



Dashboard Your Scorecard

Unleash the power of Excel for visual data analysis.

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Dashboard reports created in Microsoft Excel are powerful, flexible and easy to design. In much the same way that an automobile dashboard graphically displays numerous measures of performance from the gas level to oil pressure, a computer dashboard presents critical data in a variety of visual formats. From this organized visual display, optimal business decisions can be made quickly and efficiently.

Most enterprise systems provide dashboards that decision makers can easily customize to fit their specific needs. But suppose the data you need to analyze is regularly downloaded from your enterprise system and Microsoft Excel is the only available data analysis tool. If you are reasonably proficient at using charts, PivotTables and

conditional formatting, this article will show you how you can design your own dashboard with minimal time and effort. Adding a combo box control will further unleash the power of Excel to customize the information displayed in graphics.

Imagine the possibilities for using dashboards to quickly analyze data in a variety

Editor's note: The Excel worksheet used to create the sample dashboard presented here, along with completed dashboards in Excel 2007 and 2010, are available with the online version of this article. Go to journalofaccountancy.com and enter 20092427 in the search box to find the article.

of ways and to communicate meaningful information to specific target audiences. Imagine the effectiveness of your explanations of companywide financial or operational trends when, in the same window, you can instantly respond to a question about trends for a division, location, product line or employee.

You can learn to perform these data analyses with Excel as we guide you

through the dashboard shown in Exhibit 1. Excel 2010 commands and illustrations are included in the article. Any differences in Excel 2007 commands are noted.

THE SAMPLE DASHBOARD

For illustration purposes, suppose your company has implemented a balanced scorecard with the goal of increasing sales of its line of brick. In addition to enabling

you to analyze sales trends, the dashboard will prove useful in management's monthly performance assessment meeting.

The charts provide three views of total unit sales: percentage of sales by representative (pie chart), unit sales by representative and customer category (stacked bar), and unit sales by brick style for a selected sales representative (column chart). The table shows a year-to-date

