graphs to Represent Data,” and 6, “Single Value Components: Dials, Gauges, Speedometers, and the Like.” Don’t worry about the details; concentrate on the basics. Now you can jump to pretty much any other chapter in the book. As you need, refer to Chapter 4 when the spreadsheet stuff gets too heady.

### FOR VETERAN DASHBOARD DESIGNERS WITH PRIOR XCELSIUS EXPERIENCE

If you are a veteran user of Crystal Xcelsius, you can initially concentrate on Chapter 3 to set up your Xcelsius 2008 environment. The Xcelsius 2008 workspace may take some getting used to, but you will definitely find the tight Xcelsius/Excel integration to be liberating.

Then spend some time reading through Chapter 4 but don’t worry about reading it from beginning to end. Instead, pick a spreadsheet topic of interest to you—the text functions or date and time functions, for example. Read through that section thoroughly to learn how to set up and use those functions in a dashboard setting.

Make sure you go through Chapters 5 and 6, which describe valuable dashboard designs and constructions. They may give you ideas on how to redesign some of your own. From there on, feel free to read any of the chapters in any order you please.

### ACCESSING LEGACY XCELSIUS FILES

Xcelsius 2008 can read and convert Crystal Xcelsius files (that is, Xcelsius version 4.5). If you have files built with Xcelsius 4.0 or earlier, you will first need to open them by using Crystal Xcelsius and save them as Xcelsius 4.5 files. Then you may be able to open them by using Xcelsius 2008.

The process of converting legacy files to Xcelsius 2008 may not be so easy. Instead of trying to retrofit a legacy Xcelsius file, you may be better off building a new dashboard from scratch, using the best practices described in this book.

### BEST PRACTICES VERSUS SHORTCUTS

Some quick solutions to vexing problems cut corners and work, and some are hacks. For example, the common practice of overlaying charts one on top of another can work and can be effective, and with the previous versions of Xcelsius, it may have been the only way to do certain things. I do not view such strategies as best practices, so I generally steer away from

talking about practices of this kind. However, I do make some exceptions, discussing such techniques and explicitly citing them as not being best practices but being practical shortcuts. For example, Chapter 14, “Other Dashboard Techniques and Practices,” discusses a filled radar chart with alerts. I point out in the chapter that this is not a best practice. I also list this as an item in Appendix C.

In summary, while I try to keep the discussions pure and focused on best practices, I balance this with practical techniques.

## WHAT THIS BOOK COVERS

The purpose of Part I, “Xcelsius 2008 Fundamentals,” is to color your impressions about Xcelsius 2008 and Xcelsius dashboards and lay a foundation for how to approach the use of Xcelsius 2008.

Chapter 1, “Motivation for Using Xcelsius 2008,” gives you a backdrop for Xcelsius and spreadsheets and reveals how the two are heavily intertwined.

Chapter 2, “Showcase of Xcelsius 2008 Dashboards,” is like a wine tasting party. You’ll get a sampling of different kinds of dashboards and have a chance to think about what’s important for you and what might be interesting to pursue when you start building dashboards. In this chapter, I point out where you can find more about specific dashboards or dashboard features.

Chapter 3, “Getting Familiar with Xcelsius 2008,” helps you set up your Xcelsius workspace so you can quickly begin to build rudimentary dashboards. It also sets the stage for building full-featured dashboards. It’s important that you think clearly about using the features of the Designer environment and tapping into the unique dashboard capabilities for which Xcelsius is known.

The powerhouse behind Xcelsius is the underlying spreadsheet. If you want to do really powerful and astounding things with Xcelsius, you need to know how to use spreadsheet formulas and functions. Chapter 4, “Embedded Spreadsheets: The Secret Sauce of Xcelsius 2008,” is a skill-building chapter that works from the ground up on how to construct spreadsheet formulas in Xcelsius. This chapter is a comprehensive reference guide that covers essential spreadsheet functions, replete with examples and pragmatic constructions, and identifies some important differences between Excel functions and their handling within Xcelsius.

Chapter 5, “Using Charts and Graphs to Represent Data,” introduces you to charting components and how to use them. You’ll learn about the major kinds of charts and how to work with them; you’ll end up with a better understanding of practical matters such as chart scaling. You’ll learn about some new kinds of components introduced in Xcelsius 2008, such as Tree Map components. I also show some techniques for handling known charting problems, such as displaying negative values in bubble charts.

Chapter 6, “Single Value Components: Dials, Gauges, Speedometers, and the Like,” provides information on sliders, dials, and gauges. In this chapter, I cover Xcelsius themes to show how you can alter the appearance of your dashboards. A common criticism of dashboard dials and gauges is that they consume large swaths of screen space. I show a technique that allows you to share a single component, such as a dial, with a virtually limitless number of dashboard variables.

Part II, “Xcelsius 2008 Best Practices and Techniques,” is a comprehensive guide to Xcelsius components and best practice techniques.

When you discover that you can pack a lot of punch in your dashboards with the wide array of components, you’ll find your visualizations becoming quickly crowded. Chapter 7, “Using Multi-Layer Visibility in Your Dashboards and Visualizations,” shows you how to avoid needless complexity by using best practice techniques for managing visibility.

Chapter 8, “Managing Interactivity,” gives you more control in managing interactivity. You’ll learn about putting to use drill down features and interacting with various kinds of interfaces.

Chapter 9, “Xcelsius and Statistics,” is an Xcelsius-centric foray into statistics and statistical analysis. This chapter shows how to meaningfully integrate statistical techniques with Xcelsius. For example, histograms are commonplace, but is it commonplace to have a histogram where you can use a slider to set the boundaries between categories appearing in the histogram?

Chapter 10, “Financial Analysis,” shows how you can use the power of an underlying spreadsheet to build dashboards for converting between accrual and cash accounting, Value at Risk dashboards, and ratio analysis.

Chapter 11, “Maps in Xcelsius,” shows you best practices on using Xcelsius Map components for traditional and nontraditional applications, including augmented maps, colored maps, multi-selection maps, international maps, and connected maps.

Chapter 12, “Smart Data and Alerts,” shows you how to utilize alerts in Xcelsius and how to create smart data.

Chapter 13, “Working with Less-Than-Optimal Data,” shows practical spreadsheet techniques for detecting the presence of transposed digits, dealing with raw and unclean data, working with rounding and truncation errors, fixing faulty formulas, and dealing with scaling issues.

Chapter 14, “Other Dashboard Techniques and Practices,” addresses a variety of dashboard design solutions, including filled radar charts with alerts and avoiding occlusion with area chars. This chapter introduces a dashboard technique I call an “ABC” chart that flows two data sources into a combined chart. This chapter also addresses an interesting technique involving box plots.

Part III, “Advanced Features,” introduces advanced features of Xcelsius 2008.

Chapter 15, “XML and Data Connectivity,” explains how the Xcelsius Data Manager unifies data connectivity and outlines basic techniques for defining data connections and managing data refreshing. These principles are illustrated with XML Map components and Web Services.

Chapter 16, “Creating Custom Components for Fun and Profit,” opens the door to doing something with Xcelsius not previously possible—constructing custom components. In this chapter, I spell out the essential setup needed for designing custom components, outline the workflow involved in building components, illustrate how to build a component, and outline important and expanded next steps.

This book includes three helpful appendixes.

Appendix A, “Supported Spreadsheet Functions in Xcelsius 2008,” outlines the full range of Excel spreadsheet functions that are supported in Xcelsius 2008. This complements Chapter 4.

Appendix B, “Xcelsius Product Family Comparison,” outlines the differences among the various editions of Xcelsius 2008: Xcelsius Present, Engage, Engage Server, and Enterprise. This appendix describes each edition’s general features, built-in assistance, font support, data connectivity support, export and snapshot options, themes and styles, and back-end server support. I also run through a comprehensive list of component types, organized by Chart components, Contain components, Single Value components, Selector components, Map components, Art & Background components, Text components, Web Connectivity components, and Other components (such as the Interactive Calendar, Trend Analyzer, and other miscellaneous components).

Appendix C, “Xcelsius Best Practice Techniques and Hip Pocket Tips,” is a guide that helps you immediately locate specific best practice techniques. It identifies valuable techniques and where to find each in the book.

## CONVENTIONS USED IN THIS BOOK

This book uses several special elements:

### TIP

Tips provide advice or describe a different way of accomplishing a task.

### NOTE

Notes present extra information about a topic.

### CAUTION

Cautions pull out critical information about fixing or avoiding problems.

Code-continuation arrows are used when a line of code won't fit on one printed line. The code is wrapped to the next line and the continuation is preceded with a code-continuation arrow, like this:

```
- (B7*(EXP(B8*C12*(-1)))*NORMDIST(((LN(B6/B7))+((B8+(B13*B13/2))*C12))/(B13
↳*(SQRT(C12)))-(B13*SQRT(C12)),0,1,TRUE))
```

# USING CHARTS AND GRAPHS TO REPRESENT DATA

## In this chapter

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- Viewing Grouped Data with Stacked Charts 135
- Working with XY and Bubble Charts 141
- Working with Tree Maps 148
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One of the reasons dashboards are popular and successful is that they help you show information and relationships that would otherwise be difficult to see. It should come as no surprise that charts and graphs play a key—or even central—role in the preparation of dashboards.

The goal of this chapter is to introduce you to using charting components in Xcelsius 2008. While many of the features of charting or graphing components are outlined, the emphasis is on how to use charting and graphing components to better convey information. Sometimes, important information is buried in the rows and columns of data. Visualizing data the right way can help to reveal insights.

## CHOOSING THE RIGHT COMPONENTS FOR A DASHBOARD

Every dashboard has a story to tell. As you create a dashboard, your choice of components and the way you set your chart attributes can either bring out that story or bury it.

