Excel Magic

The Road to Excellence

Power Charting

Understanding Charting Fundamentals

Creating charts in Microsoft Office applications such as Excel, Word, and PowerPoint is an effective means of helping readers of financial statements and similar reports to understand the true meaning of the data presented in such statements and reports. Of course, this can only occur if the creator of the chart understands the fundamentals of building charts in Microsoft Office applications. In this chapter, we examine these fundamentals so that course participants have the fundamental knowledge to create Microsoft Office charts.

Learning Objectives

Upon completing this chapter, participants should be able to:

- Identify the importance of communicating visually;
- List key issues to consider prior to building a chart;
- Describe the different types of charts available in Microsoft Office and which type of chart is appropriate in specific situations;
- Identify the elements in a Microsoft Office chart and describe how to modify each; and
- Create and edit basic charts in Microsoft Office.

Why Communicating Visually is Important

Stated simply, charts assist in communication by transforming large quantities of numerical data into easily understandable visual graphics. With charts, we convert seemingly endless ranges of rows and columns of data into smaller, more compact, and, presumably, more readily understood graphic objects. In doing so, we make it easier for the consumers of this information to identify the important data points, trends, results, deviations, etc. that the data contain.

For example, suppose you have data that shows the number of customers served in a fast-food restaurant by hour. You wish to use this data to help you or a co-worker plan for adequate staffing of the restaurant during peak periods of demand. **Figure 1** presents the 280 data points in a traditional tabular format – one that causes many readers' eyes to gloss over.

	C	D	E	F	G	H	I	J
1	Time Period	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2	6:00 - 6:30	13	15	11	12	17	9	4
3	6:30 - 7:00	16	18	12	14	18	10	4
4	7:00 - 7:30	18	18	14	14	18	11	5
5	7:30 - 8:00	18	20	15	15	20	13	7
6	8:00 - 8:30	20	21	17	17	21	19	8
7	8:30 - 9:00	18	21	16	17	20	22	9
8	9:00 - 9:30	17	19	16	16	19	24	12
9	9:30 - 10:00	14	12	13	11	10	18	12
10	10:00 - 10:30	8	7	6	7	6	12	11
11	10:30 - 11:00	7	8	9	7	6	10	9
12	11:00 - 11:30	11	14	14	13	15	17	9
13	11:30 - 12:00	18	19	20	21	22	24	14
14	12:00 - 12:30	27	25	26	26	27	29	18
15	12:30 - 13:00	29	30	29	30	31	34	26
16	13:00 - 13:30	19	21	20	21	22	24	18
17	13:30 - 14:00	14	12	13	12	13	15	11
18	14:00 - 14:30	8	9	7	7	8	9	7
19	14:30 - 15:00	7	6	6	7	7	8	6
20	15:00 - 15:30	5	5	5	4	5	6	5
21	15:30 - 16:00	3	4	4	5	4	5	4
22	16:00 - 16:30	2	3	3	3	4	4	3
23	16:30 - 17:00	4	5	4	5	4	7	8
24	17:00 - 17:30	10	11	11	10	12	10	11
25	17:30 - 18:00	12	13	13	12	13	11	12
26	18:00 - 18:30	11	10	11	10	12	12	10
27	18:30 - 19:00	13	12	10	11	12	11	11
28	19:00 - 19:30	13	11	10	12	13	12	10
29	19:30 - 20:00	11	10	9	9	11	10	10
30	20:00 - 20:30	8	9	8	7	9	10	8
31	20:30 - 21:00	7	6	6	6	8	8	7
32	21:00 - 21:30	5	4	4	5	9	8	6
33	21:30 - 22:00	4	4	4	3	10	11	5
34	22:00 - 22:30	5	3	4	3	11	10	4
35	22:30 - 23:00	3	2	2	2	8	9	3

Figure 1 - Average Customers per Half-Hour for a Fast Food Restaurant

However, charting the data in Figure 1 as a PivotChart allows the consumer of information who may not be numerically oriented to visualize quickly and easily the peaks and valleys of customer activity during a specific day and to plan staffing accordingly. **Figure 2** presents an

example of such a PivotChart; the process of building such a chart is detailed beginning on page 48.

