

PivotTables: Data Aggregation Without the Aggravation

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PivotTables provide a potent and flexible way to organize—and reorganize—the records in a database or table, by letting you break out the data into a variety of visual arrangements. And once you’ve done so, you can quickly transform the results into a PivotChart.

PivotTables also let you *group* data; for example, you can bundle test score results in groups of 10 points—that is, tally the number of students who score between 100 and 91, 90 and 81, and so on.

And starting with Excel 2010, Microsoft has introduced a new PivotTable feature called the Slicer, which gives you a clearer presentation of filtered data. I’ll explain the Slicer soon, although it’s similar to the filters discussed in Chapter 7.

Looking at Some PivotTables

In this section, we’ll take a look at some specific examples of how PivotTables are used.

Imagine that you’re planning a dinner for your organization and you need to assign the invitees to their tables. You start with a database that looks like Figure 8–1.

Guest	Table
Halladay	16
Martinez	24
Grove	18
Santana	3
Johnson	7
Oswalt	15
Clemens	23
Peavy	6
Sabathia	15
Dean	28
Higuera	16
Zambrano	15
Seaver	23
Schilling	5
Ford	17
Sewell	18
Richard	27
Vuckovich	1
Gooden	5
Webb	26
Hoyt	26
Chandler	5

Figure 8–1. *The A list? Dinner guests and their table assignments*

Now while it's true that you could simply sort the data by table number, that approach won't tell you how *many* guests are seated at each table. What you really want to see is something like Figure 8-2.

Count of Table	
Table	Total
1	9
2	4
3	4
4	4
5	4
6	2
7	3
8	3
9	5
10	5
11	6
12	4
13	3
14	1
15	6

Figure 8-2. *Guests per table: One way you can organize data with a PivotTable*

Once you've compiled the data in this way with a PivotTable, you can determine if you've over- or underassigned guests to particular tables. But you may also want to see the data displayed as in Figure 8-3.

Row Labels
1
Allen
Bankhead
Farrell
Jenkins
Koufax
Moyer
Parnell
Pettitte
Vuckovich
2
Appier
Feller
McDowell
Walk
3
Borbon
Leonard
Santana
Tudor
4
Camp
Candelaria
Gibson
Morton

Figure 8-3. *Who's where: Guests identified by their table. Note that the guest names are automatically sorted, too.*

Here, you've learned exactly who's seating where.

These are the sort of things that PivotTables (technically called PivotTable reports) can do: they can organize—or again, break out—your data in all sorts of combinations and modes of presentation. They're particularly good for identifying patterns and tendencies in the data that might otherwise escape your attention, particularly when you're working with a large database.

Here's one more example, adapted from a Microsoft practice database. In this example, you have a collection of sales records, each of which cites the salesperson, country in which the sale was transacted, transaction date, and amount of each sale (see Figure 8-4).

Country	Salesperson	Order Date	Order Amount
UK	Buchanan	01/05/09	\$440.00
UK	Suyama	12/30/08	\$1,863.40
USA	Peacock	01/01/09	\$1,552.60
USA	Leverling	01/04/09	\$654.06
USA	Peacock	12/31/08	\$3,597.90
USA	Leverling	01/05/09	\$1,444.80
UK	Buchanan	01/12/09	\$556.62
UK	Dodsworth	01/04/09	\$2,490.50
USA	Leverling	01/06/09	\$517.80
USA	Peacock	01/11/09	\$1,119.90
USA	Davolio	01/12/09	\$1,614.88
USA	Peacock	01/14/09	\$100.80
USA	Peacock	01/18/09	\$1,504.65
USA	Peacock	01/19/09	\$448.00
USA	Callahan	01/14/09	\$584.00
UK	Walters	04/05/09	\$1,543.73

Figure 8–4. Salesperson data, ripe for pivot tabling

One obvious question you might want to ask of the data is: how much money each salesperson earned? A PivotTable will tell you (see Figure 8–5).

Sum of Order Amount	
Salesperson	Total
Buchanan	\$68,792.25
Callahan	\$123,032.67
Davolio	\$182,500.09
Dodsworth	\$75,048.04
Fuller	\$162,503.78
King	\$116,962.99
Leverling	\$201,196.27
Peacock	\$225,763.68
Suyama	\$72,527.63
Grand Total	\$1,228,327.40

Figure 8–5. Salesperson earnings, with the grand total besides

There's your answer—or at least *one* answer. But with PivotTables, you can also come up with something like what's shown in Figure 8–6.

Sum of Order Amount	Years		
Order Date	2009	2010	Grand Total
Jan	\$23,652.81	\$49,406.37	\$73,059.18
Feb	\$22,771.15	\$46,133.07	\$68,904.22
Mar	\$26,033.70	\$48,578.81	\$74,612.51
Apr	\$44,054.62	\$70,261.58	\$114,316.20
May	\$53,133.04	\$46,371.24	\$99,504.28
Jun	\$31,093.16	\$62,680.05	\$93,773.21
Jul	\$62,086.83	\$94,342.96	\$156,429.79
Aug	\$34,566.55	\$106,732.56	\$141,299.11
Sep	\$45,530.49	\$106,177.34	\$151,707.83
Oct	\$38,615.25	\$105,352.87	\$143,968.12
Nov	\$64,144.30		\$64,144.30
Dec	\$41,147.35	\$5,461.30	\$46,608.65
Grand Total	\$486,829.25	\$741,498.15	\$1,228,327.40

Figure 8–6. Sales data broken out, not by salesperson, but by month and year instead

Now that's a radically different take on the same sales figures—organized here by time frame, with no mention of the salespersons. But we could also do something like Figure 8–7.

Sum of Order Amount	Order Date						
Years	Jan	Feb	Mar	Apr	May	Jun	
2009	23652.81	22771.15	26033.7	44054.62	53133.04	31093.16	
2010	49406.37	46133.07	48578.81	70261.58	46371.24	62680.05	
Grand Total	73059.18	68904.22	74612.51	114316.2	99504.28	93773.21	

Figure 8–7. Turnabout: Now the years are occupying the rows

Bet that one got your attention! What you're seeing now is precisely the same data from Figure 8–6, but it's been *pivoted*, or flipped on its side, as it were. Now the years run down the column, with the months streaming across. And that's what PivotTables can do: pivot the information across their rows and columns to give the user a variety of ways of presenting the information.

Pretty impressive—and as with Excel's other data management capabilities, the methods for designing PivotTables are identical for databases of 100 or 100,000 records. And once you get the hang of them, you can batch one up in a matter of seconds.

Now take another look at Figures 8–6 and 8–7, and notice that they organize the sales data by months and years, even though the original source data only records each sale on the particular *day* on which it was transacted. But PivotTables let you *group* the data into larger categories, allowing you to easily see the bigger picture.

Again, you can't really produce these kinds of results with the filters discussed previously. PivotTables afford the user a larger and more effective set of tools for analyzing data, and though some newcomers to Excel view them as mysterious, slightly scary, and perhaps user-hostile, a bit of practice and reflection will pay off—because PivotTables are definitely worth knowing about.

It's true that there's a lot to learn about PivotTables if you're interested in turning yourself into the company guru. In fact, there are two Apress books out there devoted exclusively to the subject, *Beginning PivotTables in Excel 2007* and *Excel 2007 PivotTable Recipes*, authored by PivotTable expert Debra Dagleish. But as with many of Excel's features, there's a set of the basics you *have* learn in order to make PivotTables do productive work, and I'm going to introduce them here.

NOTE: Because a PivotTable works with a *copy* of the original database, any mistakes you may make in the course of your PivotTable design will nevertheless leave the database intact. And you can always apply the Undo command to PivotTables, just as you can with any other Excel feature.

Creating a PivotTable

So let's try to construct some PivotTables, by working with the first 15 records of the sales data we've been looking at.

1. In a blank workbook, copy the records shown in Figure 8–8, starting in cell A1.

Country	Salesperson	Order Date	Order Amount
UK	Buchanan	01/05/09	\$440.00
UK	Suyama	12/30/08	\$1,863.40
USA	Peacock	01/01/09	\$1,552.60
USA	Leverling	01/04/09	\$654.06
USA	Peacock	12/31/08	\$3,597.90
USA	Leverling	01/05/09	\$1,444.80
UK	Buchanan	01/12/09	\$556.62
UK	Dodsworth	01/04/09	\$2,490.50
USA	Leverling	01/06/09	\$517.80
USA	Peacock	01/11/09	\$1,119.90
USA	Davolio	01/12/09	\$1,614.88
USA	Peacock	01/14/09	\$100.80
USA	Peacock	01/18/09	\$1,504.65
USA	Peacock	01/19/09	\$448.00
USA	Callahan	01/14/09	\$584.00

Figure 8–8. Sales data: Working with text, date, and currency fields

2. Save the workbook as PivotTables.
3. To start with, we want to break out the sales figures—that is, the data in the Order Amount field—by salesperson to see how much each has earned. The first step is to click anywhere in the database, as we did with sorting and filtering. Then click the Insert tab, and choose PivotTable from the Tables button group (click the top half of the button). You'll see the dialog shown in Figure 8–9.

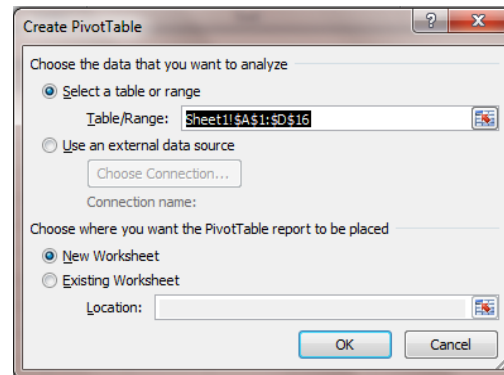


Figure 8–9. The Create PivotTable dialog box

4. Note that by default Excel will manufacture a new worksheet in which to place the PivotTable. Click OK, and you'll see Figure 8–10. We've put what could be termed the *scaffolding* of the PivotTable in place, but all we see so far is a curious, empty space holding down the left side of the worksheet; we obviously haven't generated any results yet. (Note also that a PivotTable Tools contextual tab also appears at the top of your screen.) Now look at the area in the lower half of the PivotTable Field List, in the area captioned "Drag fields between areas below." This is where you'll be doing most of the work of designing and redesigning your PivotTables.