Say that you want to incorporate the following snippet of data, which represents the number of daily visitors to a website, in your dashboard:

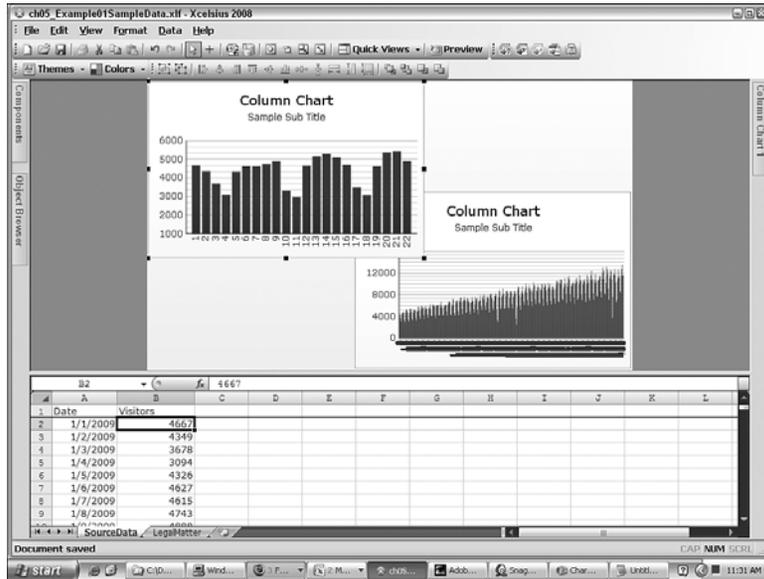
<b>Date</b>	<b>Visitors</b>	<b>Date</b>	<b>Visitors</b>
1/1/2009	4667	1/12/2009	4648
1/2/2009	4349	1/13/2009	5154
1/3/2009	3678	1/14/2009	5281
1/4/2009	3094	1/15/2009	5088
1/5/2009	4326	1/16/2009	4709
1/6/2009	4627	1/17/2009	3477
1/7/2009	4615	1/18/2009	3078
1/8/2009	4743	1/19/2009	4617
1/9/2009	4888	1/20/2009	5357
1/10/2009	3321	1/21/2009	5421
1/11/2009	2955	1/22/2009	4902

What is printed here is just a snippet. The full data can easily span a year or more. You can find the full spreadsheet for this example in the file `ch05_SampleData.xls`.

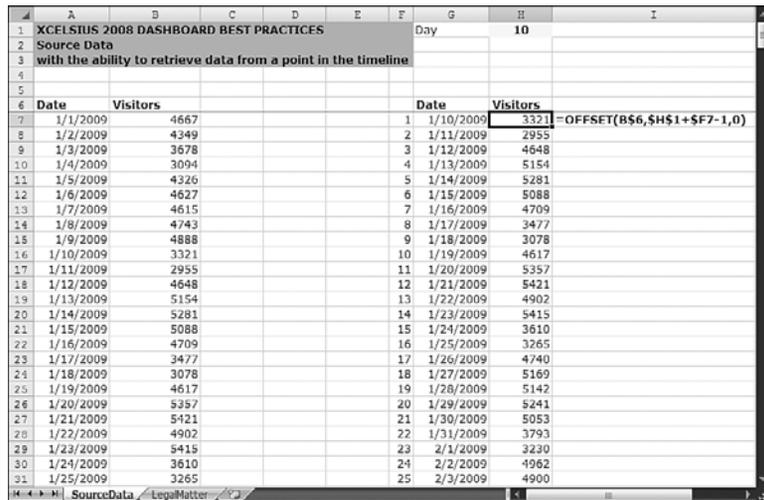
Your first hurdle is to determine how much data you want to display. Figure 5.1 shows two alternative views of the data. The top-left graph represents a 22-day snippet of data. The lower-right graph represents data over the full range of dates, roughly spanning a full year.

A quick glance reveals an increasing progression in the data over time, but there is a lot of variation throughout the course of a week. It would be nice to be able to choose an arbitrary point in the timeline and show all the data over, say, a 30-day period. You can do this by using the `OFFSET` function (see Figure 5.2 or the `ch05_SampleDataEnhanced.xls` file).

**Figure 5.1**  
Two ways to represent the data on a dashboard.



**Figure 5.2**  
OFFSET allows you to choose data from any point in the timeline.



It's not difficult to turn this into a rudimentary dashboard (see Figure 5.3).



Here are some quick steps to take:

1. Launch Xcelsius 2008 and import the `ch05_SampleDataEnhanced.x1f` file.
2. Drag a Column Chart component onto the canvas. If you prefer, you can instead use a Line Chart component or a Combination Chart component.

3. Map the component to the underlying spreadsheet data.

Click the chart and in the General tab of the chart's properties panel, click the By Series radio button and then click the + button to add a data series.

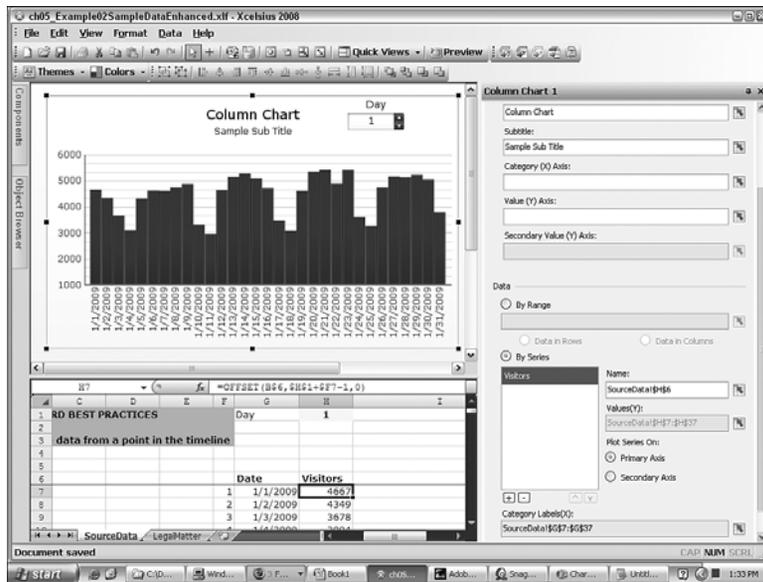
Within the added data series, link the Y values to the data to be displayed. If you are following this example, this would be cells H7:H37 of the SourceData worksheet.

If for some reason you want the Y-axis to appear on the right side of the chart, choose Secondary Axis instead of Primary Axis.

Link the category labels to the cells G7:G37.

4. Drag a Spinner component onto the canvas and link the data field to the day number (in this example, it is cell H1).

**Figure 5.3**  
A very basic timeline dashboard.



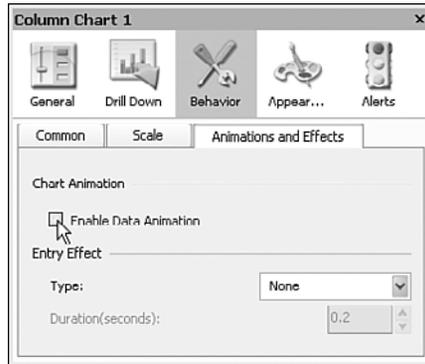
When you open the dashboard in preview mode or export the dashboard, you should be able to move along the timeline by clicking the up and down arrows in the Spinner control or jump to a day number by typing in the number.



There are a number of things you need to fix in the dashboard you've created so far. As you use the Spinner control to advance in the timeline, the column chart is a bit jittery between clicks. This is because the data animation feature of the Column Chart component is enabled. In general, data animation is a good thing; however, when you are trying to incrementally advance along a timeline, this feature becomes distracting.

In your Xcelsius workspace, select the Column Chart component. In the Behaviors tab of its properties panel, click the Animations and Effects tab and deselect Enable Data Animation (see Figure 5.4).

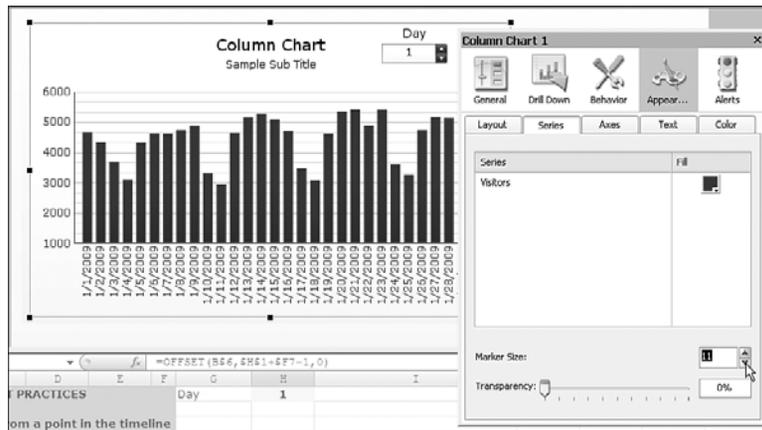
**Figure 5.4**  
Turning off data animation can remove the “jitters” from a chart.



Eliminating the jitters is easy enough. Unfortunately, the Spinner component still doesn't behave exactly as you need it to because you haven't given it minimum and maximum limits. Unless you specify otherwise, the Spinner component automatically defaults to a minimum of 0 and a maximum of 100. In this example, you should set the minimum to 1 instead of 0. The maximum limit should be a number well above 100. You have a choice of typing your own value or linking to some value on the underlying spreadsheet.

The Column Chart component in Figure 5.4 is set to display 31 vertical bars. They appear a little cramped. You can improve the appearance by setting the marker size for the data series to a value smaller than its default of 17 (see Figure 5.5).

