7 Combining Data from Multiple Sources

In this chapter, you will learn how to

- ✔ Use workbooks as templates for other workbooks.
- ✔ Link to data in other worksheets and workbooks.
- ✔ Consolidate multiple sets of data into a single workbook.
- ✔ Group multiple sets of data.

Microsoft Excel 2010 gives you a wide range of tools with which to format, summarize, and present your data. After you have created a workbook to hold data about a particular subject, you can create as many worksheets as you need to make that data easier to find within your workbook. For example, you can create a workbook to store sales data for a year, with each worksheet representing a month in that year. To ensure that every year's workbook has a similar appearance, you can create a workbook with the desired characteristics (such as more than the standard number of worksheets, custom worksheet formatting, or a particular color for the workbook's sheet tabs) and save it as a pattern, or *template*, for similar workbooks you will create in the future. The benefit of ensuring that all your sales data worksheets have the same layout is that you and your colleagues immediately know where to look for specific totals. You can use that knowledge to summarize, or consolidate, that data into a single worksheet.

If you work with the same set of workbooks repeatedly, you can group those workbooks in a special type of Excel file called a *workspace*. When you open the workspace, Excel knows to open the files you included in that workspace.

A consequence of organizing your data into different workbooks and worksheets is that you need ways to manage, combine, and summarize data from more than one Excel document. You can always copy data from one worksheet to another, but if the original value were to change, that change would not be reflected in the cell range to which you copied the data. Rather than remembering which cells you need to update when a value changes, you can create a link to the original cell. That way, Excel will update the value for you whenever you open the workbook. If multiple worksheets hold related values, you can use links to summarize those values in a single worksheet.

In this chapter, you'll learn how to use a workbook as a template for other workbooks, work with more than one set of data, link to data in other workbooks, summarize multiple sets of data, and group multiple workbooks.

> **Practice Files** Before you can complete the exercises in this chapter, you need to copy the book's practice files to your computer. The practice files you'll use to complete the exercises in this chapter are in the Chapter07 practice file folder. A complete list of practice files is provided in "Using the Practice Files" at the beginning of this book.

Using Workbooks as Templates for Other Workbooks

After you decide on the type of data you want to store in a workbook and what that workbook should look like, you probably want to be able to create similar workbooks without adding all of the formatting and formulas again. For example, you might have established a design for your monthly sales-tracking workbook.

When you have settled on a design for your workbooks, you can save one of the workbooks as a template for similar workbooks you will create in the future. You can leave the workbook's labels to aid data entry, but you should remove any existing data from a workbook that you save as a template, both to avoid data entry errors and to remove any confusion as to whether the workbook is a template. You can also remove any worksheets you and your colleagues won't need by right-clicking the tab of an unneeded worksheet and, on the shortcut menu that appears, clicking Delete.

If you want your template workbook to have more than the standard number of worksheets (such as 12 worksheets to track shipments for a year, by month), you can add worksheets by clicking the Insert Worksheet button that appears to the right of the existing worksheet tabs.

To create a template from an existing workbook, save the model workbook as an Excel template file (a file with an .xltx extension), which is a file format you can choose from the Save As Type list in the Save As dialog box. If you ever want to change the template, you can open it like a standard workbook and make your changes. When you have completed your work, save the file by clicking the Save button on the Quick Access Toolbar—it will still be a template.

Tip You can also save your Excel 2010 workbook either as an Excel 97–2003 template (.xlt) or as a macro-enabled Excel 2010 workbook template (.xltm). For information on using macros in Excel 2010 workbooks, see "Introducing Macros" in Chapter 12, "Automating Repetitive Tasks by Using Macros."

After you save a workbook as a template, you can use it as a model for new workbooks. To create a workbook from a template in Excel, click the File tab to display the Backstage view, and then click New.
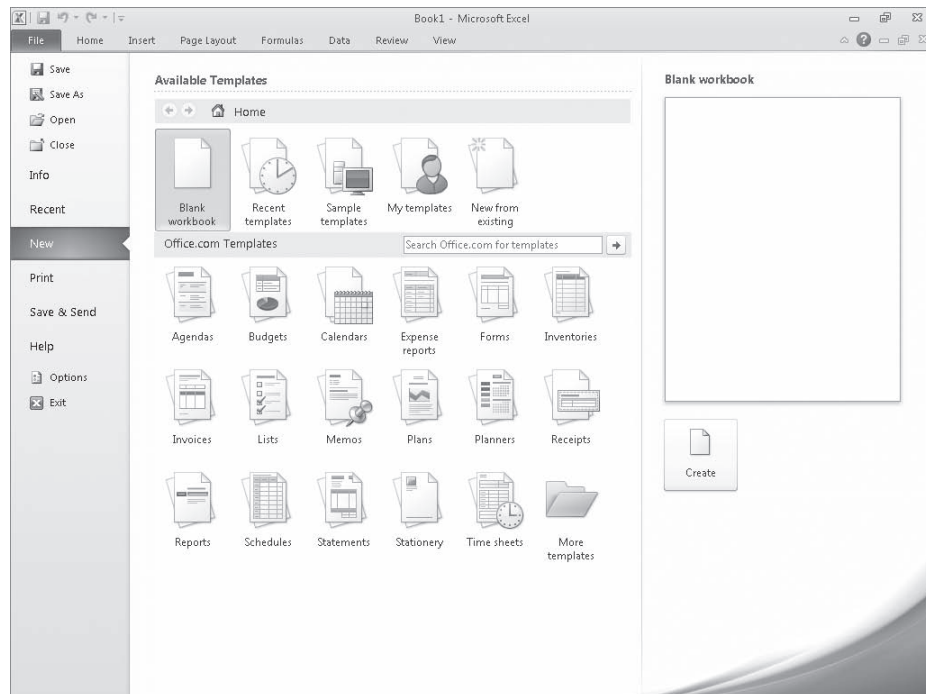

When you click New in the Backstage view, the top of the middle pane displays the blank workbook template, templates you have used recently, sample templates, and templates you created. Below that list is a set of template categories available through the Office.com Web site and a search box you can use to locate helpful templates on Office.com.