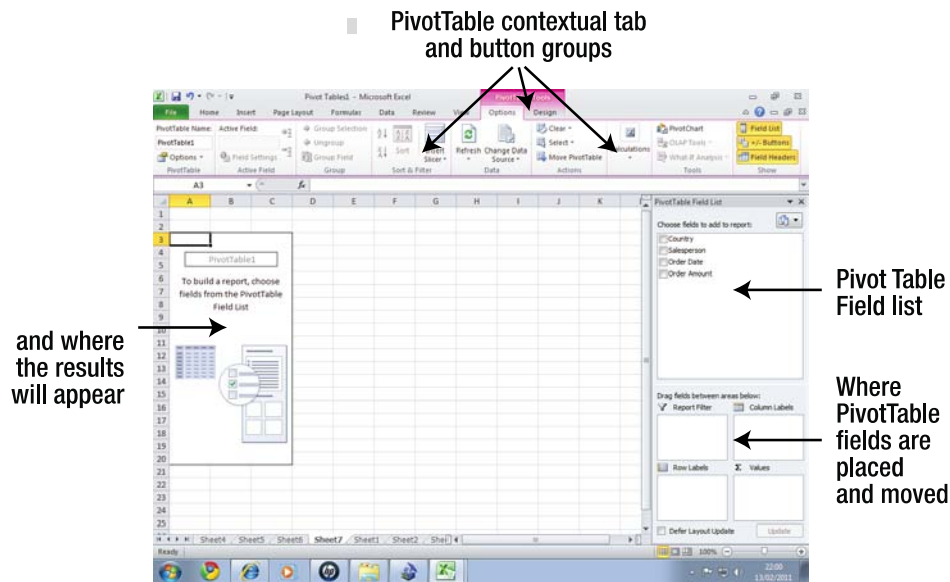


Figure 8–10. The PivotTable grid. Note the PivotTable Field List on the right.

NOTE: You can remove the PivotTable Field List from view by clicking PivotTable Tools Options, and clicking the Field List button in the Show button group. Clicking this button a second time will bring the list back onscreen.

- Next, tick the check box alongside **Salesperson** in the Choose fields to add to report area near the top right of the PivotTable Field List. Two things will happen, as shown in Figure 8–11: the names of the salespersons will be arrayed in the Row Labels area of the PivotTable on the left, and a bar representing that field will appear in the Drag fields between areas below section in the lower half of the PivotTable Field List. Note also that the salespersons are each listed *once*, no matter how many times they're listed in the source database.

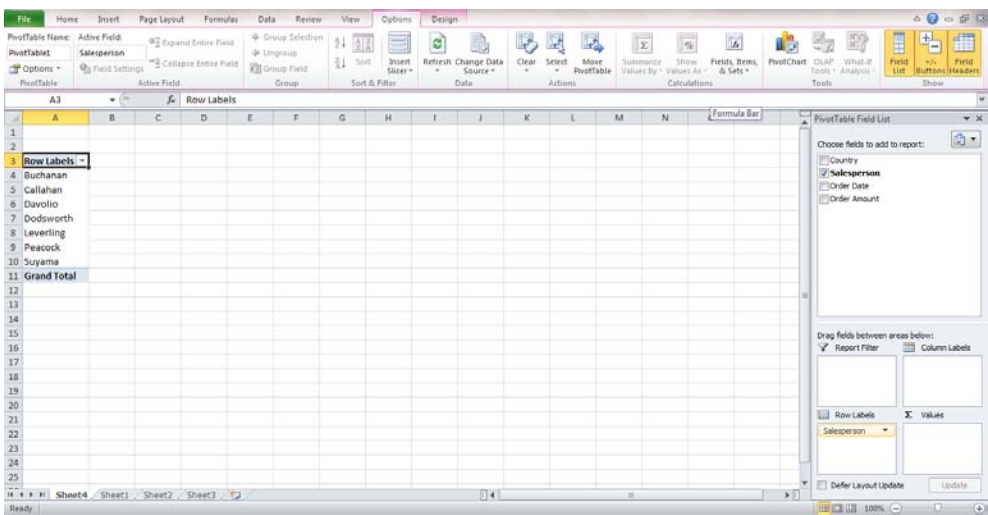


Figure 8-11. The salespersons, listed uniquely in the Row Labels area

- 6. Then tick the check box alongside Order Amount. You'll see the data shown in Figure 8-12.

Row Labels	Sum of Order Amount
Buchanan	996.62
Callahan	584
Davolio	1614.88
Dodsworth	2490.5
Leverling	2616.66
Peacock	8323.85
Suyama	1863.4
Grand Total	18489.91

Figure 8-12. There it is—your first PivotTable

We've done it. While it may not yet be suitable for framing, the PivotTable tells us what we wanted to know—exactly how much money each salesperson has earned. Note that the data from Order Amount has been automatically shipped to the Values area of the PivotTable Field List, as shown in Figure 8-13. This was Excel's decision, a point that will be taken up shortly.

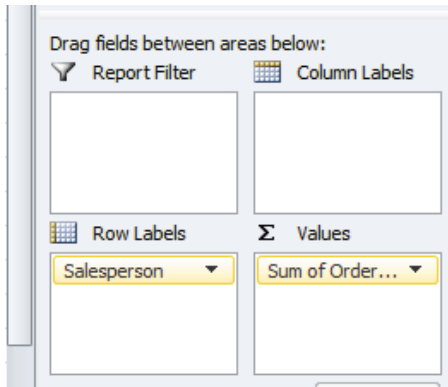


Figure 8–13. *The order amount data inhabits the Values area*

For now, don't worry about how to recast the values into currency format. That's coming up a bit later.

Choosing Which Data to Work On

Note again the four areas occupying the lower region of the PivotTable Field List: Report Filter, Column Labels, Row Labels, and Values. The idea is to place the information from the database's fields into these areas, with each area doing something different with the data. Since we just worked with the Row Labels and Values areas—probably the two most important areas—I'll first explain what they do.

The data from any field placed in the Row Labels area is *listed uniquely*. And that's exactly what happened in our PivotTable; when we ticked Salesperson, all the salespersons in our database were listed in Row Labels—and listed once. It makes no difference how often they're actually cited in the original database; place the field in Row Labels and each name appears only once.

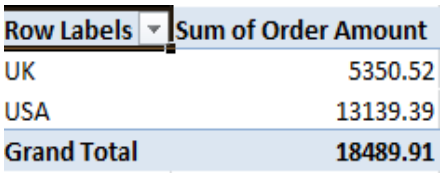
On the other hand, the data from any field in the Values area is always subject to a *mathematical operation*—it's added, counted, averaged, and the like. And again, this is consistent with our previous example. The Order Amount data—individual sales in dollars—was added, and was broken out by the salesperson data in the Row Labels area.

And that in a nutshell is really what PivotTables are about. Any data in the Values area is broken out by the data in the Row Labels area. Consider the collection of PivotTable examples in Table 7-1 (which of course assume you have these kinds of data in a database).

Table 7-1. *Examples of PivotTables: What Data Gets Broken Out, and What Data Does the Breaking Out*

PivotTable Example	Data in Row Labels (What Does the Breaking Out)	Data in Values (What Gets Broken Out)
Sales data broken out by salesperson (our PivotTable)	Salesperson	Order amount
Student aggregate GPAs broken out by major	Major subjects (e.g., sociology, chemistry)	Student GPAs
Total budget expenditures, broken out by budget category	Budget categories	Amount spent on purchases
Dinner seating totals, broken out by table	Table numbers	Table numbers (I'll explain this shortly)

So the essential PivotTable question asks what information you want to see broken out, and by what variable. If you wanted to break out the sales figures by country instead of salesperson, you'd place Country in the Row Labels area, and you'd wind up with what's shown in Figure 8-14.



Row Labels	Sum of Order Amount
UK	5350.52
USA	13139.39
Grand Total	18489.91

Figure 8-14. *International comparison: Sales by country*

Getting the Fields Where You Want Them

And how do you move, or place, the field data into either the Row Labels or Values areas? In our first PivotTable, we ticked the check boxes alongside **Salesperson** and **Order Amount**, and Excel decided by default into which areas they'd go. However, you can manually place a database field in any of the four areas in the **PivotTable Field List** by clicking in the field and dragging it into the desired area.

Let's say you're starting the PivotTable again from scratch. Once you've clicked through the **Insert > PivotTable** sequence, you can start to drag on the desired fields instead of resorting to the check boxes. If, for example, you want to lodge the **Salesperson** field in the **Row Labels** area, you can click, drag, and drop it, as in Figure 8-15.

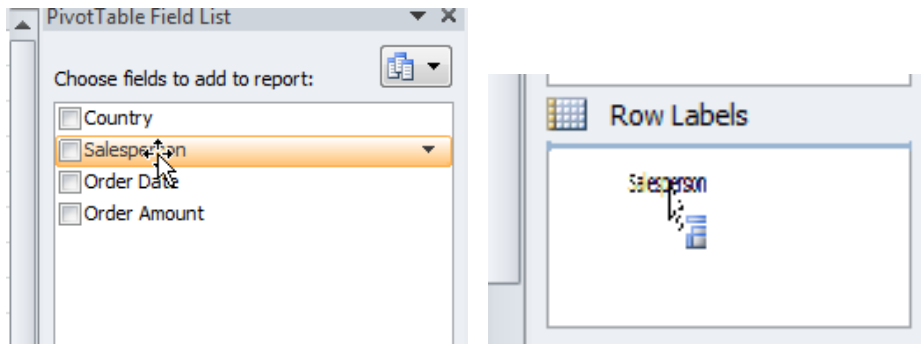


Figure 8-15. Just click *Salesperson*, and drag and drop it into the *Row Labels* area.