Exhibit 1 Sample Excel Dashboard in Excel 2010

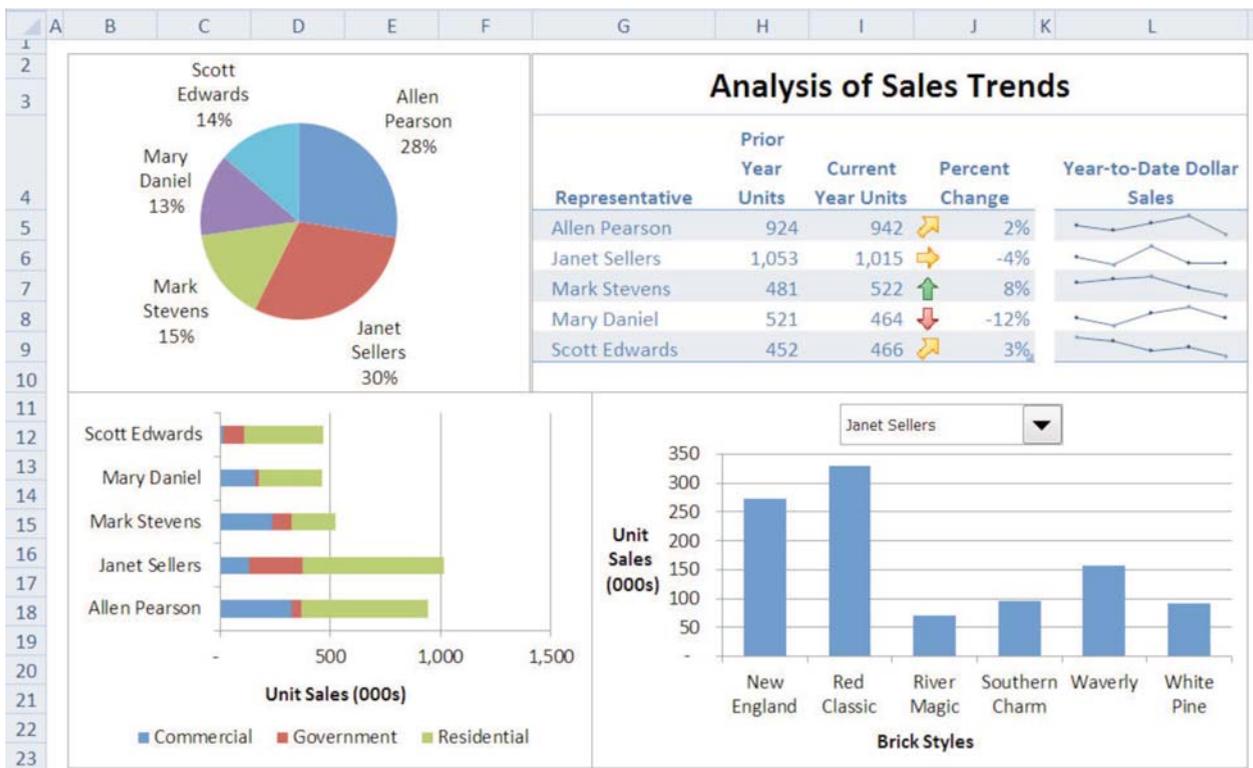


Exhibit 2 Data Structure of Downloaded Data File

Invoice	Date	Representative	Customer	Category	Style	Quantity	Price per Thousand	Total Sale
15345	1/4/2010	Scott Edwards	Sean Bishop	Residential	White Pine	26	\$ 253.00	\$ 6,578.00
15346	1/5/2010	Janet Sellers	Gail Dixon	Residential	Red Classic	18	\$ 253.00	\$ 4,554.00
15347	1/6/2010	Scott Edwards	Brent Minyard	Residential	Southern Charm	15	\$ 250.00	\$ 3,750.00
15348	1/6/2010	Allen Pearson	Keith Brunt	Residential	White Pine	24	\$ 263.00	\$ 6,312.00
15349	1/7/2010	Mark Stevens	Price Bank	Commercial	Southern Charm	64	\$ 256.00	\$ 16,384.00

analysis of unit and dollar sales for each sales representative. To the right of the table are Sparklines, one-cell charts available in Excel 2010.

SELECTING SCORECARD MEASURES

Suppose one measure of your success is the extent that each sales representative sells the entire product line, not just a few select brick styles, to all three categories of your customers—commercial, government and residential. To monitor this performance measure, you regularly download

sales data from your enterprise system as shown in Exhibit 2.

If you are familiar with the PivotChart feature, you are aware that only a single chart can be created from a PivotTable. While you can alter the data and chart type to view a revised chart, you can view only one chart at a time. However, using the GETPIVOTDATA function, you can view multiple charts of the same PivotTable data. All the tables and charts in Exhibit 1 were created with GETPIVOTDATA functions that extracted data from just two PivotTables. Using a combo box, you can

drill down into the data to instantly display a custom chart showing performance measures for selected items, such as by representative, in this case.

Understanding the value of dashboards created in Excel, let's create the dashboard for our illustrative company and see how this in-depth analysis is performed.

PREPARING YOUR DATA

When working with data tables, you should anticipate that the size of the data table will change. For example, as our illustrative company earns additional sales,

Exhibit 3 PivotTable on PivotOne Worksheet

	A	B	C	D	E	F	G	H
3	Sum of Quantity	Column						
4	Row Labels	New England	Red Classic	River Magic	Southern Charm	Waverly	White Pine	Grand Total
5	Allen Pearson	254	305	66	47	158	112	942
6	Commercial	155	89		18	64		326
7	Government		11			33		44
8	Residential	99	205	66	29	61	112	572
9	Janet Sellers	272	330	70	95	156	92	1015
10	Commercial					66	64	130
11	Government	174	13		20	37		244
12	Residential	98	317	70	75	53	28	641
13	Mark Stevens	56	232	48	109	18	59	522
14	Commercial	24	87		98		26	235
15	Government		76		11			87
16	Residential	32	69	48		18	33	200
17	Mary Daniel	131	36	87	16	132	62	464
18	Commercial			63		69	23	155
19	Government					20		20
20	Residential	131	36	24	16	43	39	289
21	Scott Edwards	64	102		71	78	151	466
22	Commercial		13					13
23	Government					27	66	93
24	Residential	64	89		71	51	85	360
25	Grand Total	777	1005	271	338	542	476	3409