Tip When you display the New page of the Backstage view, you can also find templates and other tools related to your job functions by clicking the More Templates folder at the bottom of the Office.com Templates area of the page.

From the list of available templates, you can double-click the template you want to use as the model for your workbook. Excel creates a new workbook (an .xlsx workbook file, not an .xlst template file) with the template's formatting and contents in place.

In addition to creating a workbook template, you can create a template to add as a worksheet within an existing workbook. To create a worksheet template, design the worksheet you want to use as a template, delete all the other worksheets in that workbook, and save the single-sheet workbook as a template. You can then add a worksheet based on that template to your workbook by right-clicking a sheet tab and then clicking Insert to display the Insert dialog box.
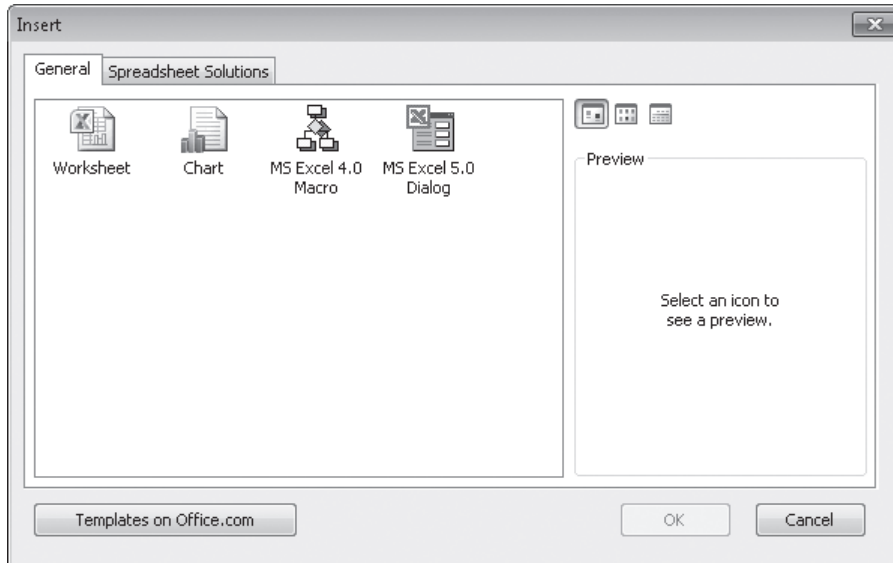
The Insert dialog box splits its contents into two pages. The General page contains icons you can click to insert a blank worksheet, a chart sheet, and any worksheet templates you have created.

Tip The other two options on the General page, MS Excel 4.0 Macro and MS Excel 5.0 Dialog, are there to help users integrate older Excel spreadsheet solutions into Excel 2010.

The Spreadsheet Solutions page contains a set of useful templates for a variety of financial and personal tasks.
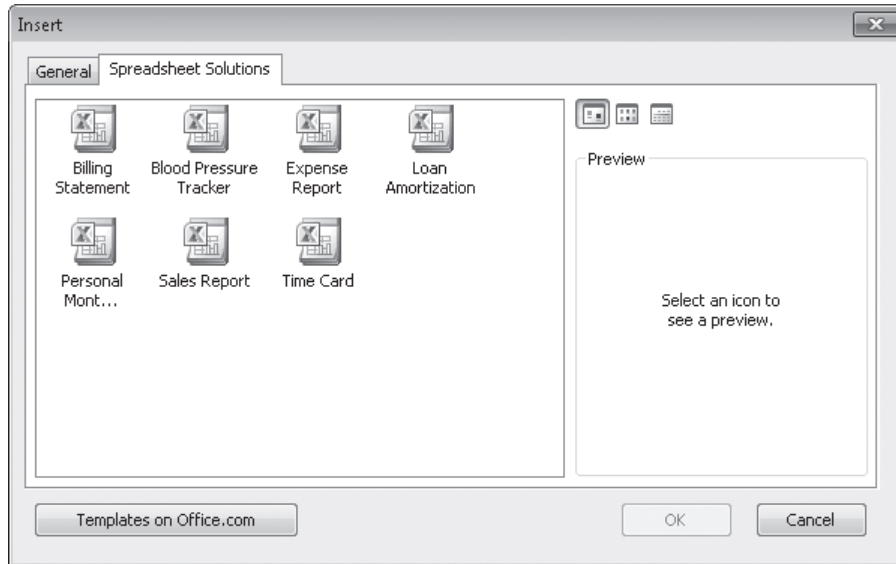
To add a spreadsheet from the Insert dialog box to your workbook, click the desired template, and then click OK. When you click a template, a preview of that template's contents appears in the preview pane, so you can verify you've selected the template you want.

In this exercise, you'll create a workbook from an existing template, save a template to track hourly call volumes to each regional center, save another version of the file as a worksheet template, and insert a worksheet based on that template into a new workbook.

SET UP You need the DailyCallSummary_start workbook located in your Chapter07 practice file folder to complete this exercise. Start Excel, open the DailyCallSummary_start workbook, and save it as *DailyCallSummary*. Then follow the steps.

1. Click the **File** tab, and then click **Save As**.

   The Save As dialog box opens.