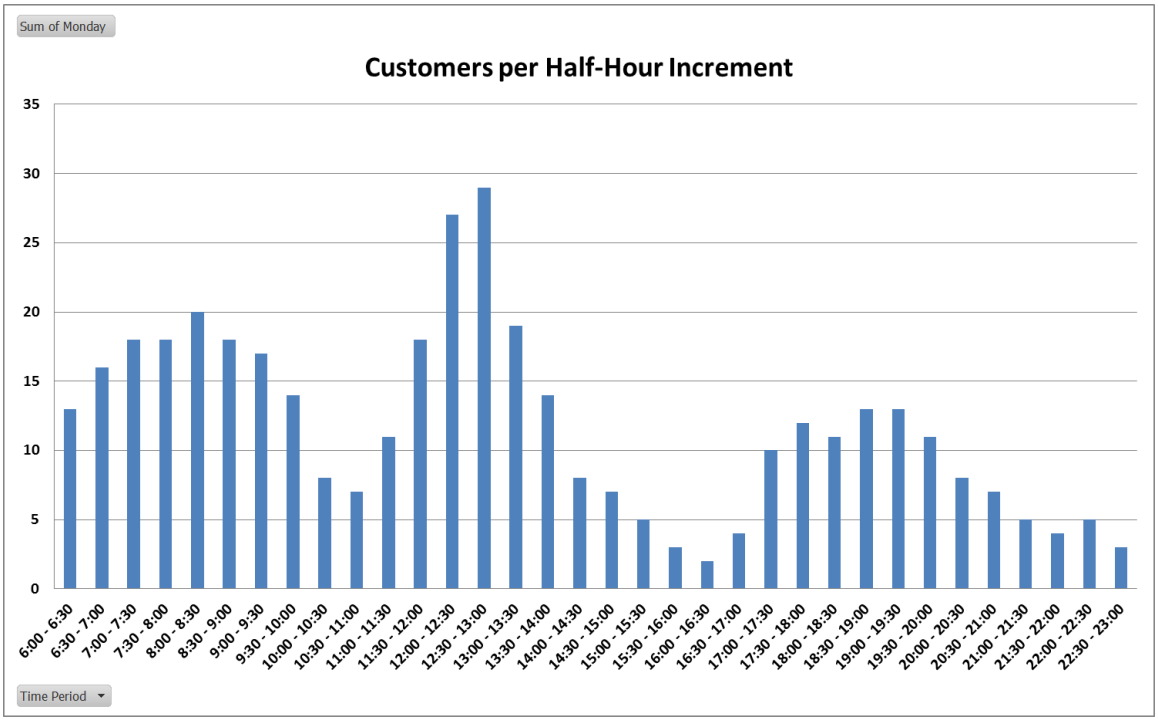


Figure 2 - Sample PivotChart Used to Understand Staffing Requirements

From the example shown above, using charts to transform tabular ranges of data into meaningful and actionable information is a clearly a prime reason to use this tool. Another is the ability for a chart to generate new information that we can use in various situations such as budgeting and forecasting. For example, as shown in **Figure 3**, a trend line and regression equation could be added easily to a chart, allowing someone who is attempting to forecast next quarter's sales to use the regression equation as the foundation of such a forecast.

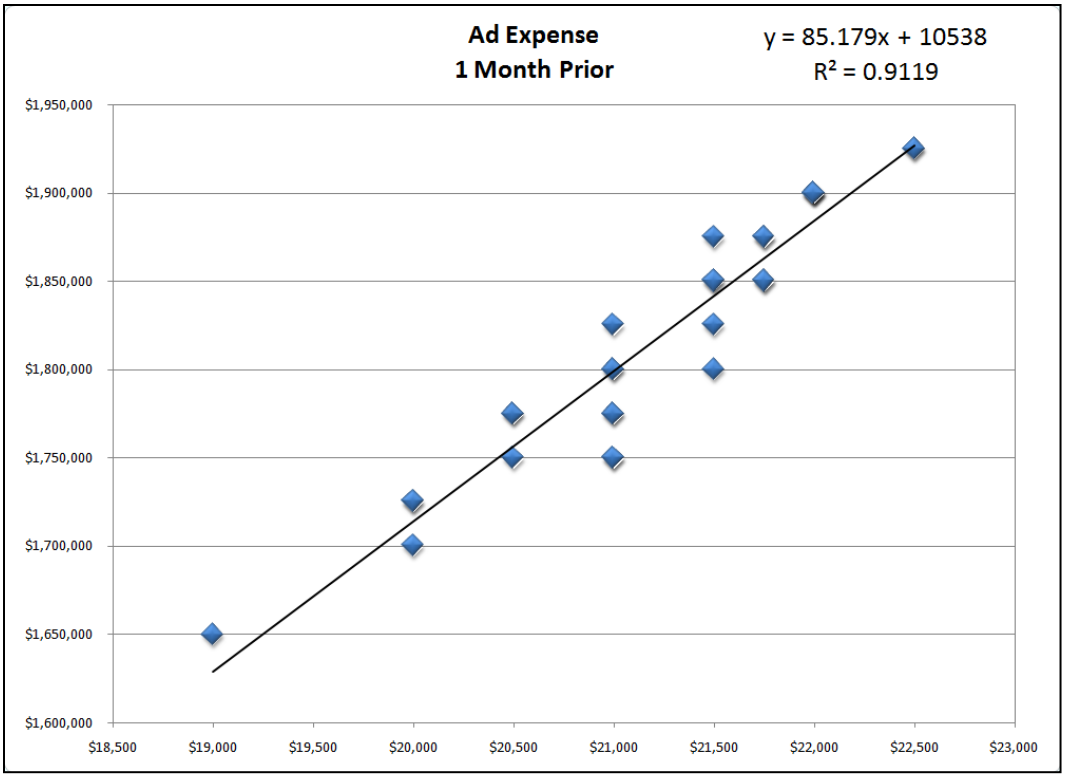


Figure 3 - Chart with Regression Equation Added

In sum, communicating visually through charts and other objects provides several significant advantages to those who choose to utilize this technique and know how to prepare meaningful charts. Among these benefits are:

- Summarizing large quantities of data into single, compact objects;
- Transforming tabular, numerical data into actionable information;
- Providing self-service business intelligence by offering interactivity to end users, allowing them to self-select the data presented in the chart; and
- Identifying trends in data and highlighting items requiring action and attention.

Considerations to Make Prior to Building a Chart

To achieve the benefits outlined above, consider carefully several important questions before building a chart. First, what is the objective of the chart? Eleven pre-defined chart groups exist in Microsoft Office, and the choices available in each of these groups are used for different purposes. So, for instance, if you are seeking to create a chart that shows trends in sales over time, you should use a different chart type than if you are seeking to compare the sales generated by each salesperson.