**Figure 5.5**  
Adjusting the vertical bar width in a column chart.



#### NOTE

Xcelsius 2008 allows you to specify a theme such as Nova, Halo, Elan, or Microsoft Classic. If you plan on trying out different Xcelsius themes on your dashboard, I strongly recommend that you do so *before* making custom formatting changes to your canvas components.

## BUILDING ON YOUR VISUALIZATIONS

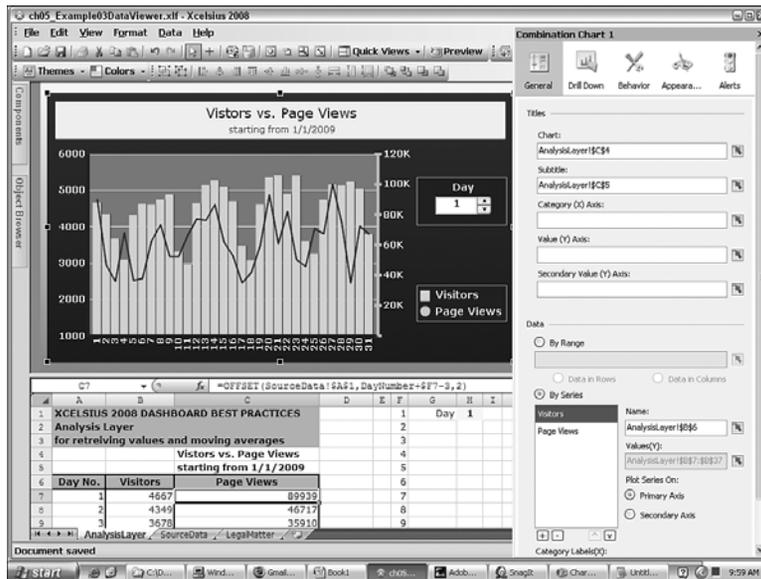
The Spinner component is not the only component that's suitable for setting a point in a timeline. You could instead use Slider, Dial, or Calendar components, to name a few.

The data becomes more interesting when it is not set in a vacuum. You might, for instance, want to compare the number of unique daily visitors to a website to the number of page views. To do this, you would need to add a second data series to the chart. Because comparing unique visitors and page views is really like comparing apples and oranges, a column or bar chart is not suited for this task, even if they were both plotted over the same range of dates. Line charts and combination charts work better for this purpose. As long as you don't need to make use of the Xcelsius Alerts feature, the Combination Chart component is the best choice in this situation.

### PUTTING YOUR DATA ONTO A TIMELINE

Figure 5.6 shows how a combination chart can be used to present two data series: The vertical bars represent visitor count, and the line graph represents page views. Because visitor count and page views are not exactly the same kind of quantity, you need to make use of a dual-axis facility.

**Figure 5.6**  
A combination chart is well suited for simultaneously displaying different kinds of information along a common axis.



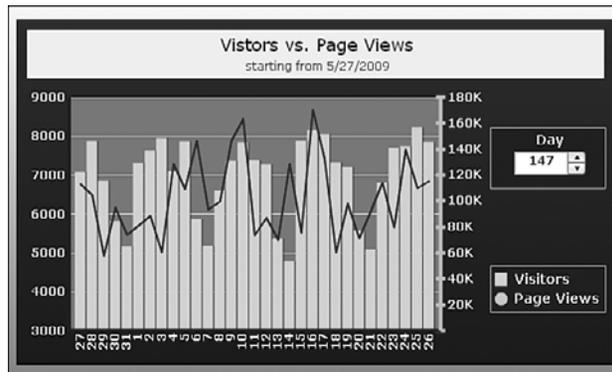
The following are important design features of this combination chart:

- You can make the chart title and/or subtitle dependent on the underlying spreadsheet content. In this example, the subtitle is pegged to cell C5, which changes every time the day number in the Spinner control is changed.

- The Spinner control title and rectangular background are purposely similar in appearance to the Combination Chart legend. This allows the dashboard user to perceive the Spinner control as an actual part of the combination chart.
- The plot area of the chart is a distinctly different color or shading than the area immediately behind the chart. This helps the visual data to stand out. The horizontal gridlines are visible, but they don't compete for attention with the chart data. In particular, only the major gridlines are enabled. If minor gridlines were enabled, the chart might be a little too busy.
- The labels along the axes and in the legend appear in boldface, making the chart easier to read. Using contrasting colors or shades between the chart labels and their background also helps the readability.

There are some hidden wrinkles that you need to be aware of related to combination charts. Figure 5.6 shows one of them. The primary axis ranges from a value of 1000 (a nonzero number) to 6000. The secondary axis ranges from a value of 0 to 120K. As you cycle through the days, as shown in Figure 5.7, notice that the scaling is not exactly proportional.

**Figure 5.7**  
The scaling in this chart is not always proportional.



On day 147, the maximum value of both axes jumps up 50% (from 6000 to 9000 and from 120K to 180K), but the minimum values do not change uniformly. The primary axis originally starts at 1000, and on day 147, it grows to 3000. The secondary axis originally starts at 0, and it remains unchanged when the timeline advances to day 147. Clearly, the scales do not remain proportional as you advance the timeline.

You can force these scales to be proportional, but to do so, you must have complete control over the scaling, and you may not always be happy with the chart appearance. You can experiment with the file `ch05_DataViewer.x1f`, which provides a solution.

You may need to be aware of a couple other things. Dual-axis charts are generally supported in Xcelsius 2008. If you plan on displaying three or more data series in a chart, at least two of the series will have to share either the primary axis or the secondary axis. If your data series contains similarly valued items (such as percentage of efficiency or market penetration), this would not be a problem. If the values between data series vary significantly, this

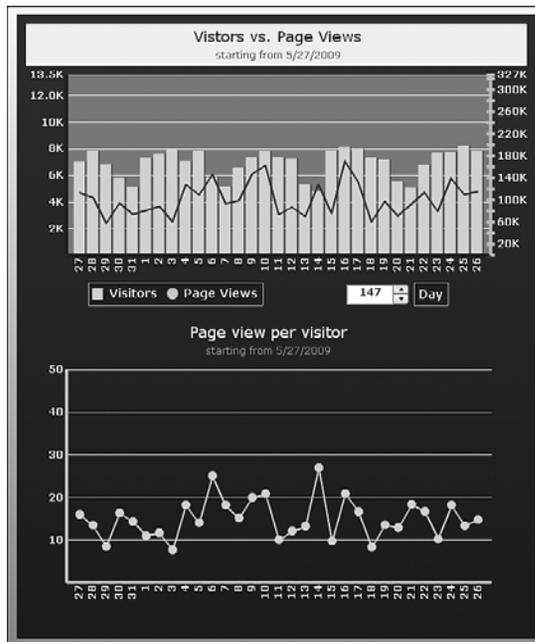
could be problematic. Consider the example of unique visitor counts and total page views. If you want to plot the ratio of page views per visitor, you might find numbers typically varying between 10 and 25. When you try including these as an additional data series in the combination chart, the data becomes flatlined, as the numbers are too small for either of the primary or secondary scales. To cope with this issue, you have several strategies available.

- You could put the page views on the same axis as the visitors and place the page views per visitor on the other axis. Unless the data series sharing a common axis have similar values, this is not going to be a very effective solution. In this particular case, the page views dominate. The visitor count is visible but too small, resulting in loss of meaningful information.

A common technique for dealing with quantities that are vastly different in order of magnitude is to apply logarithmic scaling instead of linear scaling.

- You could apply context switching so that only one data series is displayed at any time, but the user would have complete freedom to choose which two data series you want to view.
- You could overlay a line chart on top of the combination chart. The line chart would need to be precisely positioned. Its background would have to be disabled so it is fully transparent. You would not display the line chart axis labels. The line chart axes could be hidden as well.
- Instead of overlaying a chart, you could make a separate chart that is pegged to the same timeline as the main chart. If you are going to follow this strategy, and the timeline shifts the displayed data to the left or right, you should place the separate chart directly below or above the main chart, not to its left or right (see Figure 5.8).

**Figure 5.8**  
A possible layout for two charts on the same timeline.



**TIP**

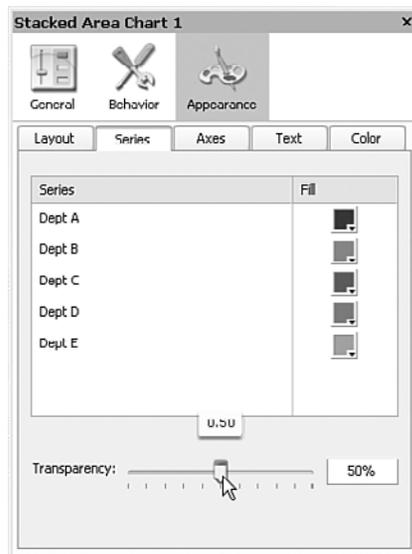
In order to create a unified appearance when displaying more than one chart in a dashboard, you can enclose the charts in a single rectangular shaded region, as is done in Figure 5.8.

## VIEWING GROUPED DATA WITH STACKED CHARTS

Stacked charts—whether column, bar, or area charts—have features similar to their unstacked counterparts. An obvious difference is that the data displayed in a stacked chart is shown cumulatively.

With stacked charts, you can set the transparency of the data series. The transparency slider shown in Figure 5.9 applies to all the data series. The series cannot be individually set.