2. In the **Save as type** list, click **Excel Template**.

   Excel displays the default Microsoft Office template folder.
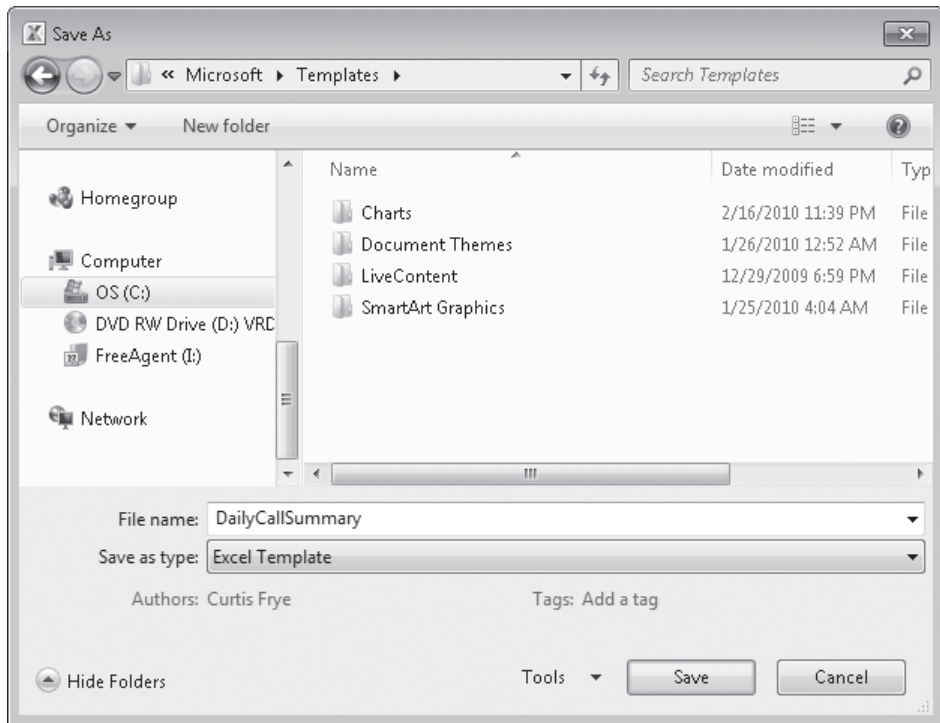
3. Click **Save**.

   Excel saves the workbook as a template and closes the Save As dialog box.

4. Click the **File** tab, and then click **Close**.

   Excel closes the DailyCallSummary workbook.

5. Click the **File** tab, and then click **New**.

   The New Workbook dialog box opens.

6. In the **Available Templates** list, click **Sample Templates**.

   The Sample Templates gallery appears.

7. Click **Expense Report**, and then click **Create**.

   Excel creates a workbook based on the selected template.
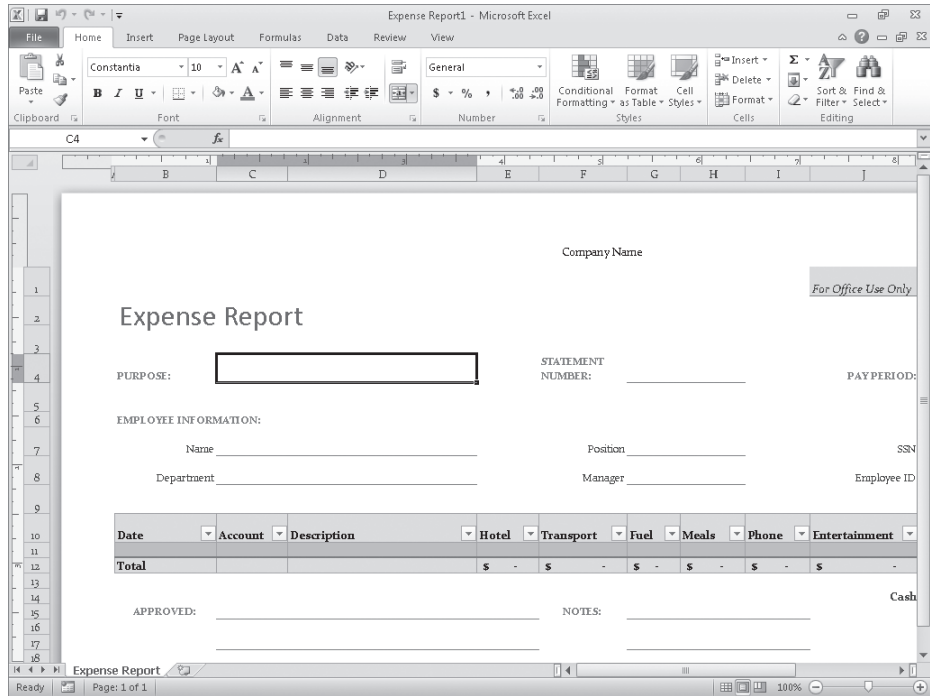
Troubleshooting The appearance of buttons and groups on the ribbon changes depending on the width of the program window. For information about changing the appearance of the ribbon to match our screen images, see "Modifying the Display of the Ribbon" at the beginning of this book.

8. On the Quick Access Toolbar, click the **Save** button.

   The Save As dialog box opens.

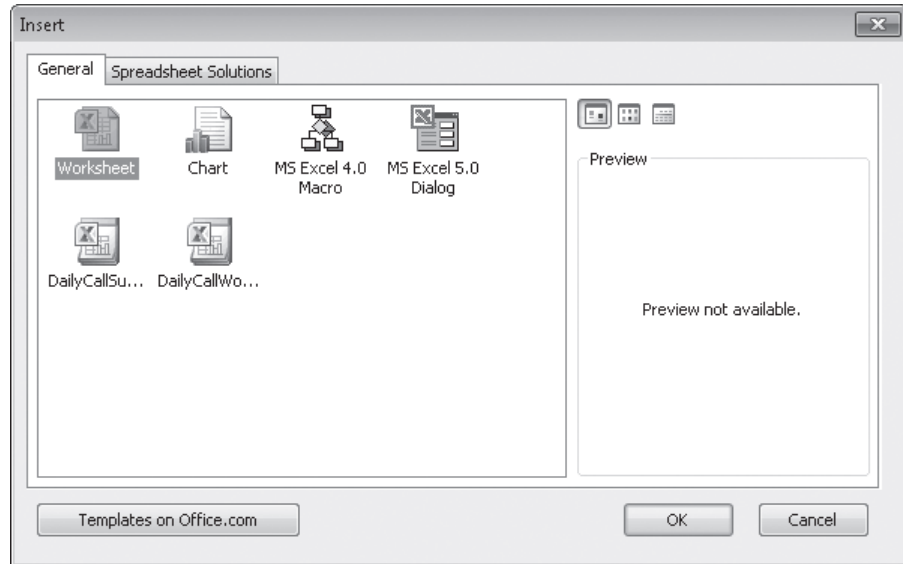9. In the **File name** box, type **ExpenseReport**. Use the dialog box controls to browse to the **Chapter07** folder, and then click **Save**.