A second consideration is how the chart will be distributed to information consumers. Will the file containing the chart be available in a central location on a server or in the cloud? Or will you distribute the chart in another object, such as a PDF document? The answer to this question is important because it potentially limits some options such as interactivity.

A third consideration is that of the choice of colors you will use in a chart. As a rule, the choice of colors should create stark contrasts in the different data series plotted on the chart. This is necessary so that consumers can clearly see the distinction in the data series, particularly if the chart is printed on a black-and-white printer, or if it is displayed in a presentation under less-than-ideal lighting conditions. An associated issue is that of red-green color blindness. Recognizing that this condition afflicts between 7% and 10% of the male population, avoid using these two colors on the same chart as they may be indistinguishable by information consumers with this condition.

The type and source of the data that you wish to plot in a chart is a fourth critical consideration. If, for example, you will keypunch the data directly into an Excel spreadsheet and then chart that data, you have much greater control over the resulting chart. On the other hand, if you will extract the data from another database and attempt to build the chart on the extracted data, you may find it necessary to manipulate the data before constructing the chart. Likewise, if your chart needs to allow for end-user interactivity, then your approach to constructing the chart will be altogether different than if you merely need to create a "one-off" line chart.

Types of Charts Available in Microsoft Office

Before proceeding with discussion on how to customize charts and manipulate chart data, a review of the basic chart types is in order. Microsoft Office includes seventy-three predefined chart types in eleven broad categories. The following table summarizes the types and number of charts available in Office.

- Column – 19
- Line – 7
- Pie – 6
- Bar – 15
- Area – 6
- XY – 5
- Stock – 4
- Surface – 4
- Doughnut – 2
- Bubble – 2
- Radar – 3

Column charts, the most common of all chart types, display data points in vertical columns. Column charts are typically used to compare discrete values and do not necessarily imply the passage of time. A **bar chart** is very similar to a column chart, except that a bar chart has a horizontal orientation, while a column chart has a vertical orientation. Bar charts are useful in comparing a large number of values and for when category labels are lengthy. **Cylinder**, **cone**, and **pyramid** charts are variants of column and bar charts in Office.

Line charts are used commonly to plot continuous data over time. Line charts are exceptionally useful in helping to identify trends in data. A line chart assumes that all of the data points plotted

are spaced evenly in time. An **area chart** is essentially a line chart where the area below the line has been filled. Like line charts, area charts are useful for displaying values over time.

XY charts, or **scatter plots**, show the relationships between variables plotted on the X (horizontal) and Y (vertical) axes. The values plotted on the X-axis are independent of the values plotted on the Y-axis. In other words, the values plotted on the X-axis drive, or cause, the values plotted on the Y-axis. **Bubble charts** are like XY charts but with an additional data series represented by the size of the bubbles. Bubble charts are useful for representing data across three dimensions.

Pie charts display the relative makeup of data. They are useful for identifying proportional values or contributions to a total. For pie charts to be effective, use no more than five or six data points. When you have a greater number of data points, consider using a bar chart, pie of pie chart, or bar of pie chart instead. A **doughnut chart** is similar to a pie chart except that it can display more than one series of data. However, because each successive series of data is placed in concentric rings, it can be relatively easy to misinterpret the meaning of the chart. Given this limitation, doughnut charts are usually best utilized with only one data series. If multiple series of data are required, consider using a stacked column chart instead.

Radar charts have separate axes for each category of data. These axes extend outward from the center of the chart. Radar charts are useful for identifying relationships among data series and in making comparisons of data values. With a **surface chart**, colors are used to distinguish *values*, not series. Surface charts can display two or more data series on a surface and are often used to find optimum combinations between two sets of data.

Stock charts are very useful for displaying information regarding security prices such as high, low, or closing stock prices. In addition, opening values and volume may be displayed. Stock charts may also be used to display scientific data. For example, stock charts may be useful in charting rainfall or temperatures.

Choosing the Right Chart Type

With all of the choices available, sometimes the most difficult part of creating a chart is choosing which type is best for a given situation. A few guidelines may be helpful.

- When comparing items to other items, *column charts*, *bar charts*, and *cylinder*, *cone*, and *pyramid* charts are generally the best choice.

- When comparing data over time, *line charts* and *area charts* are usually superior to other options.

- To make relative comparisons of one data point to another, *pie* and *doughnut charts* are useful. *Stacked bar charts*, *stacked column charts*, *100% stacked bar charts*, and *100% stacked column charts* are also good choices.

- Causal relationships in data are often best depicted with *XY charts*. If three data values need to be plotted, use a *bubble chart* instead of an XY chart.

Elements of a Microsoft Office Chart

Each Microsoft Office chart contains some or all of the elements listed below. If an element needs modification or adjustment for proper display, simply click on the element to activate it and then act on the element through the Ribbon or context menu. An alternative approach to selecting an element for modification is to do so through the Chart Tools Format contextual tab as shown in **Figure 4**. Using this approach, select the element you wish to modify and then click **Format Selection** on the same tab of the Ribbon.