And you can do the same to *Order Amount*. Again, the reason you want to know about this drag-and-drop technique is that it will let you move any database field to any of the four areas. To remove a field from an area, just click the field, drag it into the worksheet area (or back into the upper area of the **PivotTable Field List**), and release the mouse; the field will disappear from the PivotTable (but not from the source data).

TIP: You can also remove a field from the PivotTable by unchecking the box alongside the field you want to remove. Note that the box becomes checked whenever you place a field in an area, regardless of whether you do so by ticking the box or dragging the field into the area.

Pivoting the Data Sideways Using the Column Labels Area

The **Column Labels** area does exactly the same thing as **Row Labels**, except that it breaks out the data *horizontally*. Thus, this time if you drag *Salesperson* into the **Column Labels** area instead, and leave *Order Amount* in the **Values** area, the PivotTable will look like Figure 8-16.

	Column Labels							
	Buchanan	Callahan	Davolio	Dodsworth	Leverling	Peacock	Suyama	Grand Total
Sum of Order Amount	996.62	584	1614.88	2490.5	2616.66	8323.85	1863.4	18489.91

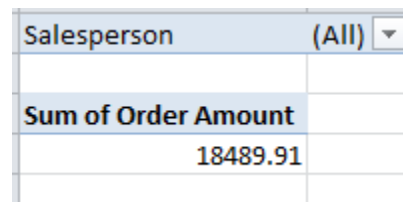
Figure 8-16. Change of direction: The sales data reading across, instead of down

Filtering Items Using the Report Filter Area

That takes us to the fourth PivotTable area: **Report Filter**. There's a familiar word in there, of course, and report filters work similarly to the filters you've already learned about, but you need to understand what they do in a PivotTable.

Report filters give a different look to a PivotTable. As with the **Row Labels** and **Column Labels** areas, the **Report Filters** area also breaks out the data in the **Values** area, but lets you isolate the impact of one *item* in the field doing the breaking out. The following short exercise will show you what that means.

1. Drag and drop the **Salesperson** bar into the **Report Filter** area. In the PivotTable, you'll see the data shown in Figure 8–17.



Salesperson	(All) ▼
Sum of Order Amount	
	18489.91

Figure 8–17. The PivotTable report filter: Just click the drop-down arrow and select a salesperson

2. Click the drop-down arrow and you'll be presented with a list of the salespersons, as shown in Figure 8–18.

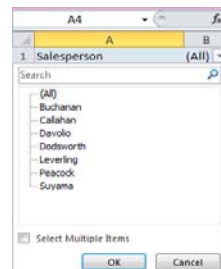
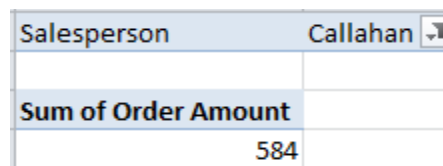


Figure 8–18. The salespersons: Just click one

3. What happens next is pretty obvious: click one salesperson name, and click OK. You'll see, for example, the data shown in Figure 8–19.



Salesperson	Callahan ▼
Sum of Order Amount	
	584

Figure 8–19. The sales data for Callahan, and only Callahan. Note the filter symbol alongside Callahan's name.

As with the standard table filters discussed in Chapter 7, we've singled out one salesperson for his or her sales totals. Want to see the totals for another salesperson? Just click the drop-down arrow again and click someone else.

You can also filter two or more salespersons at the same time:

1. Click the filter drop-down arrow.
2. Tick the **Select Multiple Items** check box.
3. Click the salespersons you want.
Thus, if you click both Callahan and Levering, you'll filter their combined sales totals, as in Figure 8–20.

Salesperson	(Multiple Items)
Sum of Order Amount	
	3200.66

Figure 8–20. *Double duty: Filtering two salespersons' data*

Good to know, but you'll probably find this option slightly uninformative, because it doesn't allow you to see the name of the salespersons you're filtering. Microsoft is aware of this issue, and has supplied an alternative to this approach that you'll learn about later: using the Slicer.

Creating a Report Worksheet for Each Item in a Filter

There's another report filter feature you may want to check out, too: the **Show Report Filter Pages** option. Let's see what this does:

1. Drag the Salesperson field into the filter area without selecting any particular salesperson, so that you see (All), as shown previously in Figure 8–17.
2. Click the **PivotTables Tools Options** tab, and then click the **Options** drop-down arrow. You'll see the options shown in Figure 8–21.

File	Home	Insert	Page Layout
PivotTable Name:	Active Field:		
PivotTable1	Sum of Order Amount		
Options	Field Settings		
Options			
Show Report Filter Pages...			
<input checked="" type="checkbox"/> Generate GetPivotData			
1 Salesperson	(All)		
2			
3 Sum of Order Amount			
4	18489.91		

Figure 8–21. *The Show Report Filter Pages... option*

3. Click **Show Report Filter Pages...**, and then click **OK** when you see the **Show Report Filter Pages** dialog box. That click will trigger a rapid-fire production of new worksheets, each named after and bearing a filtered report for each salesperson (see Figure 8–22).

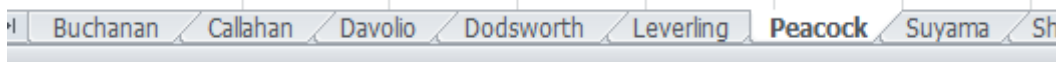


Figure 8–22. *All accounted for: Each salesperson is assigned a separate worksheet, each containing a report filter for that person*

4. Click any worksheet tab and check it out (see Figure 8–23).

Counting Records: A Way to Break Out Text Data

Recall our introductory PivotTable example—that hypothetical dinner in which, among other things, we wanted to tally the number of guests assigned to their tables. So how would we go about constructing a PivotTable for this? Well, we want to break out the number of guests by their table numbers, so the Table Number field will be posted in the **Row Labels** area. But what field is going to go into the **Values** area? The database in Figure 8–1 consists of exactly two fields: Guest and Table. And believe it not, even though the Guest field comprises text—that is, the names of the guests—we can still drag it into the **Values** area, because Excel will go ahead and perform the only mathematical operation it can on text; it will *count* the guests by their table numbers.

And that’s how it works. If you drag a text-based field into the **Values** area, its contents will be counted, and broken out by whatever field populates the **Row Labels** area. Thus, with the dinner example, the guests will be counted by their table assignment—that is, how many have been assigned to Table 1, Table 2, and so on.

But let’s try to illustrate this point with our salesperson data. Suppose we now want to determine not how much money each salesperson has earned, but how many sales each one has recorded. This exercise will demonstrate two important aspects of PivotTables: your ability to place a text-based field into the **Values** area, and the fact that you can apply the same field to a PivotTable twice.

First, make sure that the Salesperson field is positioned as usual in the **Row Labels** area. Nothing new there; but now, we’re going to also drag and drop Salesperson into the **Values** area, demonstrating that you can use the same field twice in a PivotTable. Once you maneuver Salesperson into the **Values** area, you’ll see the data shown in Figure 8–24.

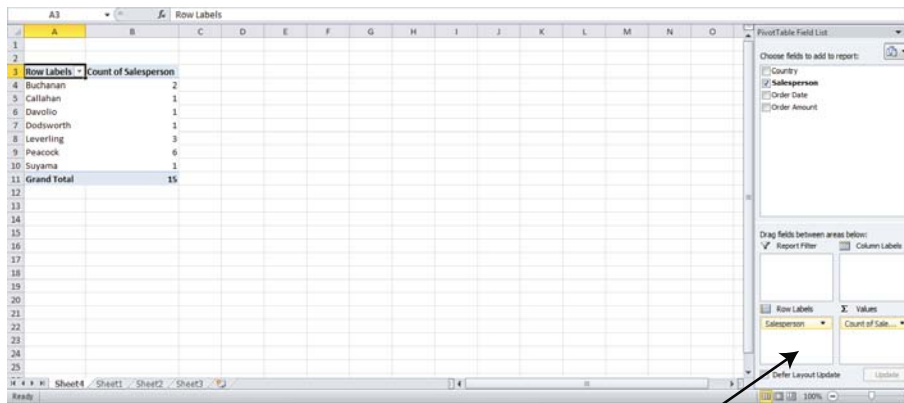


Figure 8–24. Counting, not adding, sales. Note the Salesperson bars populating both the Row Labels and Values areas.

The Salesperson bar in the Values area is recorded as Count of Salesperson, again because Excel has no choice but to count text data (it can't be added or averaged). In effect, what we've done is count the number of times each salesperson's name appears in the database—which is another way of stating how many sales each one has executed. And again, this will work the same way even if each salesperson has made hundreds or even thousands of sales.

Grouping Related Items Using Two Fields

Up to now we've traveled the basic route to designing a PivotTable, in which one field in the Row Labels area breaks out the data in a field in the Values area. But you can also place *two* fields in the Row Labels area, to carry out a kind of double-breakout.

The PivotTable in Figure 8–25 illustrates what that means.

Row Labels	Count of Salesperson
UK	4
Buchanan	2
Dodsworth	1
Suyama	1
USA	11
Callahan	1
Davolio	1
Leverling	3
Peacock	6
Grand Total	15

Figure 8–25. *National pride: Sales, broken out both by country and salesperson*

Here, the sales data is broken out by two fields, first by country and then by salesperson. We can see that 4 sales were conducted in the United Kingdom and 11 in the United States. Within the United Kingdom, it's Buchanan, Dodsworth, and Suyama who've compiled the sales, while Callahan, Davolio, Leverling, and Peacock have done their sales work in the States.

This double-breakout enhances the viewer's understanding of the sales activity, by introducing Country into the analysis and indicating which salespersons worked in which country.

How is this done? Simple; you just drag and drop Country into the Row Labels area, too (see Figure 8–26).