   Excel saves your workbook.

10. Click the **File** tab to display the Backstage view, click **Recent**, and then, in the **Recent Workbooks** list, click the **DailyCallSummary** workbook file (not the template).

    The DailyCallSummary file is displayed.
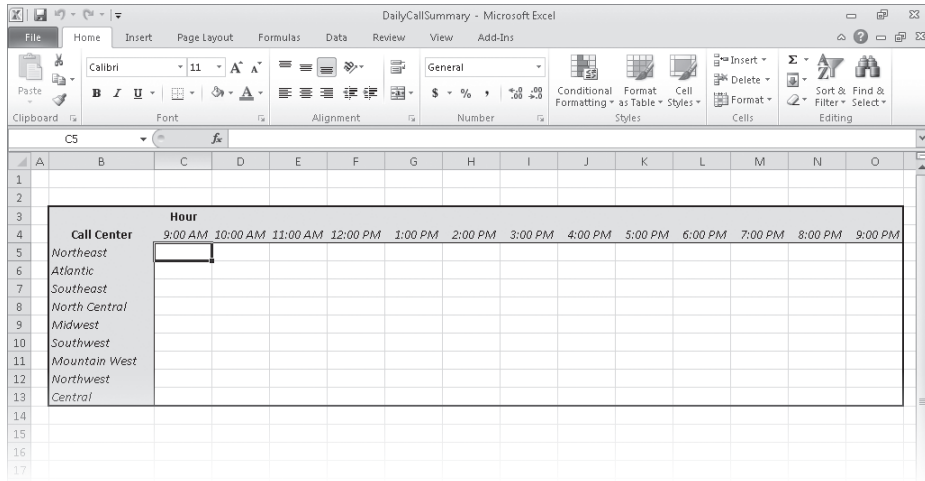
11. Right-click the **Sheet2** sheet tab, and then click **Delete**.

Excel deletes the worksheet, leaving one worksheet in the workbook.

12. Click the **File** tab, and then click **Save As**.

The Save As dialog box opens.

13. In the **File name** box, type **DailyCallWorksheet**.

14. If necessary, in the **Save as type** list, click **Excel Template**.

15. Click **Save**.

Excel saves your template.

16. Click the **File** tab, and then click **Close**.

Excel closes the template.

17. Click the **File** tab, and then click **New**.

The New Workbook dialog box opens.

18. Click **Blank Workbook**, and then click **Create**.

A blank workbook is displayed.

19. Right-click any sheet tab, and then click **Insert**.

The Insert dialog box opens.

20. On the **General** page, click **DailyCallWorksheet**, and then click **OK**.

    Excel creates a new worksheet based on the template.

21. On the Quick Access Toolbar, click the **Save** button.

    The Save As dialog box opens.

22. In the **File name** box, type **CurrentCallSummary**. Use the dialog box controls to browse to the **Chapter07** folder, and then click **Save**.

    Excel saves your workbook.

✖ **CLEAN UP** Close the CurrentCallSummary workbook.

Linking to Data in Other Worksheets and Workbooks

Copying and pasting data from one workbook to another is a quick and easy way to gather related data in one place, but there is a substantial limitation: If the data from the original cell changes, the change is not reflected in the cell to which the data was copied. In other words, copying and pasting a cell's contents doesn't create a relationship between the original cell and the target cell.

You can ensure that the data in the target cell reflects any changes in the original cell by creating a link between the two cells. Instead of entering a value into the target cell by typing or pasting, you create a formula that identifies the source from which Excel will derive the target cell's value and updates the value when it changes in the source cell.

To create a link between cells, open both the workbook that contains the cell from which you want to pull the value and the workbook with the target cell. Then click the target cell and type an equal sign, signifying that you want to create a formula. After you type the equal sign, activate the workbook with the cell from which you want to derive the value, click that cell, and then press the Enter key.

When you switch back to the workbook with the target cell, you see that Excel has filled in the formula with a reference to the cell you clicked.

For example, the reference *='[FleetOperatingCosts.xlsx]Truck Fuel'!$C$15* gives three pieces of information: the workbook, the worksheet, and the cell you clicked in the worksheet. The first element of the reference, the name of the workbook, is enclosed in square brackets; the end of the second element (the worksheet) is marked with an exclamation point; and the third element, the cell reference, has a dollar sign before both the row and the column identifier. The single quotes around the workbook name and worksheet name are there to account for the space in the Truck Fuel worksheet's name. This type of reference is known as a *3-D* reference, reflecting the three dimensions (workbook, worksheet, and cell range) that you need to point to a group of cells in another workbook.

Tip For references to cells in the same workbook, the workbook information is omitted. Likewise, references to cells in the same worksheet don't use a worksheet identifier.

You can also link to cells in an Excel table. Such links include the workbook name, worksheet name, name of the Excel table, and row and column references of the cell to which you've linked. Creating a link to the Cost column's cell in a table's Totals row, for example, results in a reference such as =*'FleetOperatingCosts.xlsx'!Truck Maintenance[[#Totals],[Cost]]*.