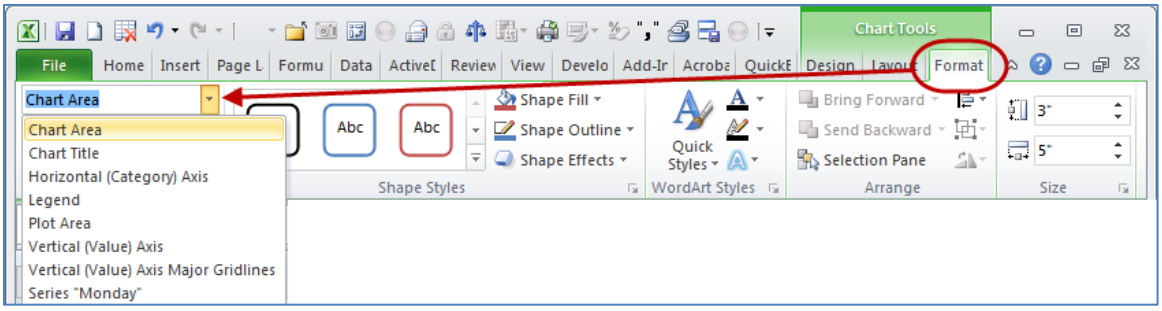


Figure 4 - Selecting a Chart Element for Editing

Adjust the formatting, scaling, appearance, etc. as required and then move on to the next element that requires adjustment. While Excel does a good job of automating the entire charting process, advanced users can fine-tune charts by modifying individual elements.

- **Data Series** – broad categories of data plotted in a chart
- **Data Points** – individual data elements plotted in a chart
- **Category Axis** – horizontal axis
- **Category Axis Label** – labels along the category axis
- **Value Axis** – vertical axis
- **Legend** – identifies data series
- **Data Labels –** identifies data points
- **Gridlines –** used to visually extend labels from an axis
- **Chart Area** – background area of a chart
- **Plot Area** – section of a chart containing the actual plot, including the plotted data, the axes, and the axis labels
- **Walls** – used for formatting the vertical axis in 3-D charts
- **Floor** – used for formatting the horizontal axis in 3-D charts
- **Trendlines** – can be plotted against data in a chart; can also be used to display a linear regression formula
- **Error Bars** – display potential error amounts relative to each data marker in a data series
- **Chart Title –** identifies the chart

A very important point to stress is that you can format each element on a chart independently of every other element. This provides exceptional power when customizing a chart to meet your specific needs. For instance, you could select an entire data series and, for example, change the color of the data series in the chart. However, you could also select only one data point within

that data series and change just the color of that single data point. This power and flexibility means that you can customize a standard Microsoft Office chart to satisfy an almost unlimited number of needs.

Creating Simple Charts in Microsoft Office

While most accounting and financial professionals will choose to build their charts in Excel, it is important to understand that Microsoft Office 2007/2010 applications share numerous enhancements, including a unified charting tool. This is an important consideration because it means that you can build charts in various Office applications using a common methodology and workflow.

Charting in Word

It is a shock to many to learn that charting is a function found in Microsoft Word and that it has been present there for many versions. For instance, in Word 2003, you can create a chart in Word by choosing **Insert**, **Picture**, and **Chart** from the menu. As indicated previously, the charting engine in Word 2007 and higher is significantly improved compared to prior versions of Word. To create a chart, choose **Chart** from the **Insert** tab of the **Ribbon** to open the **Insert Chart** dialog box shown in **Figure 5**. For those who prefer keyboard shortcuts, **ALT+N+C** opens the Insert Chart dialog box in Word, PowerPoint, and Excel. Note that the Insert Chart dialog box is the same in all Office applications.

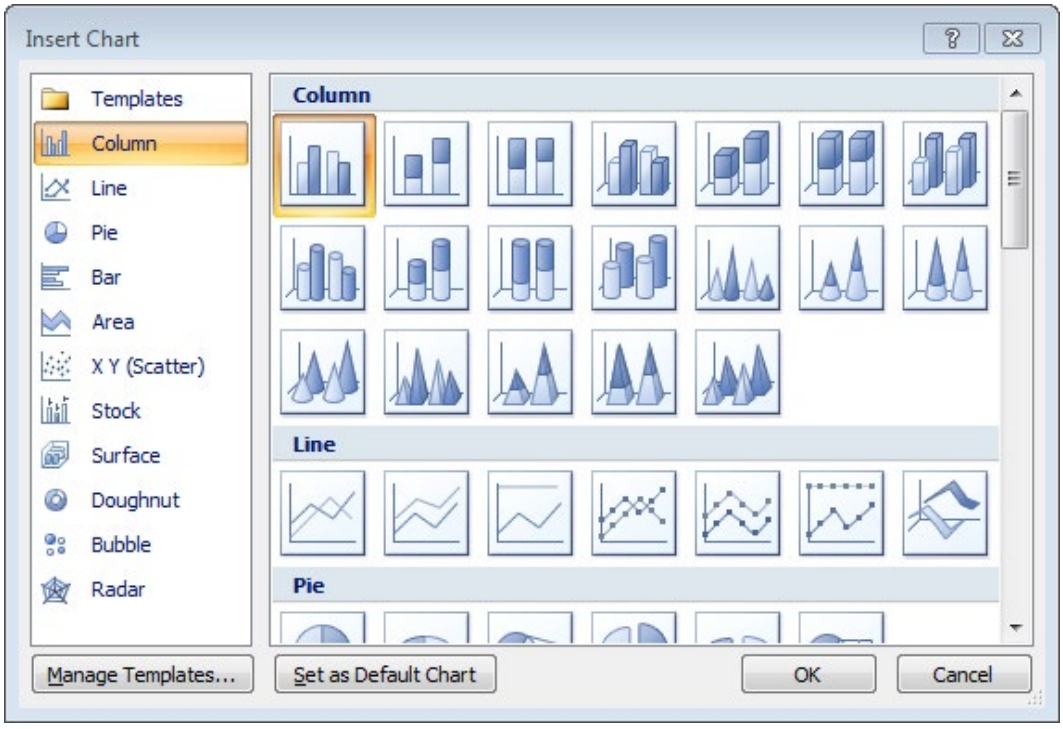


Figure 5 - Insert Chart Dialog Box

Select your desired **Chart Type** and click **OK**. Upon doing so, you will see that something interesting occurs. Word inserts the outline of a chart into the document, but it also

simultaneously opens an Excel worksheet in which you can add, edit, and delete the data for the chart as shown in **Figure 6**.