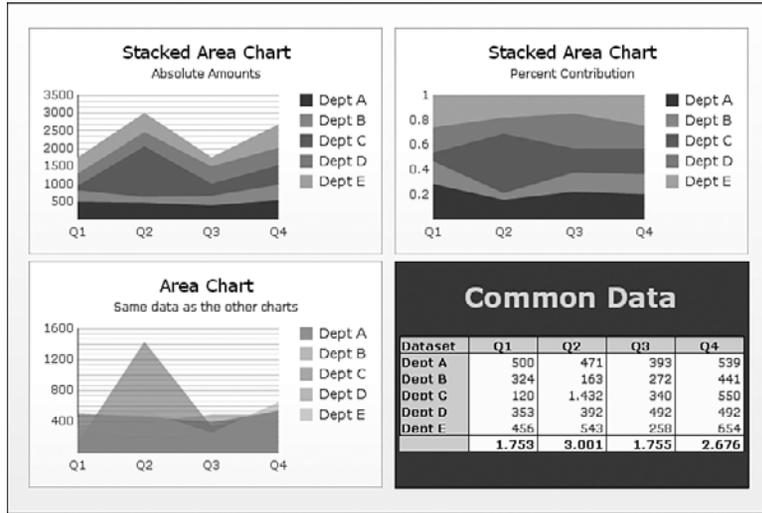
**Figure 5.9**  
Adjusting the transparency for your data series.



Transparency plays a more important role with a regular area chart than it does with a stacked chart because valuable data can be easily obscured with a regular area chart (see the lower-left corner of Figure 5.10).

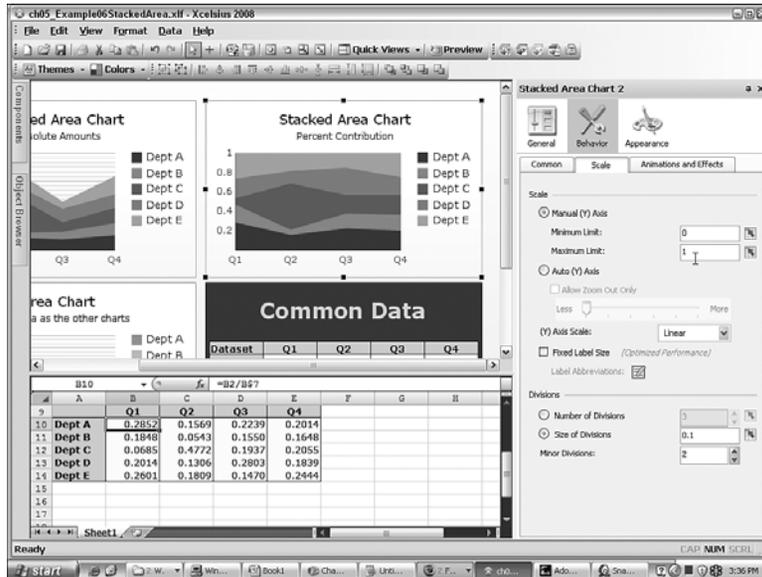
Xcelsius 2008 has the Stacked Area Chart component, but there is no option to automatically represent data based on its relative contribution, as shown in the top-right corner of Figure 5.10. To do this, you need to prepare your spreadsheet data so that the data is represented in terms of its relative contribution. Mathematically, this is straightforward. In the current example, you simply divide each of the values for the department by the total quantity for the quarter. Because the quantities for the quarters add up to 100%, the maximum limit for all the quarters is the fixed value 1. This is what gives this kind of stacked area chart a horizontal plateau.

**Figure 5.10**  
Various ways to represent data by using the Area Chart and Stacked Area Chart components.



You still need to make a further adjustment to the scaling for your Y-axis. Use of auto-scaling will push the maximum value on the Y-axis to a number greater than 1, to something like 1.2. To regain control, you need to set your scale to manual and peg the minimum and maximum values to 0 and 1, respectively (see Figure 5.11). In addition, you have the choice of setting the number of divisions along the Y-axis or the size of the division. Both of these approaches are equally suited because your scale is fixed.

**Figure 5.11**  
Setting the chart scaling for displaying relative contribution.



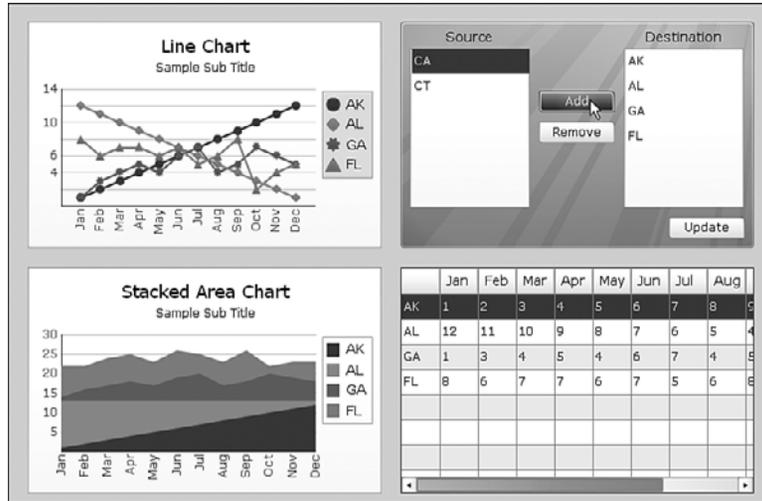
## AVOIDING NEEDLESS DATA SERIES CONGESTION



One of the challenges of presenting information in a dashboard setting is that graphical displays can easily get overcrowded with data. The List Builder component allows a dashboard user to cope with this situation by enabling him or her to select which data series to display and in which order.

The Stacked Area Chart component is useful, but it is even more useful when combined with other components, such as the List Builder component (see Figure 5.12).

**Figure 5.12**  
A List Builder component lets you choose which data series to plot on a display.



In the bottom-right corner of Figure 5.12, the data is displayed in tabular form, using the List View component. List View components have several benefits:

- They are scrollable.
- The column widths are individually adjustable.
- You can sort the data on any column by clicking the appropriate column header. You can toggle between sorting in ascending order and sorting in descending order.

List Builder components are great for when you want to cherry-pick certain pieces of information. Say, for instance, that you want to compare the sales performance of two managers.

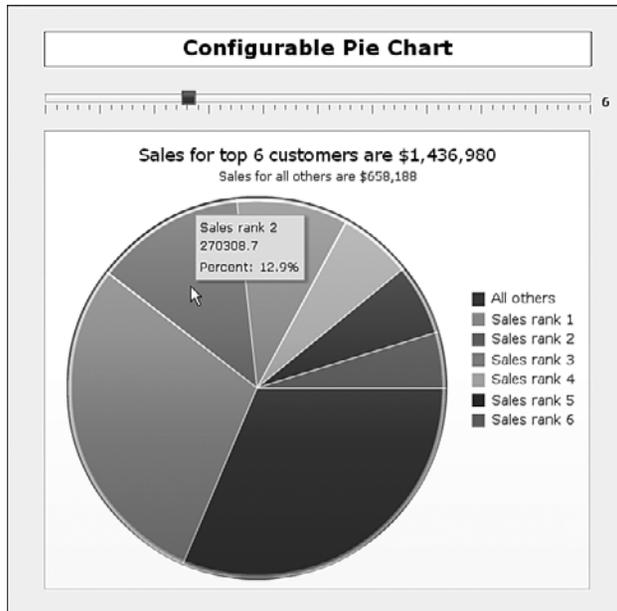
### CAUTION

There is one thing you need to consider if you are thinking about using a List Builder component. This component works by copying values, so the values displayed in the destination cells are “frozen” when the List Builder component update button is pressed.

There are circumstances in which you may want to see the totality of all the data but want to lump the smaller data values into one big group. You might, for example, be analyzing sales and want to see the detail for your four or five biggest customers and also see the combined total of all the remaining customers. Having a slider to magically set the dividing line between showing details and grouping the remainder would be very convenient.

Dynamically grouping or lumping data is especially important when it comes to Pie Chart components. Figure 5.13 shows an example of this.

**Figure 5.13**  
Dynamic data grouping lets you control how much detail you want to see.



The framework for implementing dynamic data grouping is straightforward. In your underlying spreadsheet, start by having your data sorted from largest to smallest (see column C in Figure 5.14).

Place an input cell (see cell C4 in Figure 5.14) whose value is set by a slider or some other selector-style component, such as a Dial or Spinner control.

Calculate the total amount of sales or whatever you are displaying for the top-tier customers or items displayed in your Pie Chart component (see cell C2 in Figure 5.14). This is based on the value in the input cell, as set by your slider- or selector-style component. In this example, subtract the top-tier sales from the total sales to get the sales for “all others.”

Populate a portion of the spreadsheet (such as columns F and G) with information needed for the Pie Chart component. You can use a formula like this:

```
=IF(A10<=$C$4,C10,"")
```

where cell C4 is the location of the input cell that is set by the slider.

**Figure 5.14**  
Populate columns F and G with only the data needed based on the input cell.

	A	B	C	D	E	F	G
1			2095167.8		Grand Total		
2			1210014.7		Sales for top 4 customers		
3			0.577526392		Fraction of all sales		
4			4		Cust. Count		
5							
6							
7							
8	<b>SOURCE DATA</b>			<b>PIE CHART DATA</b>			
9		<b>All others</b>	<b>Annual Totals</b>		<b>Title</b>	Sales for top 4 customers are \$1,210,015	
10	1	Sales rank 1	607331.8		<b>Subtitle</b>	Sales for all others are \$885,153	
11	2	Sales rank 2	270308.7			All others	885153.1
12	3	Sales rank 3	201293.7		-->	Sales rank 1	607331.8
13	4	Sales rank 4	131080.5		-->	Sales rank 2	270308.7
14	5	Sales rank 5	127583.6		-->	Sales rank 3	201293.7
15	6	Sales rank 6	99381.6		-->	Sales rank 4	131080.5
16	7	Sales rank 7	95854.1				
17	8	Sales rank 8	82821.5				
18	9	Sales rank 9	75082.7				
19	10	Sales rank 10	69893.6				
20	11	Sales rank 11	54802.7				
21	12	Sales rank 12	53159.8				
22	13	Sales rank 13	39012.1				
23	14	Sales rank 14	36916.6				
24	15	Sales rank 15	34402.2				
25	16	Sales rank 16	22845.2				
26	17	Sales rank 17	19996.3				
27	18	Sales rank 18	16051.4				

## NOTE

Remember to set your Pie Chart component's behavior properties to ignore blank values.