Important Hiding or displaying a table's Totals row affects any links to a cell in that row. Hiding the Totals row causes references to that row to display a *#REF!* error message.

Whenever you open a workbook containing a link to another document, Excel tries to update the information in linked cells. If the program can't find the source, as would happen if a workbook or worksheet is deleted or renamed, an alert box appears to indicate that there is a broken link. At that point, you can click the Update button and then the Edit Links button to open the Edit Links dialog box and find which link is broken. After you identify the broken link, you can close the Edit Links dialog box, click the cell containing the broken link, and create a new link to the desired data.

If you type a link and you make an error, a *#REF!* error message appears in the cell that contains the link. To fix the link, click the cell, delete its contents, and then either retype the link or create it with the point-and-click method described earlier in this section.

Tip Excel tracks workbook changes, such as when you change a workbook's name, very well. Unless you delete a worksheet or workbook, or move a workbook to a new folder, odds are good that Excel can update your link references automatically to reflect the change.

In this exercise, you'll create a link to another workbook, make the link's reference invalid, use the Edit Links dialog box to break the link, and then re-create the link correctly.

SET UP You need the OperatingExpenseDashboard_start and FleetOperatingCosts_start workbooks located in your Chapter07 practice file folder to complete this exercise. Open the OperatingExpenseDashboard_start and FleetOperatingCosts_start workbooks, and save them as *OperatingExpenseDashboard* and *FleetOperatingCosts*, respectively. Then follow the steps.

1. In the **OperatingExpenseDashboard** workbook, in cell **I6**, type **=**, but do not press Enter.

2. On the **View** tab, in the **Window** group, click **Switch Windows** and then, in the list, click **FleetOperatingCosts**.

   The FleetOperatingCosts workbook is displayed.

3. If necessary, click the **Plane Repair** sheet tab to display the Plane Repair worksheet, and then click cell **C15**.

   Excel sets the cell's formula to *='[FleetOperatingCosts.xlsx]Plane Repair'!$C$15*.

4. Press Enter.

   Excel displays the OperatingExpenseDashboard workbook; the value *$2,410,871* appears in cell I6.

Tip Yes, cell C15 on the Plane Repair worksheet contains the wrong total for the Airplane Fuel category; that's why you replace it later in this exercise.

5. In the **Switch Windows** list, click **FleetOperatingCosts**.

   The FleetOperatingCosts workbook is displayed.

6. Right-click the **Plane Repair** sheet tab, and then click **Delete**. In the message box that appears, click **Delete** to confirm that you want to delete the worksheet.

   Excel deletes the Plane Repair worksheet.

7. In the **Switch Windows** list, click **OperatingExpenseDashboard**.

   The OperatingExpenseDashboard workbook is displayed, showing a #REF! error in cell I6.
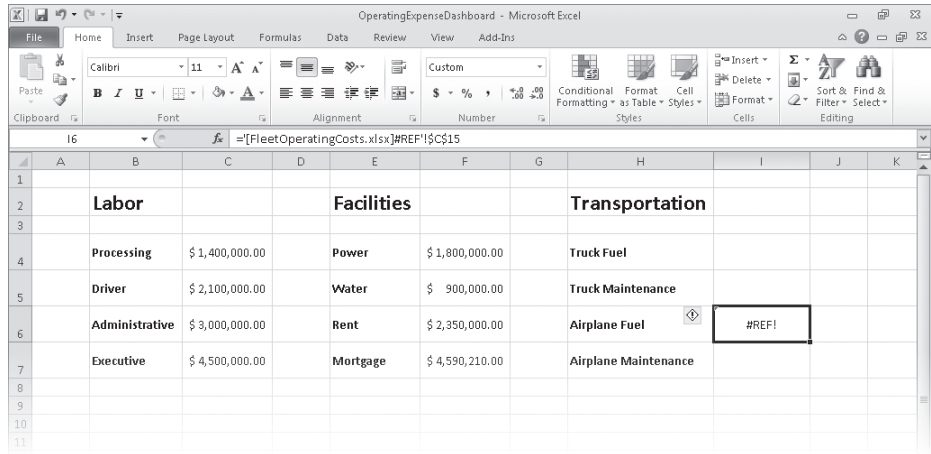
8. On the **Data** tab, in the **Connections** group, click **Edit Links**.

   The Edit Links dialog box opens.
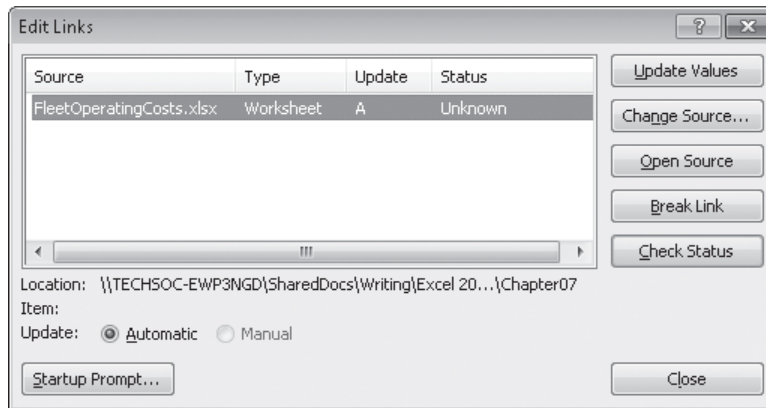
9. Click **Break Link**.

   Excel displays a warning box asking if you're sure you want to break the link.

10. Click **Break Links**.

    The warning box closes, and Excel removes the link from the workbook.

11. Click **Close**.

    The Edit Links dialog box closes.

12. In cell **I6**, type **=**, but do not press Enter.

13. In the **Switch Windows** list, click **FleetOperatingCosts**.

    The FleetOperatingCosts workbook is displayed.

14. Click the **Plane Fuel** sheet tab.

    The Plane Fuel worksheet is displayed.