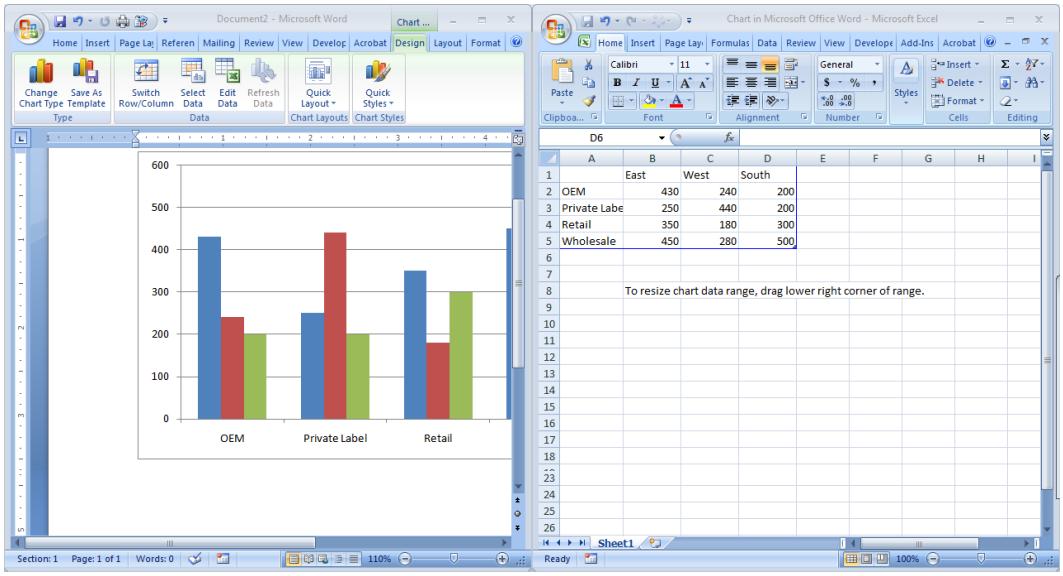


Figure 6 - Creating a Chart in Microsoft Word

Excel does not actually save the data that appears in the Excel editing grid as part of an Excel workbook; rather, Word saves that data as part of the XML-based Word 2007/2010 file. This is an important consideration because it means that data does not link to the Word document; instead, Word embeds it into the document. As such, it also means that if you send the Word document to another user, the other user will be able to edit the data for the graph.

Charting in PowerPoint

Because of the common charting tool residing in Office, the process for building a chart in PowerPoint is virtually identical to the process of building a chart in Word. Choose **Insert** and **Chart** from the **Ribbon**, select the desired **Chart Type**, and click **OK**. PowerPoint builds the basic chart and simultaneously opens an Excel grid for editing the data. As with Word, the data in the Excel grid saves as part of the PowerPoint file, not in a separate Excel workbook.

Charting in Excel

Since the early days of Lotus 1-2-3, professionals have relied on spreadsheet programs for the bulk of their charting needs. For accountants, this was particularly true for a very practical reason: most of the data that they needed to chart was already in a spreadsheet. Thus, it was natural to chart the data in the application that housed the data.

Building a basic chart in Excel follows the same process as building basic charts in Word and PowerPoint with a few minor variations. If you choose to select the **Insert** tab of the **Ribbon** to create a chart, Excel prompts you in advance for the type of chart you wish to create. If you wish to see the Insert Chart dialog box and make your selection from there, click the **dialog launcher** for the **Charts** group. In either case, upon making a selection, if you did not select a data range before inserting the chart, Excel only inserts a placeholder for the chart on the worksheet. You

should then click **Select Data** from the **Chart Tools Design** contextual tab to select the data range you wish to include in the chart.

If, on the other hand, you want to create a chart based on your default chart type, Excel provides two shortcuts for doing so. In both cases, first highlight the data range you wish to include in the chart. Then, if you want the chart to appear on the same worksheet, press **ALT+ F1**, and Excel will create a chart based on the selected data range and the default chart type. If you prefer for the chart to be on a separate worksheet, press **F11**, and Excel creates a new charting worksheet placing the chart as the only object on that worksheet. Note that while you may subsequently move that chart to another worksheet, Excel reserves the charting worksheet for charts only, and data may not reside on it.

Creating and Editing a Chart in Excel – A Detailed Illustration

Creating a chart in Excel requires four basics steps:

1. Arranging the data in a way that makes it easy to chart,
2. Selecting an appropriate chart type,
3. Selecting a chart layout and style from the Chart Tools tab, and
4. Fine-tuning the chart's look and feel on the Chart Tools Layout or Format tabs or by using a context-sensitive menu.

Generally, arranging the data so that the X-axis categories are in columns, and the data series are on rows produces the best charts using the default process. While most users instinctively highlight their data before creating a chart, that step is unnecessary, unless you want to chart two or more noncontiguous data ranges. To select noncontiguous data ranges, use **CTRL** + **Click and Drag** to highlight the ranges.