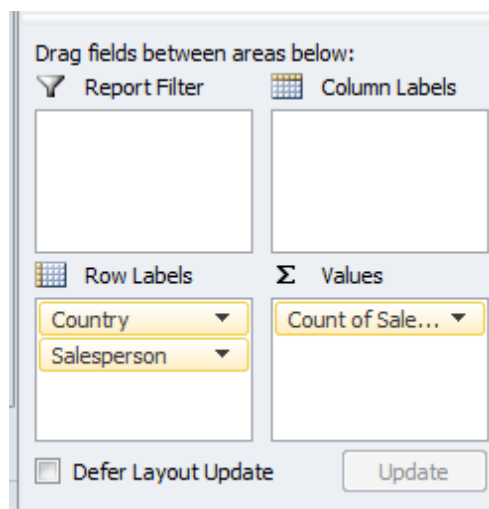


Figure 8–26. *Table for two: Two fields occupy*

the Row Labels area

When you drag Country into Row Labels, you need to carefully position it above Salesperson. If you don't, and Salesperson winds up above Country, the PivotTable will look like Figure 8–27.

Row Labels	Sum of Order Amount
Buchanan	996.62
UK	996.62
Callahan	584
USA	584
Davolio	1614.88
USA	1614.88
Dodsworth	2490.5
UK	2490.5
Leverling	2616.66
USA	2616.66
Peacock	8323.85
USA	8323.85
Suyama	1863.4
UK	1863.4
Grand Total	18489.91

Figure 8–27. *Another look at the same data*

Here the data is broken out first by salesperson and then by country, reversing the order of the initial breakout. This view might be particularly informative if a salesperson worked in both countries, because you'd see the sales data for both UK and USA under the salesperson's name. In any case, you can easily drag one field above the other in the Row Labels area if you need to, and then just release your mouse when the fields have been properly positioned.

There's another point about breaking out the data by two fields. Note that each salesperson's total—which is a subtotal of all the sales, of course—appears alongside his or her name in bold text. If you want the subtotals to appear at the bottom of each salesperson's group instead, you can click the PivotTable Tools Design tab, and then click Subtotals ► Show all Subtotals at Bottom of Group, as in Figure 8–28.

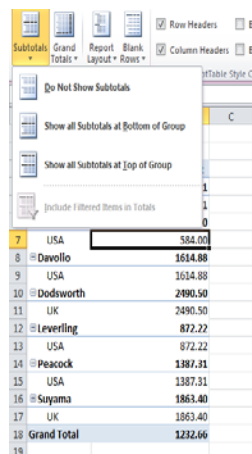


Figure 8–28. *It all adds up: PivotTable subtotal options*

First, let's return Country to a position above Salesperson in the Row Labels area, because subtotalling by country will illustrate the point more clearly (there's more to subtotal this way; because each salesperson works in but one country, there's nothing to subtotal if you group by Salesperson). Then click **Show All Subtotals at Bottom of Group**, and the PivotTable will be redesigned to take on the appearance shown in Figure 8–29.

Row Labels	Sum of Order Amount
UK	
Buchanan	996.62
Dodsworth	2490.50
Suyama	1863.40
Walters	1543.73
UK Total	6894.25
USA	
Callahan	584.00
Davolio	1614.88
Leverling	2616.66
Peacock	8323.85
USA Total	13139.39
Grand Total	20033.64

Figure 8–29. Another new look to the same data: Subtotals at the bottom of each salesperson group

Using the Row and Column Value Areas to Group Items

There's still another approach to engineering a two-field breakout of the data. If you click and drag on the Country bar and drop it into the Column Labels area, you get what's shown in Figure 8–30.

Sum of Order Amount	Column Labels	
Row Labels	UK	USA
Buchanan	996.62	584
Callahan		584
Davolio	1614.88	1614.88
Dodsworth	2490.5	2490.5
Leverling	2616.66	2616.66
Peacock	8323.85	8323.85
Suyama	1863.4	1863.4
Grand Total	5350.52	13139.39

Figure 8–30. The fields, pivoted: Again, the data is exactly the same, but organized differently

We've orchestrated still another look to the data—kind of a matrix, in which the two fields intersect in the Values area. Note the field positions in the **Drag field between areas below** section—one in **Row Labels**, the other in **Column Labels**.

Changing the Calculation

By default, PivotTables will add, or sum, numerical fields in the **Value** area. But you may want the table to calculate a different kind of result—say, an average or a maximum. Changing to the kind of calculation you need is easy.

The following example will show you the amount of the average sale each salesperson has made:

1. First, remove the **Country** field from the **Column Labels** area if you've dragged it there. Remember, you can remove the field by clicking its bar in the **Drag field between areas below** area and dragging into the worksheet; release your mouse and the field will disappear. This will leave you with your original, basic PivotTable result, in which sales are broken out by salesperson.

TIP: You can also remove a field by clicking the bar itself and clicking **Remove Field** on the menu that appears.

2. Then click inside the Values area in the actual PivotTable—not the Values area in the PivotTable Field List—and if necessary click the PivotTables Tools contextual tab, and then **Options** ► **Summarize Values By**. You'll see the options shown in Figure 8–31.

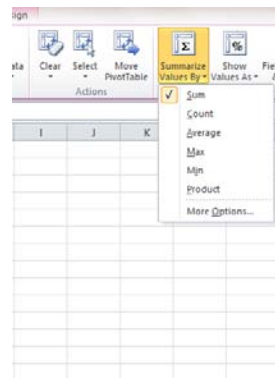


Figure 8–31. Where to change the mathematical operation for your PivotTable data

3. Click **Average**, and you'll see the data shown in Figure 8–32.

Row Labels	Average of Order Amount
Buchanan	498.31
Callahan	584
Davolio	1614.88
Dodsworth	2490.5
Leverling	872.22
Peacock	1387.308333
Suyama	1863.4
Grand Total	1232.660667

Figure 8–32. Average sale size, by salesperson

That's it—though you probably won't like all those nasty decimal points swelling the numbers. But that's a formatting issue, and we're going to discuss that later in the chapter.

TIP: You can select different mathematical operations by either right-clicking in the Values area in the PivotTable itself and clicking **Value Field Settings** on the context menu, or clicking the **Options** tab and then clicking **Field Settings** in the **Active** button group. Either way, you'll be brought to a **Value Field Settings** dialog box, from which you can choose the operation you want. You can also get to the same destination by right-clicking in that PivotTable value area and selecting **Summarize Values By**.

Grouping PivotTable Data: Organizing Your Time(s)

Earlier in this chapter, Figure 8–6 showed the salesperson data broken out by time—more specifically, the months in which the various sales were conducted. Yet the Salesperson database says nothing about months as a unit of time; each record only notates the precise day on which a sale was completed. But Excel lets you group time data into time units of your choosing, a most useful capability that can give you a big picture of financial activity over time, particularly when you're working with many records.

To illustrate, let's devise a PivotTable for the Salesperson database in which we break out sales (Order Amount) by Order Date, a field we've yet to use.

1. First, remove the Salesperson field from the Row Labels area. Then drag Order Date into the Row Labels area, and you'll see something like Figure 8–33.

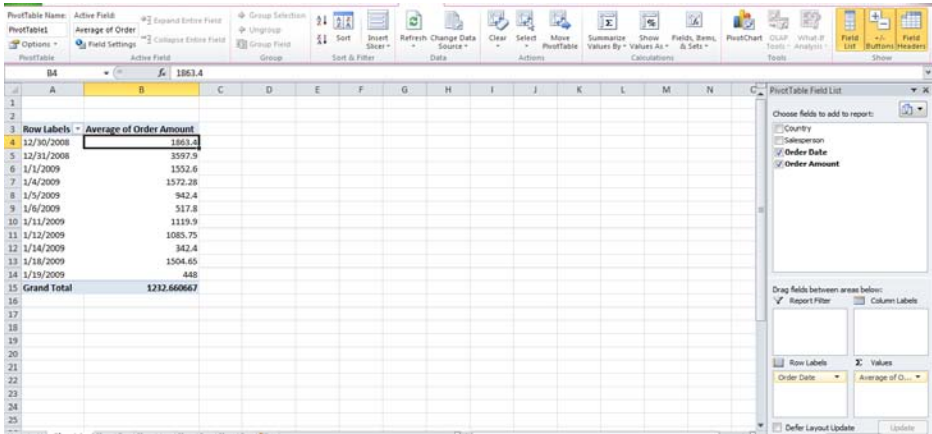


Figure 8–33. Sales data, organized by date of transaction

NOTE: Before we continue, remember that data placed in the Row (or Column) Labels area is listed uniquely. Figure 8–33 lists 11 dates even though our database has 15 records because some of the sales were carried out on the same date—and hence that date is listed only once.

2. In any case, say we want to break out the sales activity by month. Click anywhere among the dates, then click the PivotTable Totals Options tab, and then click Group Selection in the Group button group (see Figure 8–34)

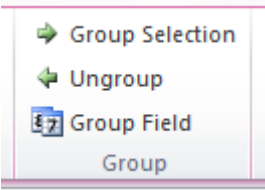


Figure 8–34. The Group Selection option

3. After clicking Group Selection, you'll see the dialog shown in Figure 8–35.

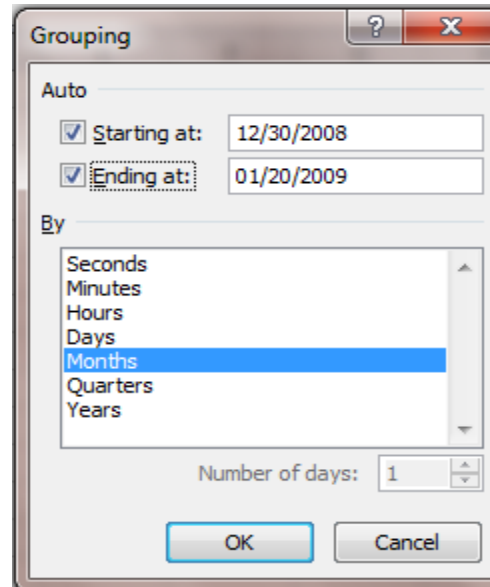


Figure 8–35. The Grouping dialog box:
Organizing your date data into the units of time
you want

4. Then click Years (Months will remain selected as well). If you don't click Years, all the January sales figures, for example, will be totaled together—and that might include Januarys in different years (and the same would of course apply to all the other months). Click OK, and you'll see the display shown in Figure 8–36.