## DRILLING DOWN WITH PIE CHARTS



What good is having lots of data if you can't get to the underlying details? The quantity of sales in the previous example may be annual sales, which is composed of monthly data. It would be convenient to examine the breakdown of sales on a month-by-month basis. This is accomplished using the drill down feature that is built into many of the Xcelsius 2008 visual components.

In your Pie Chart component's properties panel, go to the Drill Down subtab of the Behaviors tab. Click the Enable Drill Down check box (see Figure 5.15). You need to specify whether you want to drill down based on position, value, row, column, or status list. You need to specify a destination range and, depending on the type of drill down, a source range. For this example, you want to choose the position—that is, which slice of the pie you want to examine—so it is not necessary to specify the source range.

You also need to tell Xcelsius whether you want to drill down whenever the mouse passes over a slice in the Pie Chart component or when the slice is clicked.

Because you only need to find out which slice is selected for drill down, the destination range is a single cell, namely the position. It would be a good idea to set the location for this nearby the input cell set by the slider (in this example, cell C5).

To get the drill down data, it's just a matter of extracting the particular row from the monthly data based on the input cell (C5 in this example). You could display the retrieved data on a Bar Chart component.

**Figure 5.15**  
Setting drill down options.



There's just one problem: If your tabular data follows a left-to-right chronologic sequence (such as January, February, March, and so on), the bar chart displays the most recent month at the top. The result is a sequence of dates that reads downward as December, November, October, and so on. To have the bar chart show a January, February, March, and so on sequence, you need to reverse the retrieved data (see Figure 5.16).

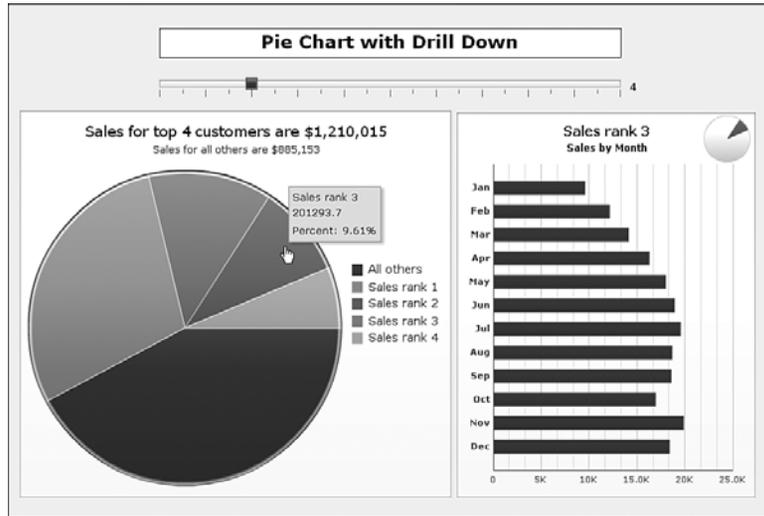
**Figure 5.16**  
Notice that the extracted data needs to go from right to left.

	J	K	L	M	N	O	P	Q	R	S	
1	Drill Down Data										
2	12	11	10	9	8	7	6	5	4	3	
3	Dec	Nov	Oct	Sep	Aug	Jul	Jun	May	Apr	Mar	
4	All others	139812.1	134399.1	135302.8	127727.9	131539.9	129377	127898.8	118556.6	115357.9	112587.9
5											
6											
7	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
9	107061.9	108214.1	112587.9	115357.9	118556.6	127898.8	129377	131539.9	127727.9	135302.8	
10	34675	39262.1	42977.8	39932.4	41167.2	44151.7	46351.3	54434.4	56459.3	65054.9	
11	15954.5	15771.6	17146.9	16737.6	20771.3	23953	24159	26222.6	25948.9	27136.4	
12	9598.7	12169.5	14135.9	16310	18008.2	18941.5	19568.6	18691.6	18600.1	16966.3	
13		10440	8463.1	9909	12057.3	11478.7	12615.1	11529.3	11404.8	9676.5	11803.3

When this is corrected, the dashboard renders as expected (see Figure 5.17).

As a little extra added touch, you can create a miniature isolated slice, as shown in the upper-right inset of the bar chart in Figure 5.18. This helps provide feedback on what slice of the pie chart is being revealed in detail within the bar chart.

**Figure 5.17**  
A Pie Chart component with drill down to the monthly data.



## WORKING WITH XY AND BUBBLE CHARTS

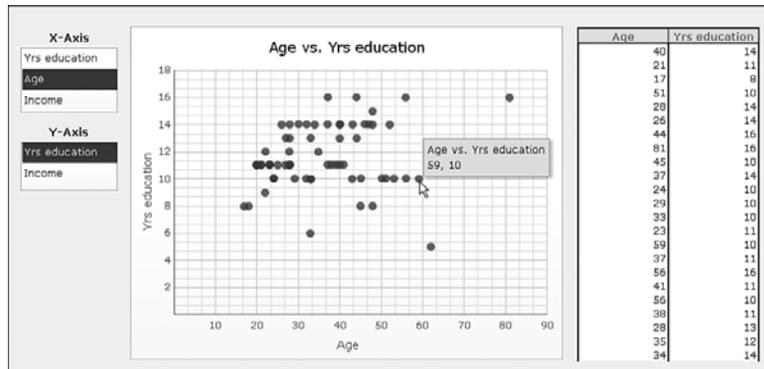
Bar charts, column charts, combination charts, line charts, and a few other variants are charts that are continuous on one axis and discrete on the other. This is fine for histograms and the like, but it offers little benefit when you need both the horizontal and vertical axes to be continuous. Xcelsius 2008 provides two kinds of continuous charts: XY and bubble charts.

Each data series in an XY chart houses data for a range of values along the X-axis and a corresponding range of values along the Y-axis. This affords a lot of interesting possibilities.

### WORKING WITH XY CHARTS

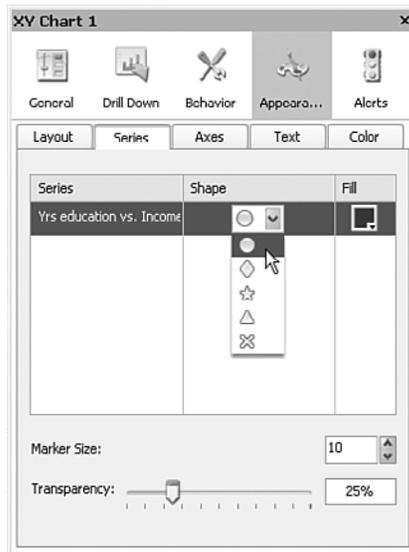
Suppose you have some raw data on individuals' years of education and age (see Figure 5.18).

**Figure 5.18**  
XY charts displaying representative demographic data.



The tabular data to the right of the chart is just a small segment of the full dataset. An XY chart gives you the ability to specify a number of features of your data series, including the series shape, fill color, marker size, and transparency (see Figure 5.19).

**Figure 5.19**  
Customizing the data series appearance in an XY chart.



#### NOTE

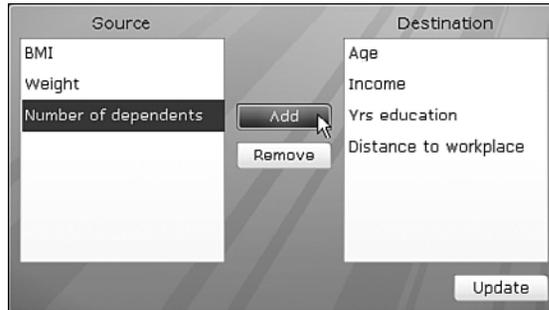
If you are displaying more than one data series, you cannot individually set the marker size and transparency for each series.

XY charts can display only two sets of values at any time—one on the X-axis and the other on the Y-axis. However, you might have a multitude of factors from which to select. It would be great to start from a list of parameters—such as age, income, and education—and choose which two go onto the XY chart. There are three ways to do this:

- Using a List Builder component
- Using naive lists
- Using intelligent lists

At first glance, using List Builder would appear to be the natural way to do this. You may have 10 or 20 kinds of parameters that you want to make available for plotting on an XY chart. With List Builder, it is easy to choose more parameters than an XY chart can accommodate (see Figure 5.20). In such a case, the extra parameters are ignored. One thing you don't want to do is to surprise a dashboard user by inadvertently withholding information he or she expects to see.

**Figure 5.20**  
List Builder doesn't stop you if you select more than two parameters.



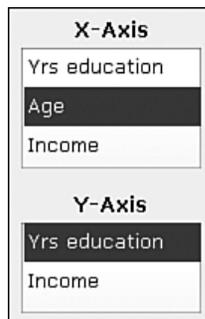
There are a couple other reasons to avoid using List Builder to create an XY chart. List Builder copies data to a location. If the original data changes, the changes are not reflected in the chart until the List Builder is updated. In addition, any time the user wants to switch which items appear in a chart, he or she must go back to the List Builder chart and reconstruct the list. List Builder may be indispensable for constructing reports, but it does not always provide the fluid interactivity needed for dashboards.