the data table will extend beyond its current 140 rows. By formatting the data as a table, Excel will extend the data table range automatically to include the new data. Using a table with other Excel tools, such as PivotTables and charts, ensures that these objects reflect all data.

To begin, download the file JofA Dashboard.xlsx from the online version of this article on journalofaccountancy.com and save it to your computer. Go to the **Data** worksheet and position the cell pointer on any cell in the table. Press Ctrl A to select all the data in the table. From the **Home** tab and the **Styles** group, select **Format as Table**. Select a table style and click **OK** to accept the format.

CREATE A PIVOT TABLE

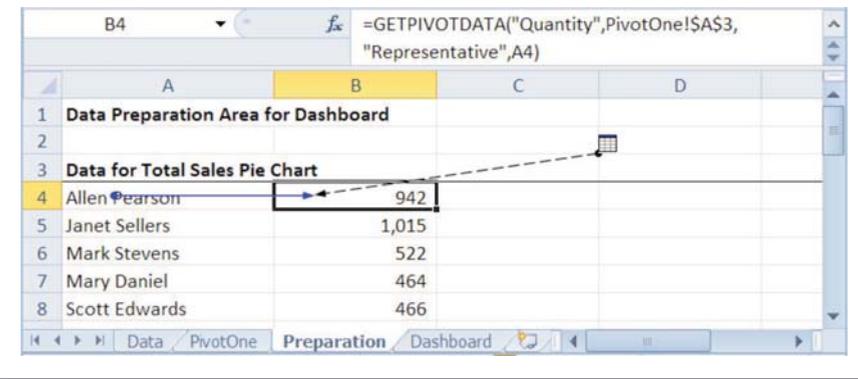
Your next step is to create a PivotTable on a new worksheet. Position your cell pointer on any cell in the table on the **Data** worksheet. From the **Insert** tab and **Tables** group, select **PivotTable**. Click **OK** to accept the default options to place the PivotTable on a new worksheet. The new worksheet displays a placeholder for the PivotTable and the **PivotTable Field List** dialog box. In the **PivotTable Field List**, drag the **Style** field to the **Column Labels** box, **Representative** to the **Row Labels** box, **Category** to the **Row Labels** box under **Representative**, and **Quantity** to the **Values** box. The PivotTable (Exhibit 3) shows the total quantity (in thousands) of each brick style sold by each representative by customer category. Rename the worksheet **PivotOne**.

The **GETPIVOTDATA** function is used to retrieve data from a PivotTable. Unlike a **VLOOKUP** function that retrieves data from a table based on a single value, a **GETPIVOTDATA** function can retrieve data using one, two or all three of the fields selected in the rows and columns of this PivotTable.

CREATING THE PIE CHART

Let's begin by preparing the data series for the pie chart. On the **Preparation** worksheet (shown in Exhibit 4), we have listed the sales representatives at A4:A8. Position your cell

Exhibit 4 Data Series for Pie Chart



pointer on cell B4. Enter an equal sign to begin a function and point to the cell in the PivotTable containing Allen Pearson's total sales, 942 (cell H5 on the **PivotOne** worksheet in Exhibit 3). Excel creates the **GETPIVOTDATA** function automatically:

=GETPIVOTDATA("Quantity",PivotOne!\$A\$3,"Representative","Allen Pearson")

Press Enter to complete the function. To prepare this function to be copied down the column, edit the function to replace "Allen Pearson" (including the quotation marks) with A4, the cell reference to Allen Pearson. The reference to A4 ensures each copied function uses the adjacent sales representative. After copying the function, your worksheet appears as shown in Exhibit 4.