15. Click cell **C15**, and then press Enter.

    Excel displays the OperatingExpenseDashboard workbook with the value
    $52,466,303 in cell I6.

❌ **CLEAN UP** Save the OperatingExpenseDashboard and FleetOperatingCosts
workbooks, and then close them.

Consolidating Multiple Sets of Data into a Single Workbook

When you create a series of worksheets that contain similar data, perhaps by using
a template, you build a consistent set of workbooks in which data is stored in a pre-
dictable place. For example, consider a workbook template that uses cell C5 to record
the number of calls received from 9:00 A.M. to 10:00 P.M. by the Northeast distribu-
tion center.
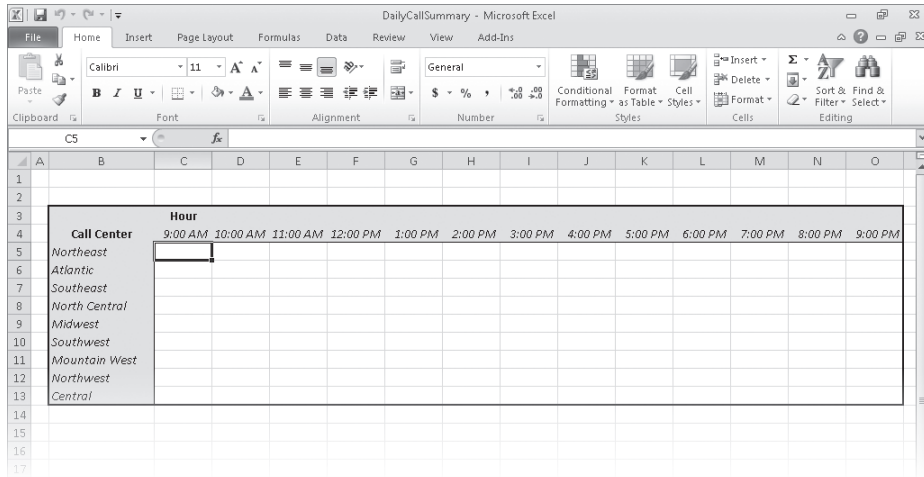
Using links to bring data from one worksheet to another gives you a great deal of power to combine data from several sources into a single resource. For example, you can create a worksheet that lists the total revenue just for certain months of a year, use links to draw the values from the worksheets in which the sales were recorded, and then create a formula to perform calculations on the data. However, for large worksheets with hundreds of cells filled with data, creating links from every cell is a time-consuming process. Also, to calculate a sum or an average for the data, you would need to include links to cells in every workbook.

Fortunately, there is an easier way to combine data from multiple worksheets in a single worksheet. This process, called *data consolidation*, enables you to define ranges of cells from multiple worksheets and have Excel summarize the data. You define these ranges in the Consolidate dialog box.
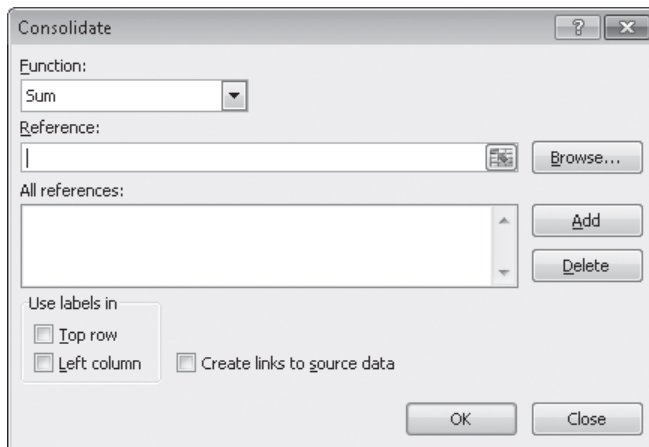
After you open the dialog box, you move to the worksheet that contains the first cell range you want to include in your summary. When you select the cells, the 3-D reference for the range appears in the Consolidate dialog box. Clicking Add stores the reference. You can then choose the other cell ranges that contain data you want to include in the summary, or you can remove a range from the calculation by clicking the range and then clicking Delete.

Cells that are in the same relative position in the ranges have their contents summarized together. When you consolidate the ranges, the cell in the upper-left corner of one range is added to the cell in the upper-left corner of every other range, even if those ranges are in different areas of the worksheet. After you choose the ranges to be used in your summary, you can choose the calculation to perform on the data (sum, average, and so on). When you're done selecting ranges to use in the calculation, click OK to have Excel summarize the data on your target worksheet.

Important You can define only one data consolidation summary per workbook.

In this exercise, you'll define a data consolidation range consisting of ranges from two other workbooks. You'll then add the contents of the ranges and show the results in a worksheet.

SET UP You need the Consolidate_start, JanuaryCalls_start, and FebruaryCalls_start workbooks located in your Chapter07 practice file folder to complete this exercise. Open the Consolidate_start, JanuaryCalls_start, and FebruaryCalls_start workbooks, and save them as *Consolidate*, *JanuaryCalls*, and *FebruaryCalls*, respectively. Then follow the steps.
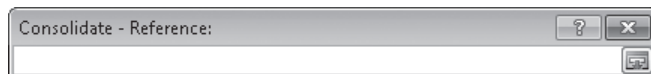
1. In the **Consolidate** workbook, on the **Data** tab, in the **Data Tools** group, click **Consolidate**.

   The Consolidate dialog box opens.

2. Click the **Collapse Dialog** button at the right edge of the **Reference** field.

   The Consolidate dialog box contracts.