To create the first example chart, position the cursor within the data. Press **ALT + F1** to create a chart as an object on the worksheet that contains the data and then reposition and resize the chart as desired. To resize a chart, first select the chart and then click on one or more of the eight resizing handles on its border indicated by the rectangles in **Figure 7** and then drag them to resize the chart.

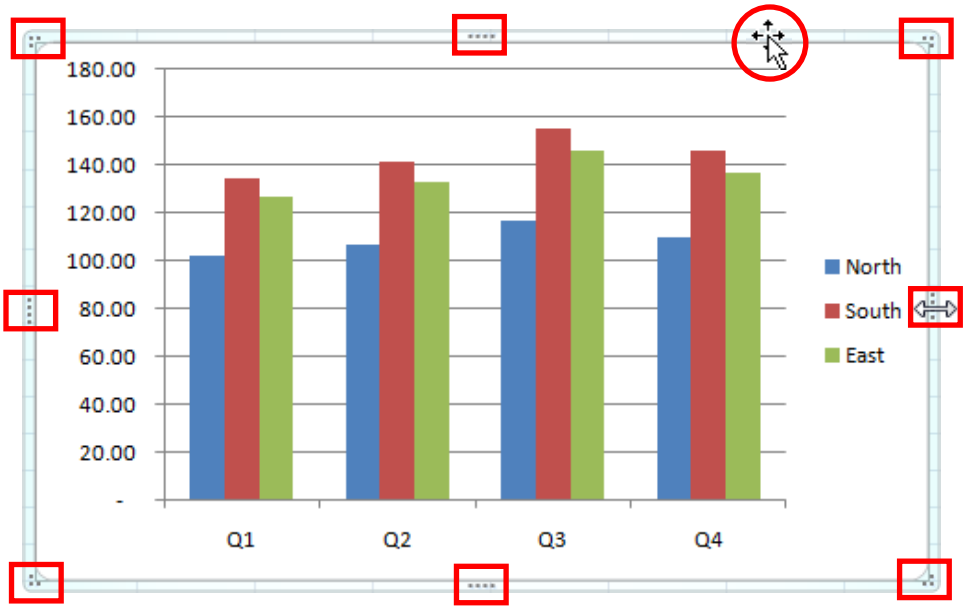


Figure 7 - Using the Chart Border to Resize and Reposition a Chart

To reposition a chart, first select the chart and then click on its border, making sure to avoid the resizing handles. The cursor will change to a compass rose as shown in the circle in Figure 7 at which point the chart may be dragged to its desired position. After repositioning the chart, the worksheet should resemble the one in **Figure 8**.

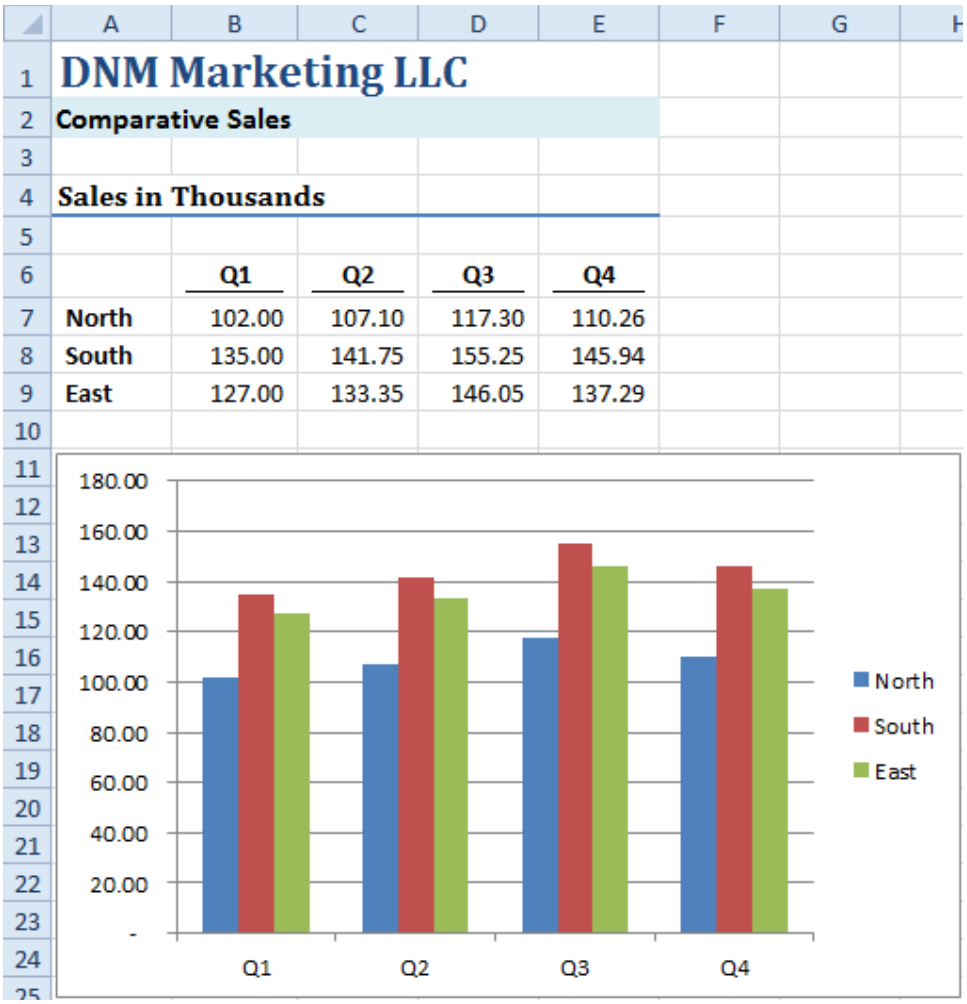


Figure 8 - Simple Column Chart Created with a Single Keystroke

To create a chart on a separate Chart Sheet, position the cursor within the data to be charted and press **F11**. Both one-click methods create a chart using the default chart type. To change the default chart type, click on a chart to display the **Chart Tools** tab. Select the **Chart Tools, Design** tab and then click **Change Chart Type**. In the **Change Chart Type** dialog box, select the desired default chart type, click **Set as Default Chart**, and click **OK**.