The arguments of the function in B4 (Exhibit 4) instruct Excel to:

"Quantity"	Retrieve a Quantity from the PivotTable ...
PivotOne!\$A\$3	Located on the PivotOne worksheet (Exhibit 3) beginning at cell A3...
"Representative"	And search the Representative field of the PivotTable...
A4	For Allen Pearson, the representative in cell A4.

The Excel **Trace Precedents** tool (**Formulas** tab, **Formula Auditing** group)

illustrates the function's dependence on the contents of A4 and the PivotTable (Exhibit 3). Highlight cells A4:B8 and insert a pie chart. Cut the pie chart and paste it in the upper-left corner of the **Dashboard** worksheet. Resize the chart to fit adjacent to the existing table.

DOUBLE YOUR ANALYSIS

The stacked bar chart in the lower-left corner of the dashboard (Exhibit 1) displays data based on two fields—representative and category. On the **Preparation** worksheet, note the list of representative names in A12:A16 and the customer categories in B11:D11. Position your cell pointer at B12 of the **Preparation** worksheet. Enter an equal sign to begin a function and point to the cell in the PivotTable containing Allen Pearson's total sales to Commercial customers, 326 (cell H6 on the **PivotOne** worksheet in Exhibit 3)). Excel creates the **GETPIVOTDATA** function:

=GETPIVOTDATA("Quantity",PivotOne!\$A\$3,"Representative","Allen Pearson","Category","Commercial")

Press Enter to complete the function. To prepare this function to be copied, edit the function to replace "Allen Pearson" with \$A12, the cell reference to Allen Pearson, and replace "Commercial" with B\$11, the cell reference to Commercial. After copying the function to B12:D16, your schedule appears as shown in Exhibit 5.

Exhibit 5 shows one of the copied functions. Notice that the first two arguments

Exhibit 5 Data Series for Stacked Bar Chart

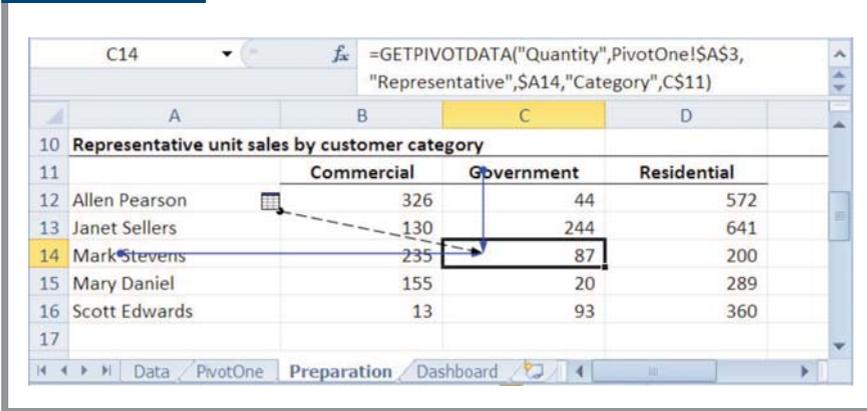
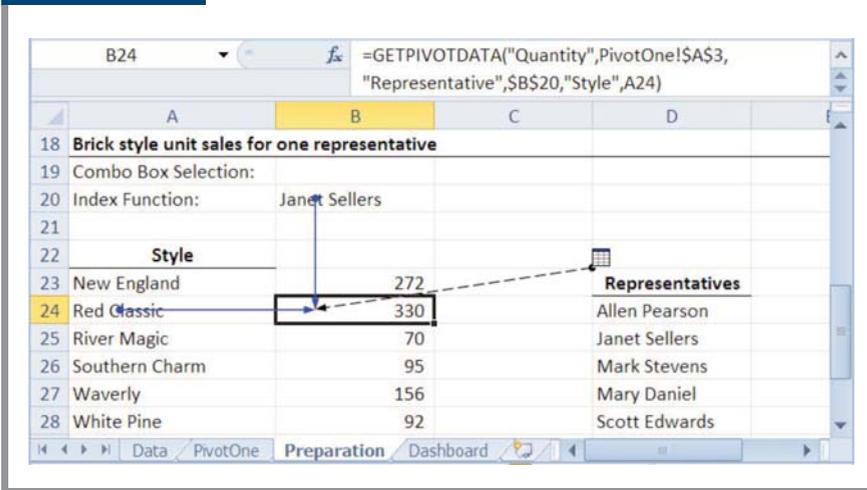