Row Labels	Average of Order Amount
2008	
Dec	2730.65
2009	
Jan	1002.200769
Grand Total	1232.660667

Figure 8–36. Getting it all together: The data
organized by months and years

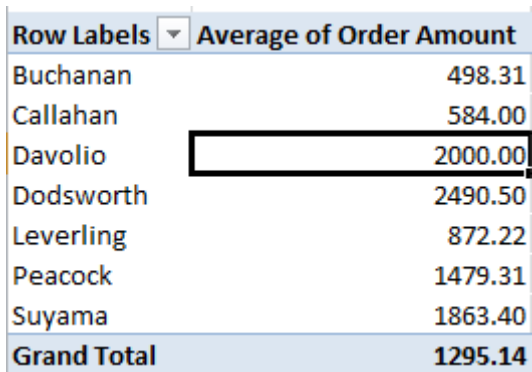
Now the sales data is grouped, and we can easily tell how sales have proceeded by month. Again, while our database is small, grouping will work with any collection of dates, no matter how large. To ungroup the data and return it to its original row label appearance, just click within the date data and click Ungroup in the Group button group.

Refreshing the PivotTable: Changing the Data

So far our PivotTables have worked with the same 15-record database throughout, but in the real world, of course, you may need to enter additional records and/or make changes to existing ones, while at the same time seeing to it that your PivotTable results reflect those changes. How does that happen?

Well, the first thing to understand is that, unlike Excel formulas, PivotTables do not perform automatic recalculation. That is, if you change data in your database, the PivotTable will not immediately incorporate the changes and update existing results. You'll have to refresh the PivotTable instead, by clicking the **Refresh** button on the **Options** tab.

To see this, click back into the Salesperson database and change Davolio's sales amount to \$2,000. Then click anywhere in the PivotTable and click the **Refresh** button. You'll see the new data, as shown in Figure 8–37.



Row Labels	Average of Order Amount
Buchanan	498.31
Callahan	584.00
Davolio	2000.00
Dodsworth	2490.50
Leverling	872.22
Peacock	1479.31
Suyama	1863.40
Grand Total	1295.14

Figure 8–37. *Davolio's sales total has now changed from the original \$1614.88.*

If you've modified an *existing* record—that is, one already in the database—all you need to do is click **Refresh**. But if you've added a completely new record, clicking the **Refresh** button won't update the PivotTable. The next section discusses what to do in this case.

Adding New Records to a PivotTable

The easiest way out of this little dilemma is to convert the database into a table. New table records *are* automatically processed by PivotTables, and clicking **Refresh** will then update your results. Let's try it.

1. First, click anywhere in the database, click the **Insert** tab and choose **Table** from the **Tables** button group, and then click **OK**.
2. Then add a new record containing the information shown in Figure 8–38.

UK	Walters	05/04/2009	\$1,543.73
----	---------	------------	------------

Figure 8–38. *New recruit: Walters joins the sales force*

3. Click **Refresh**. Walters' data will be automatically incorporated into the PivotTable, as shown in Figure 8–39.

Row Labels	Average of Order Amount
Buchanan	498.31
Callahan	584.00
Davolio	1614.88
Dodsworth	2490.50
Leverling	872.22
Peacock	1387.31
Suyama	1863.40
Walters	1543.73
Grand Total	1252.10

Figure 8–39. *The current PivotTable. Note that Walters' record is included, and sorted, too.*

NOTE: The **Data Source** button identifies the current range of data being processed by the PivotTable, and you can see that **Table1** now appears as the source table, thus incorporating Walters' record.

Now you can enter as many new records as you like into the Salesperson database, and whenever you click **Refresh** those new records will appear in the PivotTable.

NOTE: If your PivotTable shows **Sum of Order Amount** instead of the **Average Amount** as shown in Figure 8–39, it doesn't matter. Adding and refreshing PivotTable data works no matter what mathematical operation you've selected.

How the Slicer Works

Before I demonstrate how to use the Slicer, make sure that the Order Amount data is placed in the Values area of your PivotTable, and place Salesperson in the Report Filter area (for this exercise, it doesn't matter if you've added Walters' data or not).

1. Click anywhere in the PivotTable. Then click the **PivotTable Tools Options** tab, and click the **Insert Slicer** button in the **Sort & Filter** button group. You'll see the options shown in Figure 8-42.

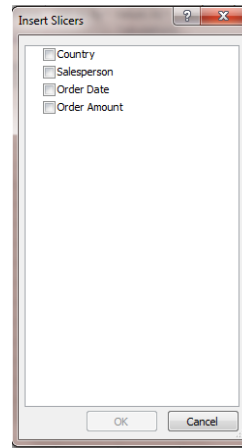


Figure 8-42. *Slice of life, PivotTable style. Note that all the database fields are listed.*

2. Click **Salesperson**, and then click **OK**. The Slicer will appear, with all the salespersons listed and colored blue, as in Figure 8-43.



Figure 8-43. *Don't worry if you don't have Walters listed.*

3. This is the equivalent of the (All) indicator shown in the report filter—that is, all the salespersons are currently selected. But if you click any one salesperson's name, only his or her data will appear in the Value field. If you click one salesperson, hold down the Ctrl key, and click a second name (see Figure 8–44), the data for both will be totaled in the Value field.

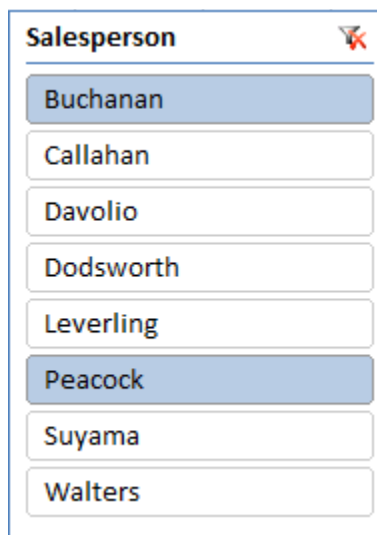


Figure 8–44. Two salespersons selected with the Slicer. Their combined sales data will appear in the Values area.

This is the Slicer solution to that report filter multiple-items problem—it allows you to clearly see which salespersons have been filtered. If you want to deselect a salesperson, hold the Ctrl down again and click that salesperson's name.

Note that our PivotTable now has the Order Amount data in the Values area, the Salesperson field in the Report Filter area, and the Slicer in place (see Figure 8–45).

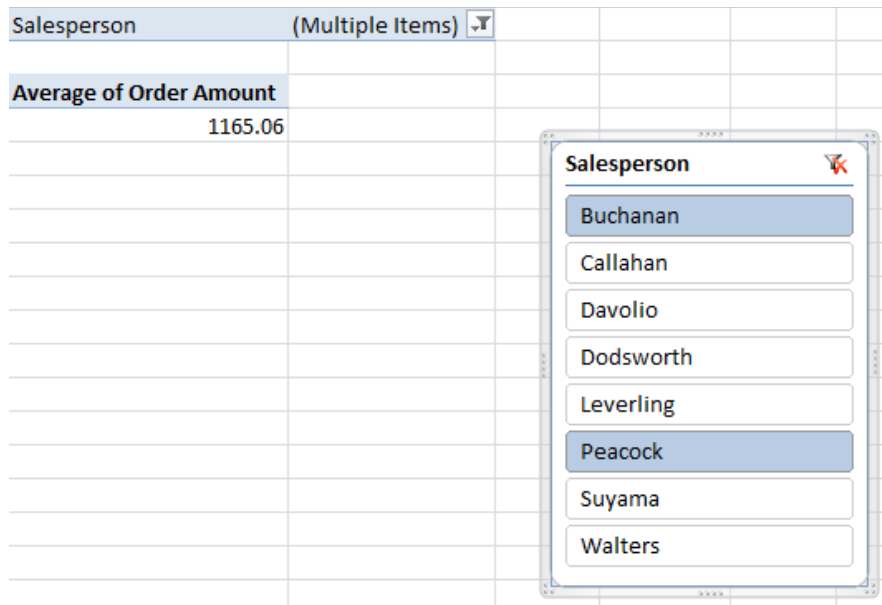


Figure 8-45. The Salesperson field in two places: The Report Filter area and the Slicer

And that's a bit redundant, because now the salespersons are being filtered in two places. As a consequence, you can drag Salespersons off the PivotTable, leaving you with what's shown in Figure 8-46.



Figure 8-46. There's no need to use the Report Filter area now, because the Slicer is doing the same job.

And now you can see exactly who's being filtered.

The **Clear Filter** button—that funnel image accompanied by an X in the upper right of the filter—will turn off the current filter when you click it, but that doesn't mean that it will remove the filter from the PivotTable. It means that it will no longer single out or filter any particular salesperson, but rather combine all the salesperson data in the Value area (see Figure 8–47).

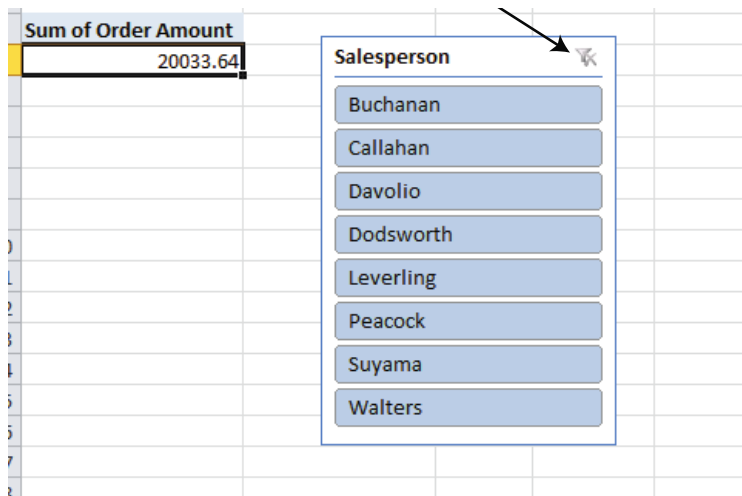


Figure 8–47. The **Clear Filter** button has been clicked, combining all the salesperson data in the Value area result.