Now that we have a chart, select **Change Chart Type** from the **Chart Tools, Design** contextual tab and review the various chart types available. In our example, a simple column chart is appropriate for our needs, but a chart's type can be changed at any stage of creation or use. Our chart needs a title and the Y-axis formatted so that it displays dollar signs and zero decimal places. To choose a layout that includes a chart title, select the **Chart Tools, Design** tab. Expand the **Chart Layout** gallery and select a layout that contains a chart title and a legend on the right hand side as shown in **Figure 9**. Note that the chart layout gallery will change, depending on the type of chart selected.

Figure 9 - Selecting a Chart Layout

In the chart, click and highlight the text of the placeholder label **Chart Title** and type in **DNM Marketing LLC**. Press **ENTER** to continue on another line. Change the font to **12pt** and then enter **Sales by Division**. Click anywhere on the chart to end the edit process.

Now, let's change the number format of the quarterly sales amounts. Click anywhere on the numbers in the Y-axis area to activate the axis. A gray box will surround the area. Select the **Charts Tools, Layout** contextual tab. Click on **Axes, Primary Vertical Axis, More Primary Vertical Axis Options** to open the **Format Axis** dialog box. Click on **Number** in the Navigation Pane on the left. In the **Number** pane on the right, select **Currency** in the **Category** box, enter **0** decimals, and select **$** as the symbol. Click **Close** to apply the changes. The process described is shown in **Figure 10**.

To format a chart element, you can simply double-click the element you wish to format. As mentioned previously, you can also format an element by choosing it from the Chart Tools Format contextual tab of the Ribbon. Additionally, you can format an element of a chart by right-clicking the element and choosing the **Format** option from the resulting contextual menu. For example, to format the vertical axis of any chart, just right-click in the vertical axis area and select **Format Axis**.