Exhibit 6 Data Series for Column Chart



chart, we have entered on the **Preparation** worksheet a list of styles in A23:A28 and a list of representatives in D24:D28. Let's begin by creating the GETPIVOTDATA functions. For the moment, you will retrieve the sales for Janet Sellers, the representative name entered in B20. Enter an equal sign in B23 to begin a function and point to the cell in the PivotTable containing Janet Sellers' total sales of New England, 272 (cell B9 on the **PivotOne** worksheet in Exhibit 3). Excel creates the GETPIVOTDATA function:

```
=GETPIVOTDATA("Quantity",PivotOne!$A$3,"Representative",JanetSellers,"Style","New England")
```

Press Enter to complete the function. Edit the function to replace "Janet Sellers" with \$B\$20, the cell reference to Janet Sellers, and replace "New England" with A23, the cell reference to New England. After copying the function to B24:B28, your worksheet appears as shown in Exhibit 6.

Exhibit 6 shows one of the copied functions. The function at B24 retrieves the Quantity from the PivotTable at A3 of the **PivotOne** worksheet for Representative Janet Sellers (B20) of brick Style Red Classic (A24). The precedent arrows in Exhibit 6 illustrate the function's dependence on cells B20, A24, and the PivotTable.

A combo box and the INDEX function eliminate the need to input a different representative in B20 to drill down into the PivotTable to display the desired data in the chart. To create a combo box, you must add the **Developer** tab to the Excel Ribbon if it is not already present. To do so, from the **File** tab, select **Options** and **Customize Ribbon**. In the right window, select the **Developer** option box. (In Excel 2007: Select the Office button and the **Excel Options** button. From the left pane, click **Popular** and check the option box **Show Developer tab** in the Ribbon option box.) After clicking OK, a **Developer** tab appears in the Ribbon to the right of the **View** tab.

On the **Developer** tab, select **Insert** from the **Controls** group. In the **Form Controls** panel, select **Combo Box**. Move

of the function, "Quantity",PivotOne!\$A\$3, are identical to the function used to create the functions for the pie chart. Both charts retrieve data from the same PivotTable. The remainder of the function in C14 instructs Excel to search the **Representative** field of the PivotTable (Exhibit 3) for Mark Stevens, the representative in A14, and to retrieve the quantity for the Category in C11, **Government**.

Highlight A11:D16 and insert a Stacked Bar chart. Cut the chart and paste the chart in the lower-left corner of the **Dashboard** worksheet.

A DIFFERENT PERSPECTIVE

To provide insight into certain performance

measures, you may need to drill down into data for more detailed analysis. For example, what style of brick has Janet Sellers sold to her customers? What style has Scott Edwards not sold well? In the column chart in the lower-right corner of the dashboard (Exhibit 1), notice the combo box that allows you to conveniently view data for a selected item, such as a specific representative. Although the combo box appears to be part of the chart, it's actually an independent object positioned over the chart. Three Excel features—a combo box, an INDEX function, and the GETPIVOTDATA function—work together to create a custom chart for any representative.