Restyling the Slicer

You can also restyle the Slicer by clicking the Slicer title (i.e., the upper area that reads “Salesperson”—see the arrow in Figure 8–47), and calling up the **Slicer Tools** contextual tab. Click the **Options** tab, followed by the **Slicer Styles** drop-down arrow, and click a style (see Figure 8–48).

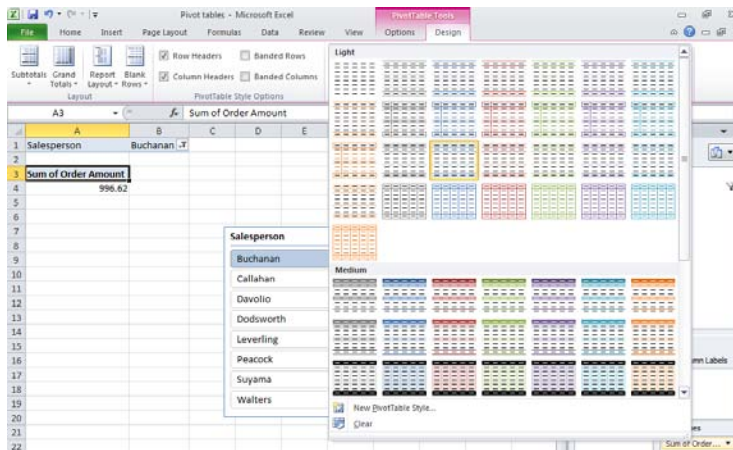


Figure 8–48. *Selecting Slicer styles*

To remove a Slicer, click in the Slicer title area so that the Slicer is surrounded by a gray border (see Figure 8–49). Then just press the Delete key.

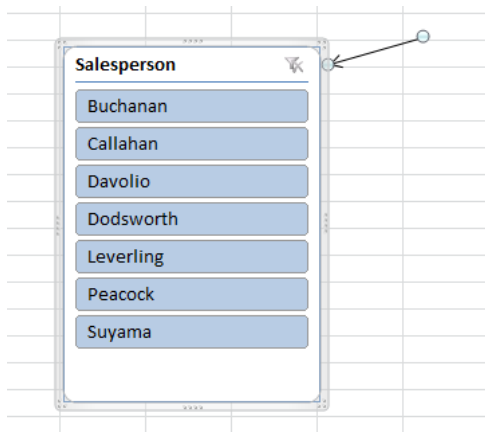


Figure 8–49. *Click the Slicer area to trigger that gray border and press Delete.*

NOTE: You can also resize the Slicer by clicking a dotted area on that gray border and dragging in the desired direction, just as you would resize a chart.

Formatting the PivotTable

Excel offers many options for formatting PivotTables. Perhaps most importantly, you can easily reformat the values in the Value area, which, after all, contains data you need to know. Now, about all those decimal points.

As usual with Excel, there are several ways to access the commands that will enable you to change the appearance of PivotTable values. I'll describe two.

1. First, right-click anywhere in the Values area in the actual PivotTable, and click **Value Field Settings** on the context menu. You'll see the dialog shown in Figure 8–50.

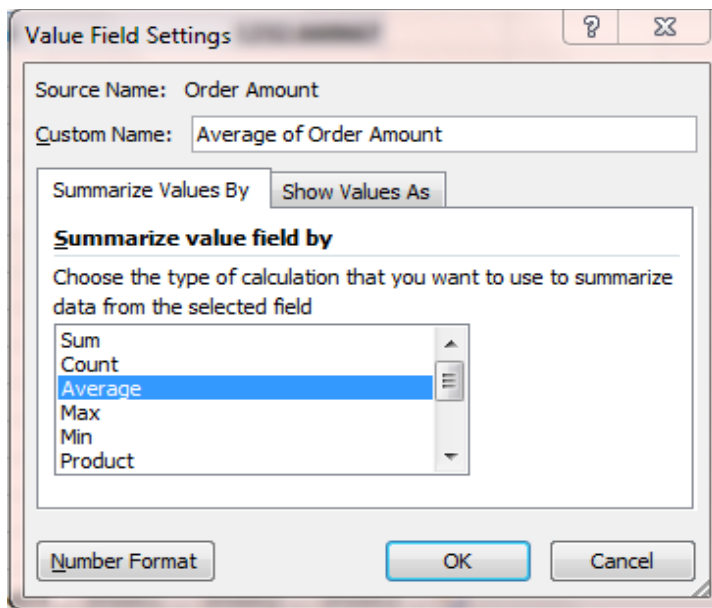


Figure 8–50. Note the *Number Format* button.

2. Just click the **Number Format** button, and you'll be brought to a familiar dialog box (see Figure 8–51).

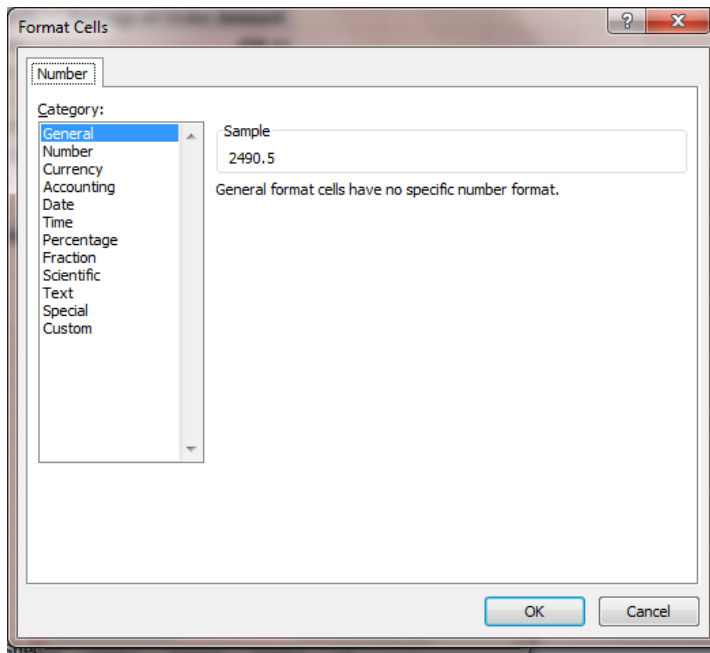


Figure 8–51. *Déjà vu: The good old Format Cells dialog box*

3. You've seen this collection of options in Chapter 5. We want the values to display just two decimal points, so click **Number** in **Category** list shown in Figure 8–51, and type **2** in the **Decimal Places** field you'll see in the next dialog box (see Figure 8–52). Then click **OK** twice.

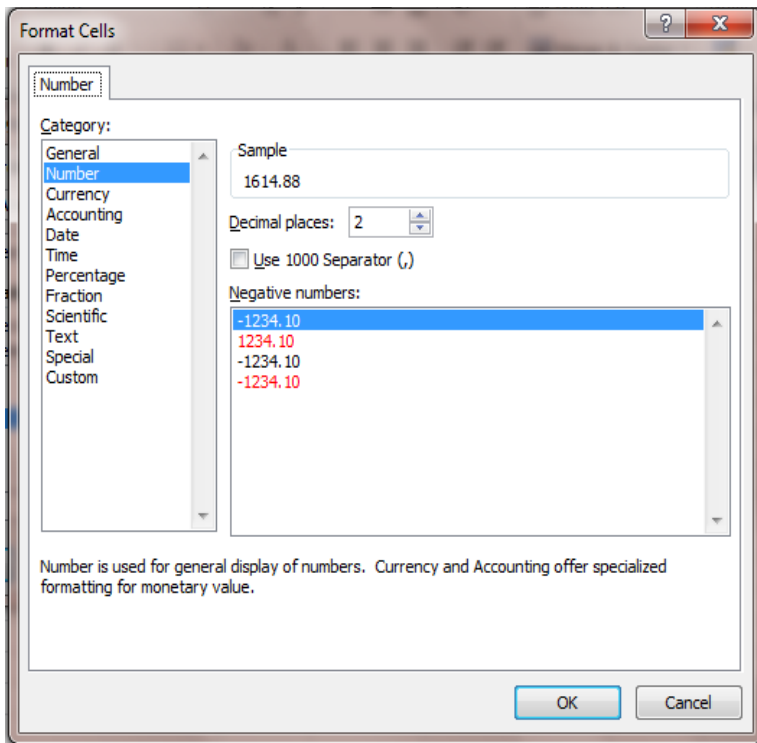


Figure 8–52. The number formatting options; you’ve seen it all before

NOTE: What’s different about formatting PivotTable values is that, unlike a standard range, you *don’t* select every cell in the Values area before you select the formatting options; all you do is right-click in the area and execute the commands, and all the values will be reformatted. It’s an all-or-nothing procedure here.

Styling Your Report

You can also draw upon a large collection of PivotTable styles that resemble the styles available in Excel tables. To view these, just click the **PivotTable Tools Design** tab, select **PivotTable Styles**, and click the **More** drop-down arrow (the lowest of the arrows you’ll see). You’ll be presented with the options shown in Figure 8–53.

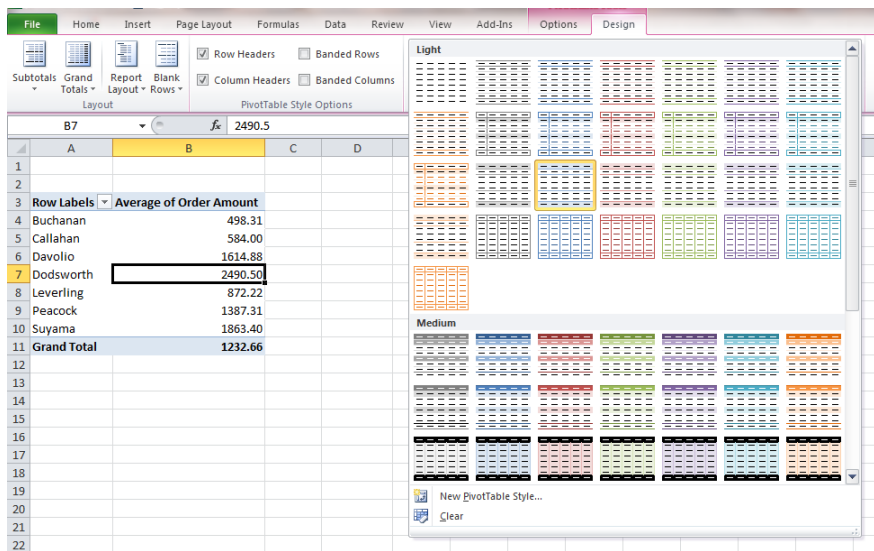


Figure 8–53. Stylish options: *PivotTable* styles

And as with their table cousins, these styles will display themselves in preview mode when you simply place your mouse over them before clicking. You can also introduce row and column banding in the PivotTable just as you can in Excel tables by clicking in the PivotTable Style Options button group just to the left of PivotTable Styles.