   Consolidate - Reference:

3. On the **View** tab, in the **Window** group, click **Switch Windows** and then, in the list, click **JanuaryCalls**.
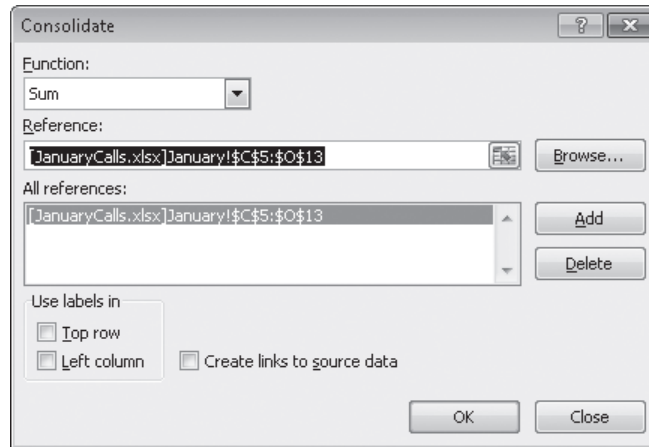
The JanuaryCalls workbook is displayed.

4. Select the cell range **C5:O13**, and then click the **Expand Dialog** button.

The Consolidate dialog box is restored to its full size.

5. Click **Add**.

The range you selected appears in the All References pane.

6. Click the **Collapse Dialog** button at the right edge of the **Reference** field.

The Consolidate dialog box contracts.

7. In the **Switch Windows** list, click **FebruaryCalls**.

The FebruaryCalls workbook is displayed.

8. Select the cell range **C5:O13**, and then click the **Expand Dialog** button.

The Consolidate dialog box is restored to its full size.

9. Click **Add**.

The range *'[FebruaryCalls.xlsx]February'!$C$5:$O$13* appears in the All References pane.

10. Click **OK**.

Excel consolidates the JanuaryCalls and FebruaryCalls workbook data into the range C5:O13 in the Consolidate workbook. You didn't change the *SUM* operation in the Function box, so the values in the Consolidate workbook are the sum of the other workbooks' values.

❌ **CLEAN UP** Save the Consolidate, JanuaryCalls, and FebruaryCalls workbooks, and then close them.

Grouping Multiple Sets of Data

When you work with Excel for a while, you'll find that you often open a number of the same workbooks at the same time. For instance, Lori Penor, the chief operating officer of Consolidated Messenger, might always pull up a workbook that tracks labor costs at the same time she opens the package volume summary workbook. She can open the workbooks individually through the Open dialog box, but she can also group the files so that she has the option of opening them all simultaneously.

If you want to open a set of files simultaneously, you can define them as part of a workspace, which uses one file name to reference several workbooks. To define a workspace, you open the files you want to include and then open the Save Workspace dialog box.

Clicking Save in the Save Workspace dialog box saves references to all the Excel files that are currently open. Whenever you open the workspace you create, all the files that were open when you defined the workspace are displayed. Including a file in a workspace doesn't remove it from general circulation; you can still open it by itself.

In this exercise, you'll save a workspace that consists of two workbooks, close the included files, and then test the workspace by opening it from the Open dialog box.

SET UP You need the OperatingExpenseDashboard and FleetOperatingCosts workbooks you created in the second exercise in this chapter to complete this exercise. If you did not complete that exercise, you should do so now. Open the OperatingExpenseDashboard and FleetOperatingCosts workbooks. Then follow the steps.

1. In either workbook, on the **View** tab, in the **Window** group, click **Save Workspace**.

    The Save Workspace dialog box opens.
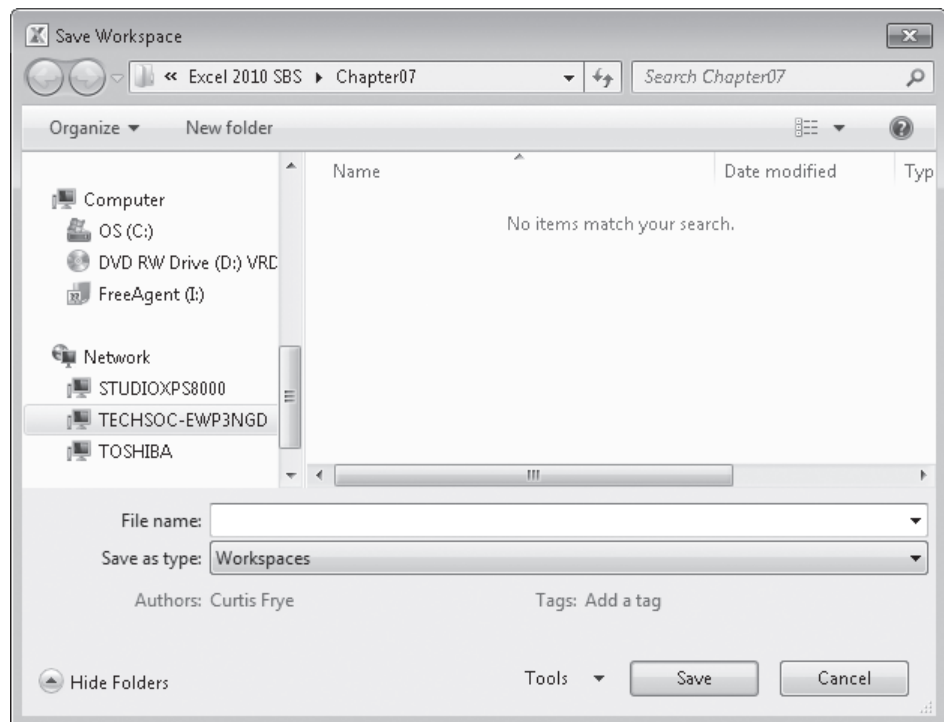
2. In the **File name** field, type **Expenses**.

3. Click **Save**.

   Excel saves your workspace and closes the Save Workspace dialog box.