To assist you in creating the column

your pointer adjacent to the representative list, and click and drag to create a box about two cells in width. A blank combo box will appear. Right-click the combo box and select **Format Control** from the menu list. Enter Preparation!\$D\$24:\$D\$28 in the **Input range** box (Exhibit 7) to identify the range of cells containing the items to display in the combo box. Enter Preparation!\$B\$19 in the **Cell link** box to identify when Excel is to store the selected item. The worksheet reference, Preparation!, is required for the combo box to work when pasted in another worksheet.

Click **OK** and click any cell to unselect the combo box. Let's experiment with the combo box. Use it to select one of the sales representatives. You may be disappointed that the sales representative's name does not appear in B19. Instead, a number appears indicating the position of the sales representative in the list. When you select an item, the combo box enters that selection's numeric order in the input range (D24:D28) in the cell link (B19).

Now, let's tackle the final piece of the puzzle. Enter the function =INDEX(D24:D28,B19) in cell B20 (Exhibit 8).

The function =INDEX(D24:D28,B19) in B20 directs Excel to:

D24:D28 Select from the list of representatives at D24:D28...

B19 the name Janet Sellers in row 2 of the list.

The three Excel features are now in place. When you select Janet Sellers from the combo box, the number 2 is stored in B19. Create a column chart using the schedule in A23:B28 and position the chart in the lower-right corner of the **Dashboard** worksheet. Right click on the combo box, and then cut and paste the combo box to any blank cell on the **Dashboard** worksheet (do not paste the combo box into the chart). Right-click on the combo box again to drag the object over the chart. Click any cell to deselect the combo box.

BEYOND CHARTS

While graphics are ideal for depicting

Exhibit 7 Format Control for Combo Box

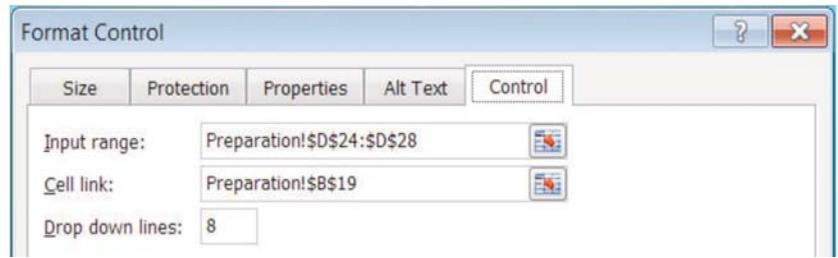
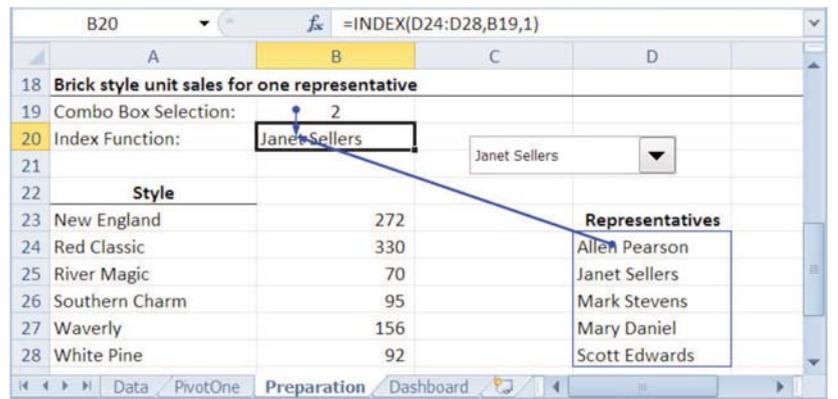


Exhibit 8 INDEX Function Selects From List



numeric data, you may need to view some numeric data in a table. For example, our dashboard includes a simple year-to-date analysis of sales by representative. The structure of the schedule appears on the **Dashboard** worksheet. The prior-year amounts are entered, and the current-year amounts will be retrieved from the PivotTable. At cell I5 on the **Dashboard** worksheet, enter an equal sign and point to the cell on the **PivotOne** worksheet containing Allen Pearson's total sales, 942, in cell H5. Change the function reference to "Allen Pearson" to G5. The schedule has been formatted using the **Format as Table** tool and, therefore, the function is automatically copied down the schedule.