Another approach would be to supply for each axis a list-like selector such as a List Box or Radio Button component and, based on the parameter selected, look up the respective dataset. This technique overcomes the primary challenges of using List Builder: It is not possible to oversaturate the XY chart with too many parameters, and there is no wait time; as soon as an item is selected from the list, the data appears on the plot. There is one wrinkle with using a List Box or Radio Button component, though: It is possible to select the same item in each of the independent lists. For instance, it is possible to plot income on both the X-axis and Y-axis. Although this is not problematic, it isn't very elegant.



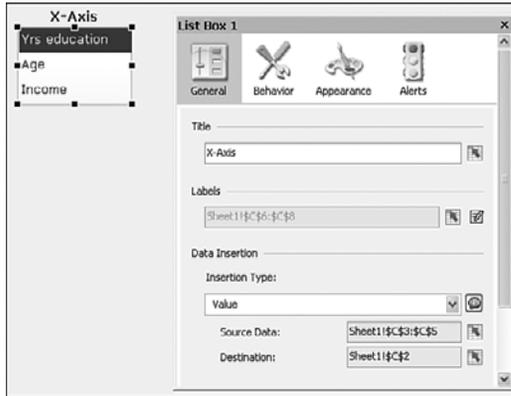
You can use a strategy that automatically eliminates the item chosen from the list (see Figure 5.21). This strategy involves what I call *correlated lists*. There is a list for the X-axis and one for the Y-axis. Notice in Figure 5.21 that the X-axis list box has three items, and the Y-axis list box has two items. Also notice that the item selected in the X-axis box is conspicuously absent from the Y-axis box. This is by design. No matter which item is chosen in the X-axis box, it is automatically eliminated from the Y-axis box.

**Figure 5.21**  
You can select parameters in the XY chart by using correlated list boxes.



Let's look at some implementation details. Your List Box component should be based on inserting values, not position (see Figure 5.22).

**Figure 5.22**  
List box properties  
for the X-axis.



In cells C3, C4, and C5, you need to place the value 1, 2, and 3 (see Figure 5.23). In cells C6, C7, and C8, you need to place the labels Yrs education, Age, and Income.

**Figure 5.23**  
Spreadsheet setup for  
correlated list boxes.

	C2		C3	D3
1			<b>Yrs education</b>	<b>Income</b>
2			<b>1</b>	<b>3</b>
3		1	1	2
4		1	2	3
5		1	3	
6			Yrs education	Age
7			Age	Income
8			Income	

Your list boxes for the X-axis and Y-axis should be reading the labels from your underlying spreadsheet (cells C6:C8 and D6:D7).

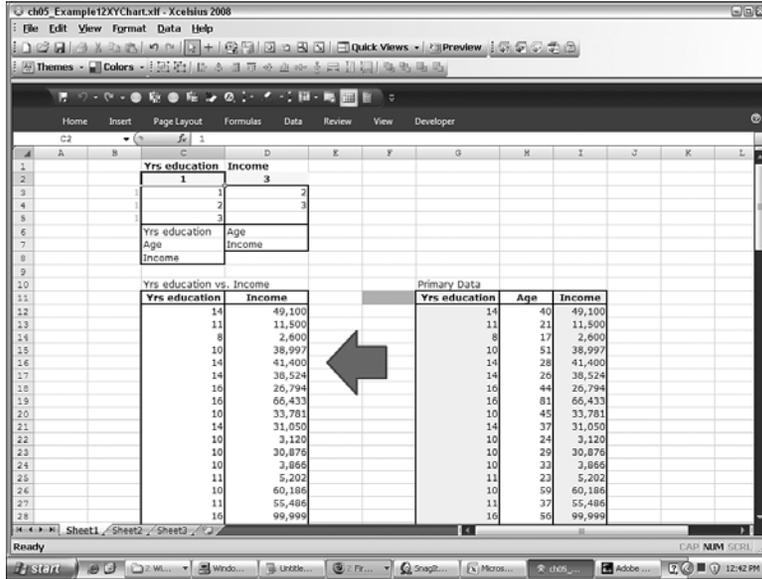
The formulas for cells D3 through D7 get a little complicated. I leave you to explore these on your own in the file `ch05_XYchart.xlsx`. Essentially, the logic behind them is that if an item was already selected for the X-axis omit this item for the Y-axis and go to the next item in the list.

#### NOTE

Depending on the quantity of data, XY charts and bubble charts can consume a fair amount of time and CPU resources in opening the XLF file and adding data to the components.

To complete the picture, the datasets that are chosen (the shaded cells on the right side of Figure 5.24) are retrieved for display in the XY chart (the left side of Figure 5.24).

**Figure 5.24**  
Datasets are chosen for graphical display.

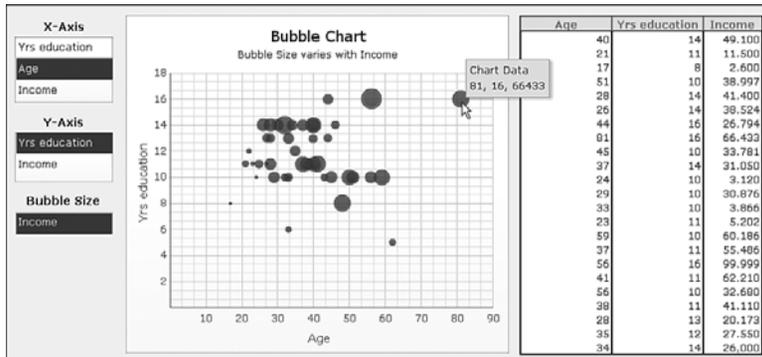


In this example, you can choose any 2 of 3 data sets. There is nothing to stop you from setting up your dashboard to select from, say, 20 possible datasets. Unlike using the List Builder approach, with this method, the retrieved data is still live. Changes to source data for the values plotted are instantly reflected in the chart.

### EXTENDING GRAPHICAL PRESENTATION WITH BUBBLE CHARTS

The bubble chart can be regarded as the sibling of the XY chart. The essential differences between the two are that in a bubble chart, the marker size is variable, based on the value of some data, and the marker shape is round. Bubble charts offer a convenient way to pack more information into a chart. Rather than being forced to choose two of three parameters, you can simultaneously display all three in a single chart. With a bubble chart, you need to decide which parameter is associated with the X-axis, which parameter is associated with the Y-axis, and the bubble size (see Figure 5.25).

**Figure 5.25**  
You can choose bubble chart parameters from the list boxes.

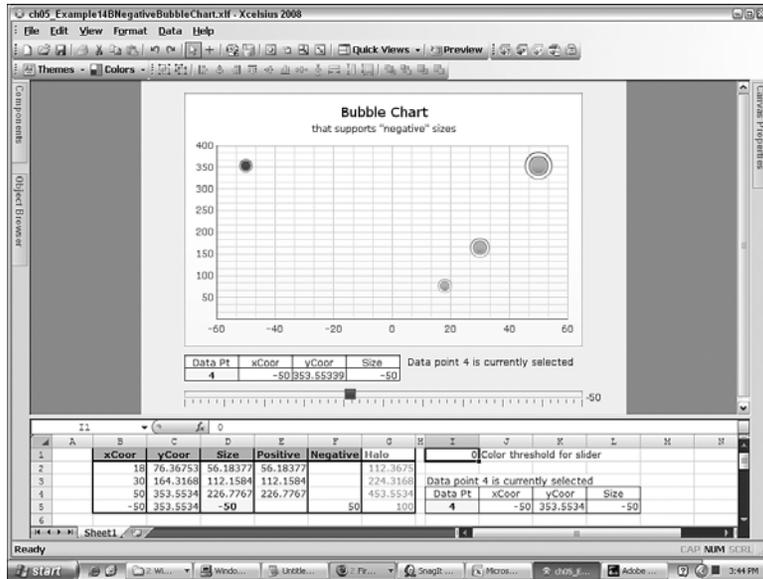




Bubble charts use size to represent a quantity. So how would you represent a negative quantity with size? Does a circle implode in on itself and invert its color? Xcelsius 2008 does not provide a particularly elegant solution for negative values. Basically, it shrugs its shoulders and gives you a little dot that is non-changing in size.

Fortunately, there's a workaround that allows for a relatively clean implementation. The setup is quite simple. You position your data to display your X coordinates, Y coordinates, and bubble size (see columns B, C, and D in Figure 5.26).

**Figure 5.26**  
Setting up a bubble chart to support negative values.



The next step is to separate positive and negative sizes (columns E and F of Figure 5.26). The respective formulas in columns E and F could be something like this:

```
=IF(D2>=0,D2,"")
=IF(D2<0,D2,"")
```

positive values in column E  
negative values in column F

Next, create a data series for the positive and negative values (see Figure 5.27). (You'll learn the details behind the halo sensors shortly.)

In the Appearance tab, set the color of the positive data series to something like green and set negative values to red. Choose whatever colors suit your needs.

In this particular example, all the data is static except for a single data point, whose size can be adjusted with a slider to both positive and negative values. The X and Y coordinates for this data point use formulas that incorporate the size. Consequently, the data point moves as you adjust the slider, and the chart automatically rescales. This example is a little contrived, but it helps to make the essential concepts and their implementation clear.

**Figure 5.27**  
Properties of the data series detailing negative values.



### Displaying Values of Individual Data Points

At this time, Xcelsius 2008 does not natively support the display of negative sizes. Negative values for bubble size are rendered as tiny dots that never change size. In the preceding section, you used a little trick to fool Xcelsius into treating negative size bubbles as if they are positive and at the same time, change their colors. This size/color combination renders correctly, but Xcelsius still thinks the bubble size is a positive value. When your mouse hovers over the “negative” size bubble, the hover text displays the correct X and Y coordinates, but the negative value for size shows up as a positive number.