NOTE: Remember, in order to access the PivotTable button group options, you must click in the PivotTable first.

Changing PivotTable Headers

Note that Figure 8–53 sports a “Row Labels” header above the Salesperson field, and you might opt for something a bit more specific. If so, all you have to do is click in that header cell directly in the PivotTable, type whatever replacement header you wish, and press Enter. You can do the same to the Values header as well; just note that in the Values case your customized header will also appear in the Values area in the PivotTable Field List.

NOTE: Changing PivotTable field headers *won't* change the corresponding headers in the database source you've used to produce the PivotTable.

Layout Options

The PivotTable warehouse of design options stocks three principal layouts:

- Compact (the default, shown in Figure 8–54)

Row Labels	Average of Order Amount
UK	1337.63
Buchanan	498.31
Dodsworth	2490.50
Suyama	1863.40
USA	1194.49
Callahan	584.00
Davolio	1614.88
Leverling	872.22
Peacock	1387.31
Grand Total	1232.66

Figure 8–54. *The Compact PivotTable layout option*

- Outline (see Figure 8–55)

Country	Salesperson	Average of Order Amount
UK		1337.63
	Buchanan	498.31
	Dodsworth	2490.50
	Suyama	1863.40
USA		1194.49
	Callahan	584.00
	Davolio	1614.88
	Leverling	872.22
	Peacock	1387.31
Grand Total		1232.66

Figure 8–55. *The Outline PivotTable layout option*

- Tabular (see Figure 8–56)

Country	Salesperson	Average of Order Amount
UK	Buchanan	498.31
	Dodsworth	2490.50
	Suyama	1863.40
UK Total		1337.63
USA	Callahan	584.00
	Davolio	1614.88
	Leverling	872.22
	Peacock	1387.31
USA Total		1194.49
Grand Total		1232.66

Figure 8–56. *The Tabular PivotTable layout option*

These can be easy to confuse, and exactly what distinguishes them becomes clearer when you break out the data by two fields. There are a few differences that separate the three layouts, however:

- The Compact layout tucks the Salespersons data beneath the Country field in the same columns, whereas the other two layouts assign Salesperson a separate column.
- The Outline and Tabular layouts title the columns with the actual names of the fields being broken out, unlike Compact, which can't do that—because it presents two fields in one column.
- The Tabular layout presents the UK and USA subtotals beneath the data, while the other two align the subtotals with the Country titles.

You access the various layout options by clicking the PivotTable Tools Design tab, and clicking the Report Layout button in the Layout button group, as shown in Figure 8–57.

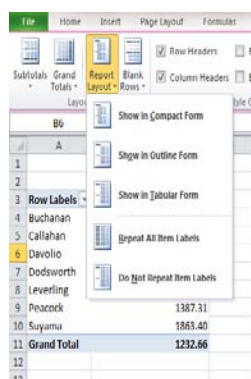


Figure 8–57. PivotTable layout options

And what about those minus signs stationed to the left of the country names in all the layouts? When clicked, those buttons conceal, or *collapse*, the salesperson data beneath the country (see Figure 8–58).

Row Labels	Average of Order Amount
UK	1337.63
USA	1194.49
Callahan	584.00
Davolio	1614.88
Leverling	872.22
Peacock	1387.31
Grand Total	1232.66

Figure 8–58. Now you see it, now you don't: UK salespersons hidden, or collapsed, beneath the UK category

Note that the minus has reverted to a plus sign alongside the UK in the figure. Click it now and the UK salesperson records return to view. This plus/minus option gives you a way to streamline the PivotTable's appearance by temporarily obscuring the detail data under a global category—in our case, Country. (Of course, you could achieve a similar effect by simply removing the Salesperson field from the PivotTable.)

In addition, you can collapse and expand the *entire* PivotTable by clicking the Expand Entire Field/Collapse Entire Field buttons in the Options ► Active Field button group (see Figure 8–59).

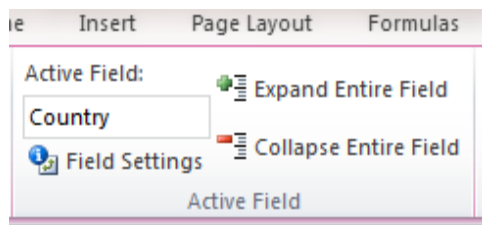


Figure 8–59. The Expand and Collapse Entire Field buttons

Clicking the Collapse Entire Field button, for example, would be equivalent to clicking the minus signs alongside UK and USA simultaneously, yielding the results shown in Figure 8–60.

Row Labels	Average of Order Amount
⊕ UK	1337.63
⊕ USA	1194.49
Grand Total	1232.66

Figure 8–60. The entire Salesperson field has been collapsed, impacting both countries.

Clicking Expand Entire Field now would restore all the salesperson names to view.

Creating Charts from PivotTables Using PivotCharts

Just as you can summarize database data with a chart, you can chart PivotTable results too. The principles behind pivot charting are very similar, but not identical, to the techniques we've already discussed for charting database data.

Let's say we want to turn our basic PivotTable—in which sales data is broken out by salesperson totals—into a chart (see Figure 8–61).

Row Labels	Sum of Order Amount
Buchanan	996.62
Callahan	584.00
Davolio	1614.88
Dodsworth	2490.50
Leverling	2616.66
Peacock	8323.85
Suyama	1863.40
Walters	1543.73
Grand Total	20033.64

Figure 8–61. Back where we started: Sales figures broken out by salesperson. If your data still shows averages instead of sums, it won't affect the chart-making process.

1. If necessary, restore your PivotTable to the appearance shown in Figure 8–61, in which Salesperson occupies the Row Labels area and Order Amount is in the Values area.
2. Then click anywhere in the PivotTable, click the **PivotTable Tools Options** tab, and choose **PivotChart** from the **Tools** button group. You'll see the familiar dialog box shown in Figure 8–62.

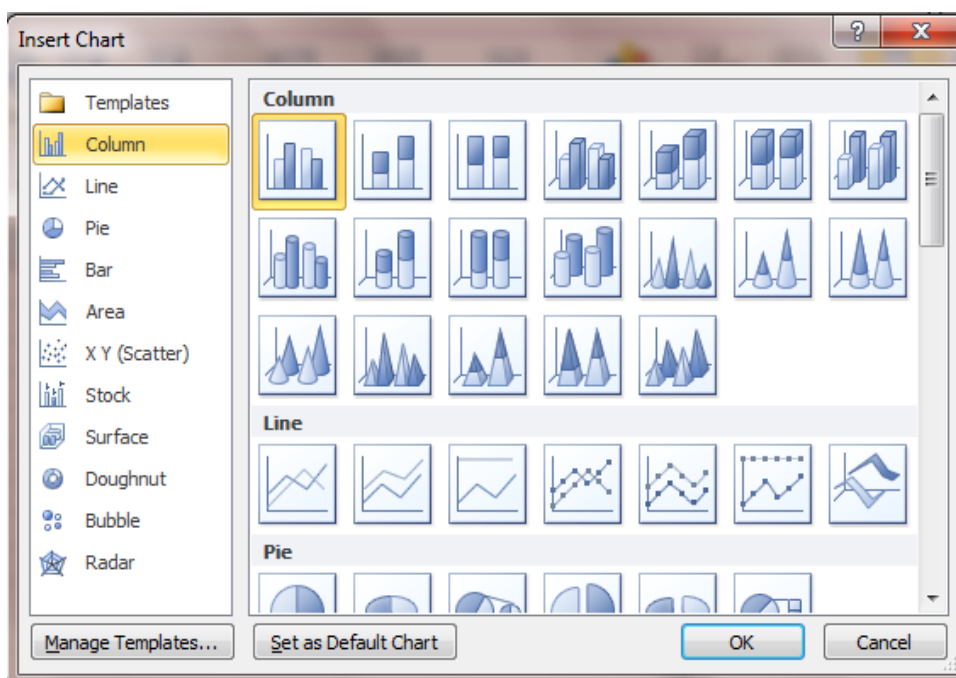


Figure 8–62. The *Insert Chart* dialog box, again

3. Note that you've already seen this box in Chapter 6. Go ahead and click OK to Excel's default selection, that redoubtable Column chart, and you'll see the data presented as in Figure 8–63.

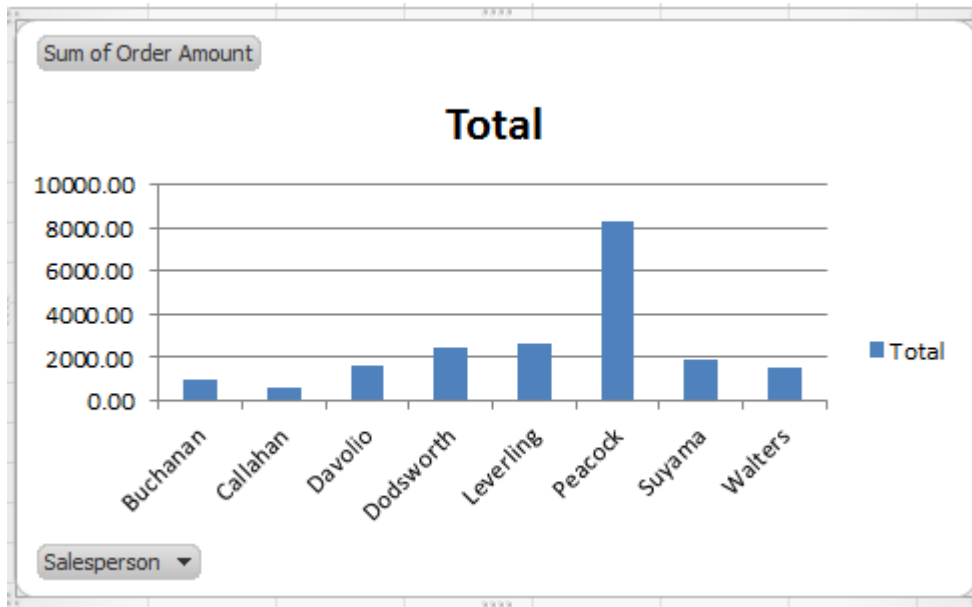


Figure 8–63. A PivotChart. Note the difference from a standard Excel chart: the appearance of what are called field buttons.