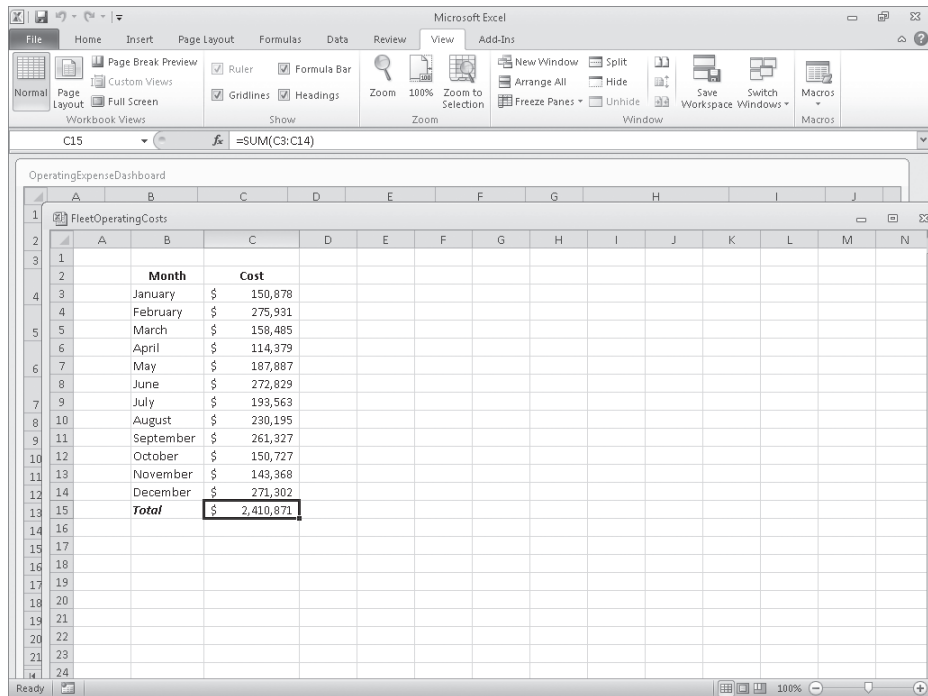4. Click the **File** tab, and then click **Close**.

   Excel closes the active workbook.

5. Click the **File** tab, and then click **Close**.

   Excel closes the second workbook.

6. Click the **File** tab and (if necessary), click **Recent**. In the **Recent Workbooks** list, click **Expenses.xlw**.

   Excel opens the OperatingExpenseDashboard and FleetOperatingCosts workbooks.

✖ **CLEAN UP** Close the OperatingExpenseDashboard and FleetOperatingCosts workbooks. If you are not continuing directly to the next chapter, exit Excel.

Key Points

- If you create a lot of workbooks with the same layout and design, saving a workbook with the common elements (and no data) will save you time when you create similar workbooks in the future.

- You can use data in other worksheets or workbooks in your formulas. You make the link by clicking the cell, which creates a 3-D reference to that cell.

- When you create a link to a cell in a table's Totals row, hiding the Totals row causes Excel to display a #REF! error in the cell where you created the link.

- If you always work on a group of workbooks at the same time, create a workspace so that you can open them all at once.
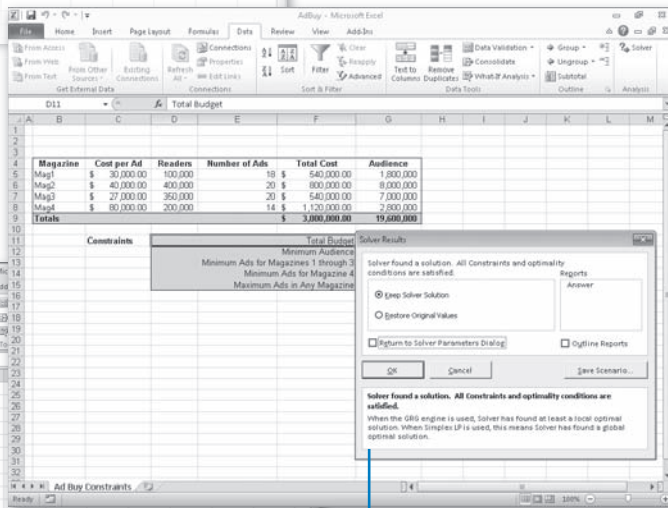
Chapter at a Glance
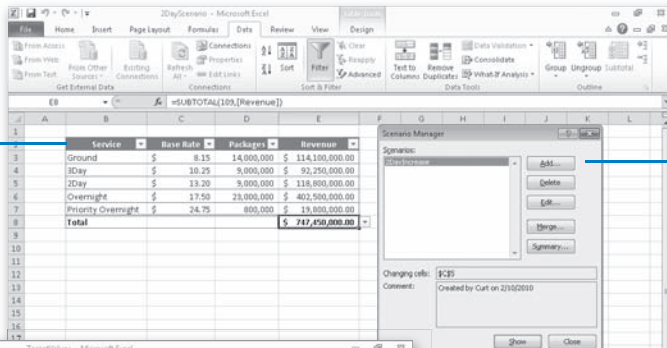
Define an alternative data set, **page 190**

Define multiple alternative data sets, **page 194**
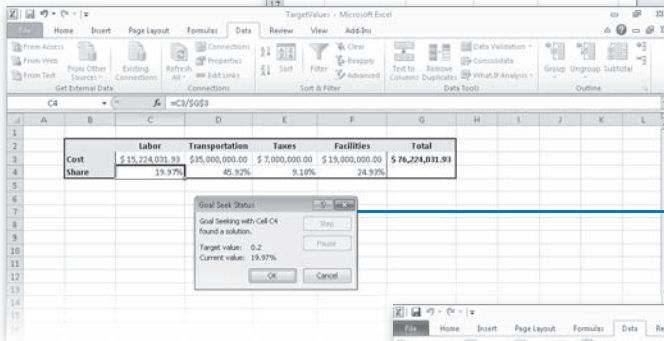
Vary your data to get a desired result by using Goal Seek, **page 198**

Analyze data by using descriptive statistics, **page 207**

Find optimal solutions by using Solver, **page 201**