Conditional formatting enables you to apply the power of graphics within a table (see "Discover the Power of Excel 2007," *JofA*, Feb. 2008, page 60). Select cells J5:J9.

Then, from the **Home** tab in the **Styles** group, select **Conditional Formatting**, **Icon Sets**, and the **5 Arrows (Colored)** option to visually depict the relative period-over-period performance of sales representatives. If you later want to change the icon set or otherwise alter the rules for displaying them (such as to select green icons when lower numbers are better, as in the case of customer complaints), highlight the cells and from the **Styles** group on the **Home** tab, select **Conditional Formatting** and **Manage Rules**. Click on the icon set and click on **Edit Rule**. Make the appropriate changes in the dialog box and click **OK** twice.

SPARKLINES

Sparklines, a new feature of Excel 2010, are one-cell charts useful in representing trending data (see "What's New for CPAs

in Office 2010,” *JofA*, Feb. 2010, page 40). In our dashboard in Exhibit 1, Sparklines show the monthly trend for total dollar sales for each sales representative.

Because the PivotTable in the **PivotOne** worksheet does not contain either sales by month or total dollar sales, you must create a second PivotTable. Using the table in the **Data** worksheet, insert a PivotTable on a new worksheet with **Representative** as the row labels, **Date** as the column labels, and **Total Sale** as the values. Right-click on any date in row 4 of the new worksheet and select **Group**. Be certain that **Months** is selected and click **OK**. Rename your worksheet **PivotTwo**.

Position your cell pointer on L5 of the **Dashboard** worksheet. From the **Insert** tab in the **Sparklines** group, select **Line**. For the Data Range, highlight B5:F9 on the **PivotTwo** worksheet. For the Location Range, highlight L5:L9 on the **Dashboard** worksheet, and click **OK**. With the Sparklines highlighted, select the **Sparkline Tools** and **Design** tabs to view available options, such as the **High Point** and **Low Point** options in the **Show** group.

UPDATING YOUR DASHBOARD

Having formatted the data table using the **Format as Table** tool, new data entered or copied to your table are automatically included in the range of cells used in the PivotTables. However, you must refresh your PivotTables (right-click inside the PivotTable and select **Refresh**) to ensure that any new data are reflected in your charts and tables.

Any new columns or rows added to the PivotTables (for example, a new sales representative or brick style appears in the data) will require minor modifications of your schedules on the **Preparation** worksheet. Simply add the new row or column label to the schedule, copy your existing GETPIVOTDATA functions, and revise the data series used in the related chart.

Any new data added to a PivotTable created for the Sparklines will require you to update the data range for these charts (right-click on any Sparkline and select **Edit Data**

on the **Sparkline Tools Design** tab).

These important but simple maintenance steps are well worth the effort to ensure your dashboard is current and accurate.

USE YOUR IMAGINATION

In our dashboard example, the column chart (lower right) shows the sales *by* brick style *for* a selected sales representative. The words *by* and *for* in that statement are key to comprehending the immense value of a dashboard. These words emphasize that a PivotTable can be used to analyze the data *by* one or more fields. Adding a combo box makes it easy to select the data *for* a selected item, such as a division, employee, or product line. Note the use of *by* and *for* in these examples:

- A bank employee analyzes the average loan interest rates *by* customer income category *for* a selected branch office.
- A store manager analyzes sales returns *by* time of day *for* a selected sales clerk.
- An auditor analyzes a client’s inventory adjustments *by* store and *by* product line *for* all inventory control clerks.

Now that the mystery behind creating powerful dashboards with Excel has been revealed, you can begin to identify potential dashboard applications for your own data. A wealth of resources is available on the Internet to further your understanding of this powerful data visualization tool. ❖

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