Rather than deliver a broken dashboard, it is better to turn off the mouse over text. But don’t despair. I know another useful trick. By using the drill down capability of the bubble chart, it is easy to extract which point the mouse is positioned over and push relevant data about the point, including the negative bubble size, to a table that’s suitable for displaying the data. I call this technique the *halo sensor*. With this method, you surround each data point with a thin ring, or “halo,” that is capable of sensing when the mouse is positioned over it. It uses the drill down feature of the chart to identify which data point has focus. When the data point is identified, its related information can be easily retrieved.

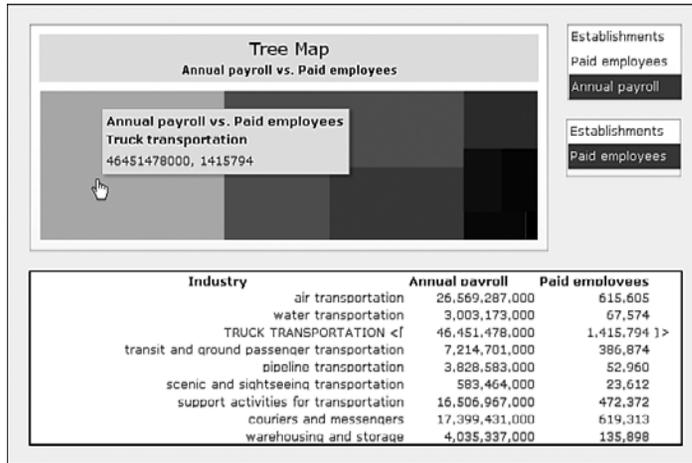
The halo is set up as a separate data series. It visually appears behind the positive and “negative” size circles. If a halo were smaller than or the same size as these positive or negative circles, it would be eclipsed. Consequently, the halo needs to be a larger size than the circle size for the data points. Doubling the size seems to work well.

When you enable drill down, you may want to set the interaction options to mouse over instead of mouse click. Incidentally, you can drill down with each of the series as long the insertion points do not overlap.

## WORKING WITH TREE MAPS

New to Xcelsius 2008 is the Tree Map component. Tree Map components simultaneously use color and size to represent data pairs, such as median income level and employee turnover. A Tree Map component is a collection of non-overlapping colored tiles that completely fill up a large rectangle (see Figure 5.28).

**Figure 5.28**  
Tree Map components display data by size and color and support drill down.



Each tile represents a row of data. Its size corresponds to the relative contribution of a specific measure, such as sales volume. The color of each rectangle can represent a different kind of measure, such as profitability.

A Tree Map component automatically arranges the tiles based on size and then by color or shading.

Tree maps are pretty, but unless you can easily connect them to data they use, their benefits are limited. In a world where there are lots of different kinds of data to examine, it would be nice to be able to choose datasets as easily as you can with the XY chart examples outlined a few pages ago.

Figure 5.29 shows the spreadsheet used to create the dashboard shown in Figure 5.28. The dataset in column C determines the tile size on the tree map. The dataset in column C is used to set the shading of colors for each of the tiles. When you start thinking about placing your data in two columns, one of which shows up as tile size and the other as tile color, the setup of a tree map becomes particularly easy to envision. The greater complexity comes about by shuttling data so that it is conveniently easy for a tree map to use.

Rather than reinvent the wheel, it makes sense to reuse spreadsheet designs already developed and vetted. You can use one of the spreadsheets already prepared in this chapter (refer to Figure 5.23) for the tree map.

**Figure 5.29**  
The spreadsheet  
setup for a tree map.

	Establishments	Paid employees
1	1	2
2	2	3
3	3	
4	Establishments	Paid employees
5	Paid employees	Annual payroll
6	Annual payroll	
7	Establishments vs. Paid employees	
8	Tree Map Size	Tree Map Color
9		
10	<b>Industry</b>	<b>Establishments</b>
11	air transportation	5429
12	water transportation	1900
13	truck transportation	110416
14	TRANSIT AND GROUND PASSENGER TRANSPORTATION	16383
15	pipeline transportation	2802
16	scenic and sightseeing transportation	2254
17	support activities for transportation	31440
18	couriers and messengers	12297
19	warehousing and storage	7123
20		
21		
22		
23	Source: U.S. Census Bureau, "County	
24	Business Patterns."	
25	See <http://www.census.gov/eppcd/cbp/view/cbpview.html>.	
26	http://www.census.gov/compendia/statab/tables/08s1039.xls	
27	http://www.census.gov/compendia/statab/cats/transportation/all_modes_of_transportation.html	
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In fact, the spreadsheet of Figure 5.25 was actually used to build this dashboard. Basically, the data was swapped, and a few formulas were tweaked. There is also a little extra work involved in drilling down to detailed information based on the selected tile.

Before we leave the topic of tree maps, I need to mention a few things about them:

- The hover text in a tree map typically consumes a fair amount of screen space. It can easily obscure other relevant data. For this reason, the drill down data is placed below the tree map and not to the right of it.
- When selecting colors for high and low values, try to stay in the same color family and vary the brightness.
- Each data series in a tree map consists of a pair of correlated datasets—one column for the size and the other for color. If you want to add a second series, place the data immediately to the right of the first data series.
- The tile area, and not the tile length or width, is proportional to its underlying data. If sales increased by a factor of 9, the relative length and width of the tile would increase by a factor of 3. This is both a good and bad thing. Because the total area for the whole tree map remains conserved, the other tile sizes get scaled down by a lesser amount. Small values don't get diminished so quickly. It is also more difficult to interpret because we are used to linear proportionality, but in a tree map, tile size is proportional to the square root of its underlying data.

While a tree map may be pretty to look at, it doesn't do anything that an XY chart doesn't. Actually, an XY chart can be easier to interpret than a tree map. If you stop and think about it, the data points in an XY chart are, by definition, already sorted.

## ISSUES AND TECHNIQUES RELATED TO SCALING

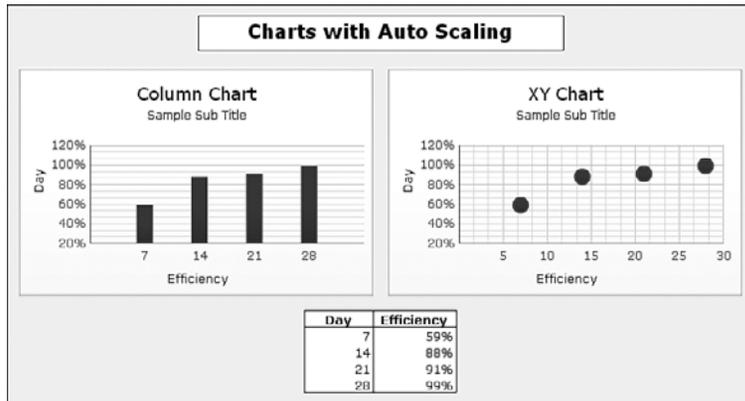
Xcelsius 2008 provides for auto-scaling of charts. This relieves you of the burden and drudgery of manually setting a chart scale. Most of the time, auto-scaling works well, but if your living is based on presentations and dashboards, you might want more fine-tuned control than auto-scaling allows.

Consider the following data regarding estimates of manufacturing efficiency:

day	production efficiency
7	59%
14	88%
21	91%
28	99%

Depending on real-world circumstances, the data scale that auto-scaling chooses may or may not be appropriate (see Figure 5.30). In this example, the scale reaches 120%. In terms of manufacturing efficiency, 120% is a physically meaningless quantity. Except for reporting or rounding errors and incorrectly calculated estimates, manufacturing efficiency would not exceed 100%.

**Figure 5.30**  
Auto-scaling can go well beyond the data extremes.



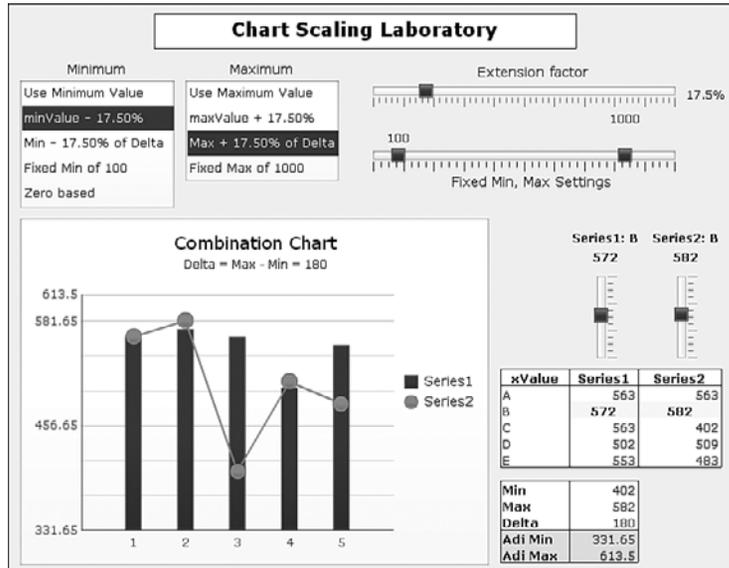
The point here is that there will be times you will want to take charge of how Xcelsius scales the data in your charts. With the aid of spreadsheet formulas you can design, you may be able to create the scaling behavior you are looking for.

### EXPLORING THE SCALING LABORATORY

Rather than try to explain the intricacies of the various permutations and combinations of scaling settings, in this section I provide you with a scaling laboratory dashboard (see Figure 5.31 or have a go at it with `ch05_ScalingLab.xlf`).

In the scaling lab dashboard, you have the option of specifying how minimum and maximum scales are handled.

**Figure 5.31**  
Chart scaling dashboard for which you can adjust the data extremes.



This dashboard has two data series, which are displayed in a combination chart. The data used for the chart is displayed in a table (on the right side of Figure 5.31). Notice that two of the data points in this table are shaded. You can adjust the values for the two data points by using the vertical sliders immediately above the data table. The vertical sliders allow you to dynamically adjust values plotted on the chart, so you can see what happens based on the prevailing scaling behavior.