It isn't a thing of beauty yet, but the chart has captured the PivotTable data. The chart takes the salesperson names (the data in the Row Label), applies them to the horizontal (category) axis, and draws its vertical (value) axis from the sales figures.

NOTE: When you click in a PivotChart, the Row Values area in the PivotTable Field List is named Axis Fields (Categories). Click back in the PivotTable, and the Row Values label is restored.

And once the PivotChart makes its appearance in the worksheet, the means for modifying and reformatting it are nearly identical to the options described in Chapter 6. When you click in the chart, a PivotChart Tools contextual tab is ushered onto the screen, offering some familiar selections (see Figure 8–64).



Figure 8–64. *PivotChart options available via the PivotChart Tools contextual tab: The Design, Layout, Format, and Analyze tabs*

Filtering Data in the Chart with Field Buttons

Click the PivotChart tabs and you'll recognize nearly all the button groups, because you've seen them on the Chart Tools contextual tab, too. There is, however, a fourth tab—**Analyze**—that contains buttons you won't see associated with standard Excel charts (see Figure 8–65).

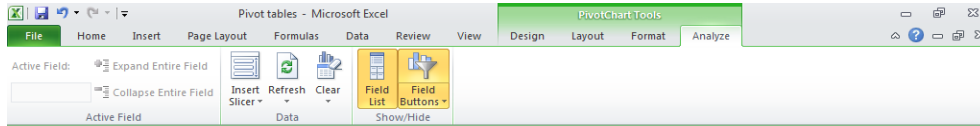


Figure 8–65. The contents of the PivotChart Tools Analyze tab

NOTE: Clicking the Clear drop-down arrow on the Analyze tab will reveal a Clear All option, which when clicked will remove both the PivotChart and the PivotTable but leave the underlying grids for the two objects. It's a way allowing you to start all over again by selecting a new set of fields for the PivotTable, which in turn immediately generate a PivotChart. The Clear button is also available in the PivotTable Tools Action button group.

But PivotCharts themselves reveal an element that is nowhere to be found in conventional charts: *field buttons*. These represent the PivotTable fields that contribute the source data to the chart, and when they're clicked they enable you to make various changes to the chart.

For example, clicking the arrow on the **Salesperson** button on the chart triggers the menu shown in Figure 8–66.

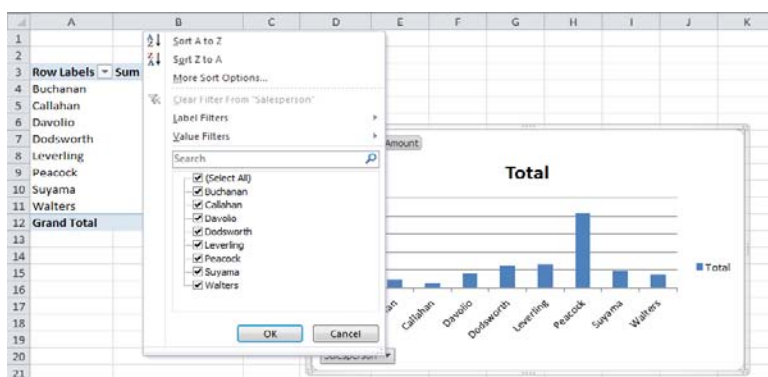


Figure 8-66. Ticking any check box will remove that salesperson's name—and column—from the chart.

To illustrate, if you click **Peacock** and then **OK**, Peacock's column bar will be banished from the chart (see Figure 8-67).

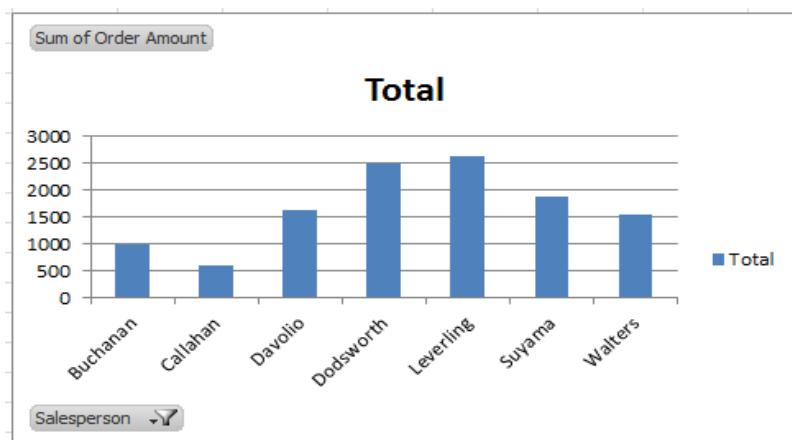


Figure 8-67. The salespersons, minus Peacock. Note the filter symbol that now appears on the **Salesperson** field button, indicating that a name has been filtered out of the chart.

Peacock has flown the coop, and as a result, the value axis, which had established a maximum of 10,000 in order to be able to record Peacock's high sales total, has been reset to 3,000, now that Leverling is the leading salesperson. But more importantly, take a look now at the source PivotTable (see Figure 8-68).

Row Labels	Sum of Order Amount
Buchanan	996.62
Callahan	584
Davolio	1614.88
Dodsworth	2490.5
Leverling	2616.66
Suyama	1863.4
Walters	1543.73
Grand Total	11709.79

Figure 8–68. *Peacock's missing here, too.*

What we see is that filtering the data in the PivotChart changes the source PivotTable correspondingly. If you make a change in the data recorded by the chart, you'll also change the PivotTable that gave rise to the chart in the same way. And, needless to say, the reverse is true, too; any data change in the PivotTable changes the PivotChart as well.

And if you don't want to see those field buttons on the chart, right-click any button and select the **Hide All Field Buttons on Chart** option on the resulting menu. You can also delete a particular field button by right-clicking it and selecting **Remove Field** (see Figure 8–69).

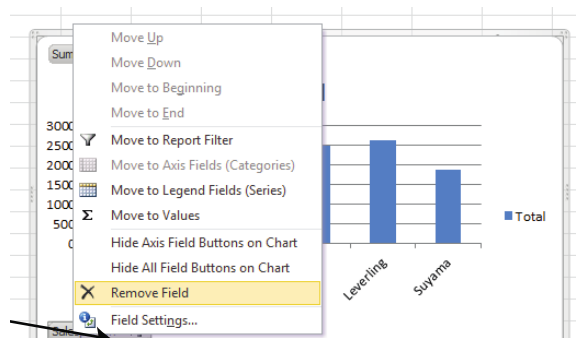


Figure 8–69. *Removing just one field button from a PivotChart*

NOTE: You can also remove individual PivotChart field buttons by clicking the PivotChart contextual tab, choosing **Analyze**, and clicking the **Field Buttons** arrow.

If you want to delete the PivotChart, click in its chart area so that you see that gray border surrounding the chart, and press **Delete**—just as you would with a standard Excel chart.

Creating a PivotTable and PivotChart Together

You can also produce a PivotTable and chart *simultaneously*, by clicking anywhere in the source data (meaning the original database), and then clicking Insert ► Tables ► PivotTable ► PivotChart. You'll see what's shown in Figure 8–70.

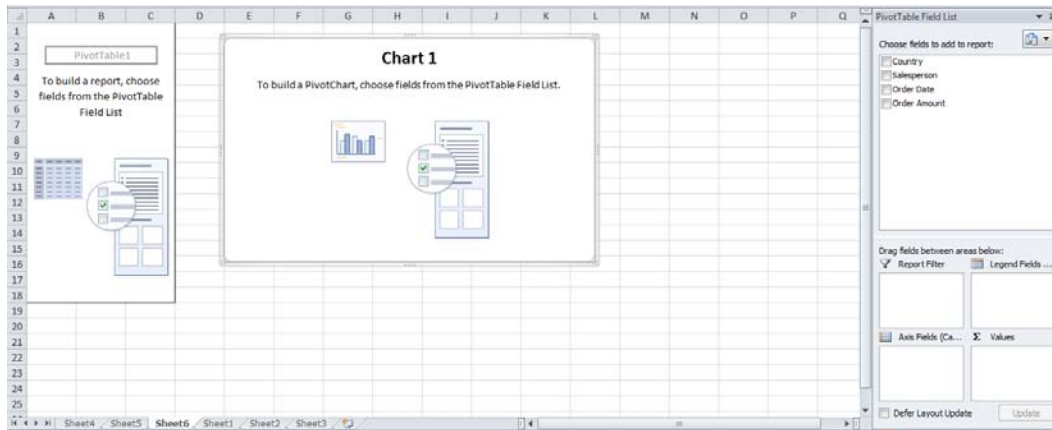


Figure 8–70. Note that the PivotChart and PivotTable areas appear at the same time.

Now if you drag Salesperson into what's now called the Axis Fields (Categories) area and drag Order Amount into the Values area, both the PivotChart *and* PivotTable will materialize onscreen.

Summary

PivotTables are an acquired taste, to be sure, but one worth acquiring, as they can greatly enhance your analyses of spreadsheet data. Understanding basic PivotTable principles will go a long way toward empowering you to fashion them on your own.

Next we'll direct our attention to another analytical enhancement—working with multiple worksheets and how they can work together.