You set the scaling behavior by clicking the various options in the two list boxes near the upper-left portion of the dashboard.

Here is a brief description of the various terms in the Minimum list box:

- **Use Minimum Value:** This is the minimum value of all the data points displayed in the data table. It includes the values from both series.
- **minValue - x%:** This is the minimum value reduced by an extension factor. You can adjust this extension factor by using the horizontal slider labeled Extension Factor near the top-right side of the dashboard.
- **Min - x% of Delta:** This takes the minimum value of all data points and sets the lower limit of the scale to be a set percentage of the difference between the maximum and minimum values of both data series. If all your data is concentrated over a narrow range of values, this type of scaling would be appropriate.
- **Fixed Min of x:** This hardwires the lower limit of the scale to a fixed number. You have the option of setting this value by using a slider. Once you set it, the value is unchanging until you decide to manually revise it.
- **Zero based:** This option hardwires the scale's lower limit to 0.

The Maximum list box options are largely the equivalent of those in the Minimum list box, except that they apply to the scale's upper limit and tend to add rather than subtract values. In addition, there is no zero-based equivalent for the Maximum list box.

#### NOTE

Keep in mind that if you don't like the way Xcelsius is handling scaling—for example, if it is creating scaling limits clearly beyond 100%—you need to be able to handle *both* the upper and lower limits of the scale. You can't get away with addressing only one side of the spectrum.

### DEALING WITH VASTLY DIFFERENT VALUES ON THE SAME CHART

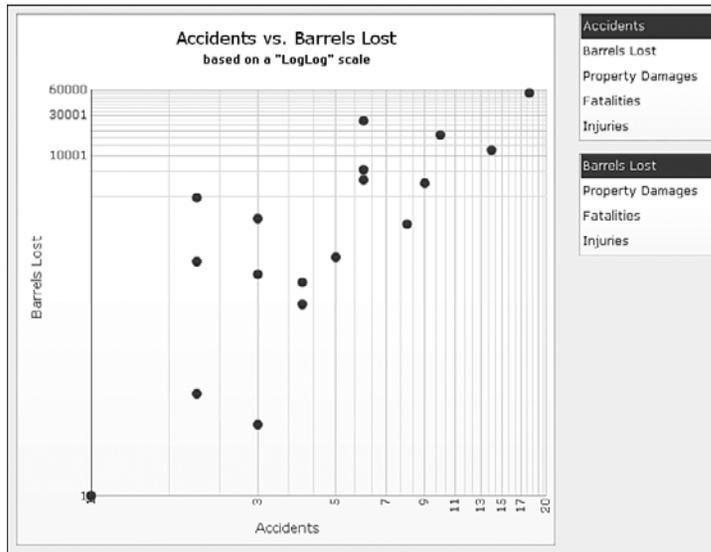


Sometimes you can get caught with having quantities such as 10, 100, and 60,000 in the same chart. If you place these on a linear plot, the small values will virtually disappear. If you are tabulating information such as loss or impairment of an asset and frequency of occurrence, then you definitely don't want to forgo treating the infrequent but very expensive events in your data analysis.

Figure 5.32 shows government-published data on number of oil pipeline accidents versus barrels lost in the United States during 2006. There is a remarkable level of linearity on the upper limit for the number of accidents.

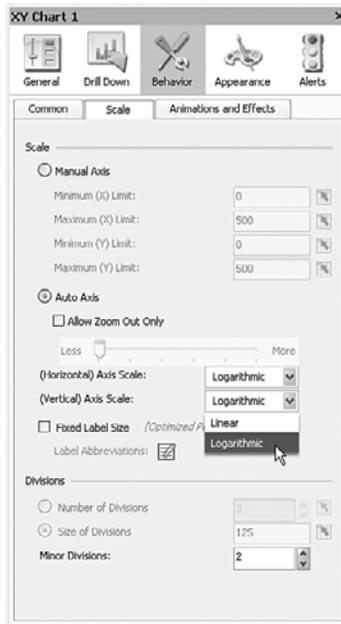
**Figure 5.32**

A LogLog scale (that is, logarithmic scaling on both the X- and Y-axes) reveals structured relationship over many orders of magnitude.



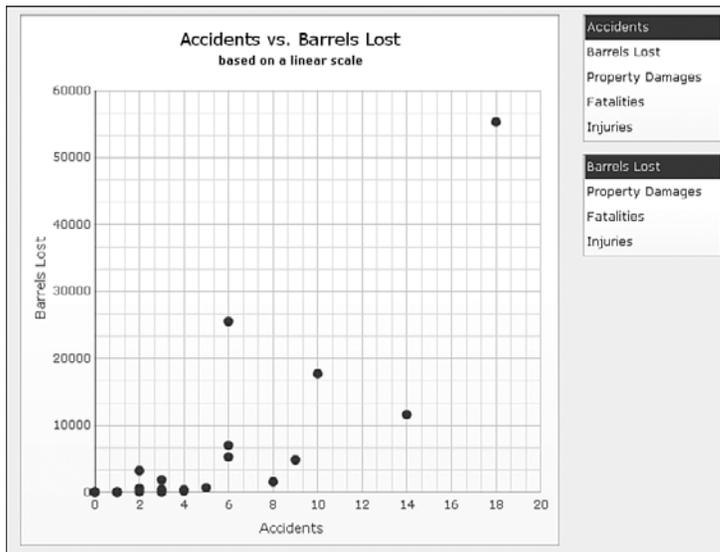
Setting up logarithmic scaling is rather straightforward. You simply open the Scale subtab of the chart's Behavior tab and select Logarithmic for both Horizontal and Vertical Axis Scale (see Figure 5.33). You can also experiment with applying logarithmic scaling for only one of the axes.

**Figure 5.33**  
Specifying logarithmic scaling on an XY chart.



What happens if you keep both axes linear? The details for the smaller values are almost completely lost because they are too small to be seen (see Figure 5.34).

**Figure 5.34**  
The smaller values for barrels lost are too small to discern in linear scaling.



## PUTTING VISUAL DATA ANALYSIS INTO FOCUS

Before leaving this chapter on charting, I want to address a key point that has been nagging at me ever since I started doing work with visual data analysis and dashboards. Many people who work on dashboard design are literally consumed with cramming as much as they can onto a single screen. They revel in the aesthetics of interface design and are quick to criticize a dashboard layout without offering alternatives or workarounds.

Understandably, it is very easy to get consumed with the visual interface and its aesthetics. One of the major premises of the dashboard is that an executive or a decision maker who uses it may have a limited opportunity to closely examine details, so the dashboard has to bring together all the information in one place. The information has to be easy to consume.

Focusing on the interface design without taking into account the mechanics, tasks, and practical challenges of building the visual interface is like coming up with a requirements document: It is a starting point but not a solution.

One of the alluring features of Xcelsius is that you can use it to harness a spreadsheet engine to intelligently and dynamically feed the dashboard visual display with appropriate information when and where it is needed. When information moves in such a fluid fashion, you can begin relaxing the all-consuming need to cram data onto a single screen. This, in turn, helps you sensibly design your dashboards and visualizations with greater simplicity and clarity.

## CLOSING THOUGHTS

The goal of visual data analysis is to make obvious implicit and otherwise difficult-to-discern relationships. I started out this chapter by saying that every dashboard should have a story to tell. Sometimes, it's the dashboard designer who knows exactly what has to be said and is in need of a way to masterfully present the message. Other times, the dashboard lets the data speak for itself, by making it easy for the end user to examine and explore the data with ease and turn over stones that would otherwise be left untouched. I refer to the latter as "planned serendipity."

This chapter presents key issues, possible strategies, useful techniques, and hidden gotchas that tend to come up when presenting data visually. Along the way, many of the principles and techniques are shown in action.

The best place to begin is to ask, which components do I use? Then you can tackle, how do I tame the data? One answer is to put the data on a timeline. In this manner, you can see trends but not be overwhelmed by a dizzying array of distracting information competing for your attention.

In some cases a dashboard may be otherwise well designed, but the cosmetics get in the way. Xcelsius automatically enables data animation, which gives the dashboard a certain coolness and is designed to "wow" the audience. Unfortunately, when you are trying to analyze patterns and trends, the jittery behavior of this feature can be downright distracting!

As you get more sophisticated in your dashboard skills, you are bound to combine several components so they work as one. People often forget to make components visually blend together as if they are one larger component. Sometimes all it takes to glue them together is a single visual background. Sometimes it makes sense to stack data together so you can see all the data together at one time. Stacked data and its components become further empowered when you can drill down to get at the underlying details.

A common perceived limitation of pie charts is that they are only well suited to situations in which the various slices of the pie are roughly similar in size, and there are not too many of them. However, by dynamically grouping the smallest slices, you can use pie charts in many other situations as well.

Many of the Xcelsius charting components, such as column charts, are designed to handle histogram-like data where one of the axes is continuous, and the other varies in discrete measures or categories. There are times when it is necessary to get more quantitative and display two or more measures. This is where XY charts, bubble charts, and tree maps come into play. Standing behind these charts can be a variety of different kinds of datasets, waiting to be visually mixed and matched. I introduce a technique of using correlated list boxes to seamlessly select the datasets to be displayed. This technique takes context switching to an extreme.

In this chapter, you saw a solution for rendering bubble charts when the bubble sizes have negative values. You also learned how to set up tree maps. In addition, you learned about chart scaling because it is important to be able to fully control a dashboard's visual elements.

The theme of visual elements continues into Chapter 6, "Single Value Components: Dials, Gauges, Speedometers, and the Like."

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