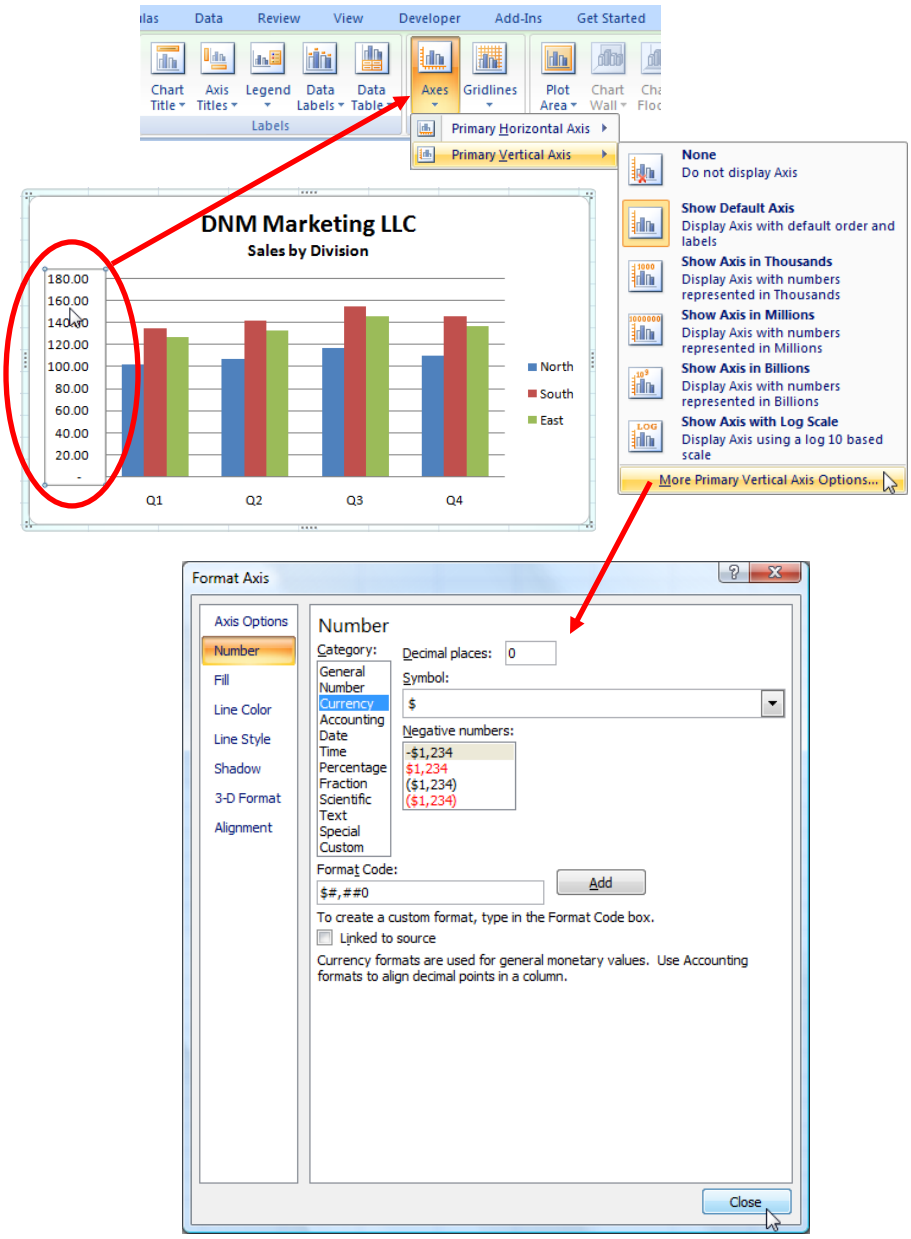


Figure 10 - Changing the Number Format of the Y-Axis

Now, let's make the chart more appealing by adding some visual effects. Click on the chart and select the **Chart Tools, Design** contextual tab. Expand the **Chart Styles** gallery and select one of the new dark background styles, **Style 42**. Select the **Chart Tools, Format** contextual tab, expand the **Shape Styles** gallery, and click **Colored Outline – Accent 2**. Next, let us "dress-up" the chart even more. Select **Themes** from the **Page Layout** tab and then click on the **Apex** theme to complete our chart. The process described, along with the completed chart, is shown in **Figure 11**. The process to create a simple chart with professional results could not be easier or faster.

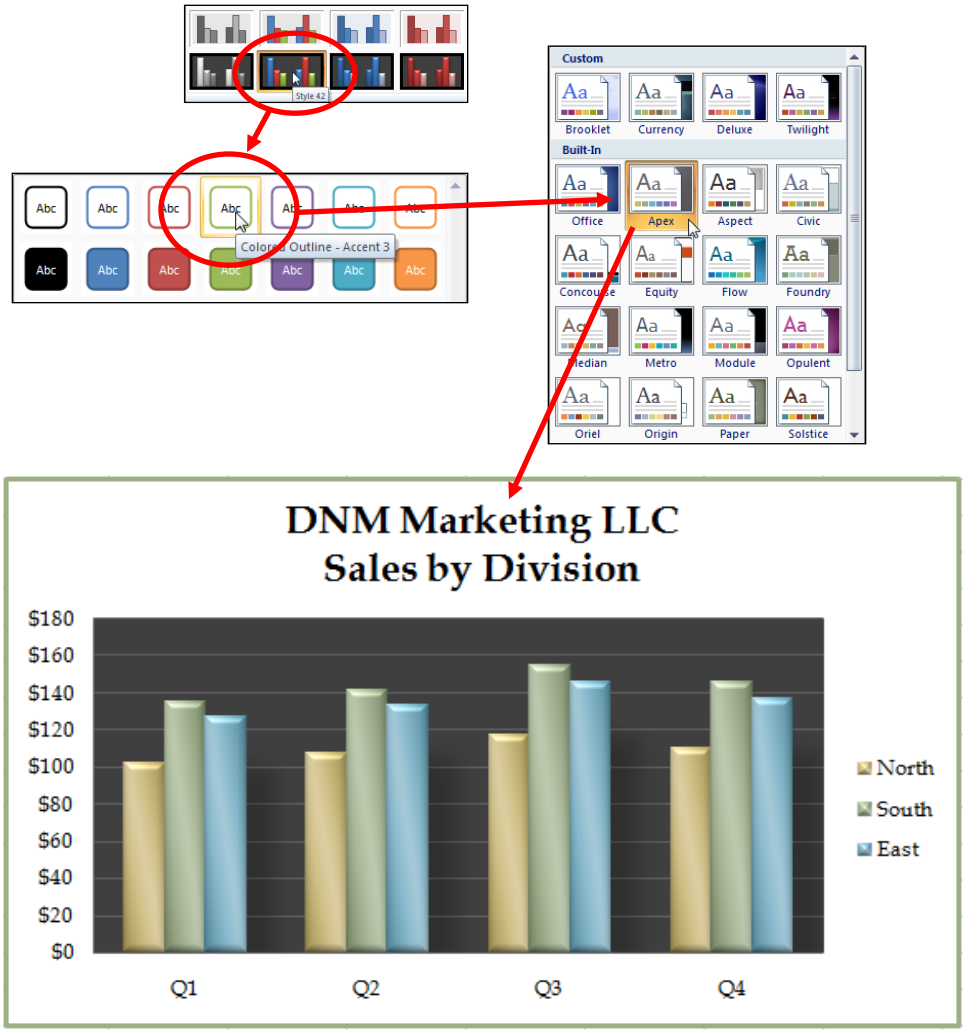


Figure 11 - Adding Advanced Visual Effects to a Simple Chart with a Few Clicks

Suppose that a quarter has passed, and the CFO of DNM Marketing would like to change the chart to include the latest quarter while removing the oldest quarter. First, type in the new heading (**Q1**) and data in the column immediately to the right and adjacent to the current data. Enter **112.2**, **148.4**, and **139.7** for the North, South, and East divisions, respectively. Now, click on the chart. In the source data, the legends are surrounded by a green box, the X-axis labels are surrounded by a magenta box, and the data series are surrounded by a blue box. Click and drag the blue box in the lower right-hand corner of the data series area one cell to the right so that the new quarter is now inside the box. Similarly, click and drag the blue box in the lower left-hand corner of the data series area one cell to the right so that the original first quarter data is not included in the data series box. Notice how the chart immediately changes to reflect the new data range. **Figure 12** shows the completed chart.

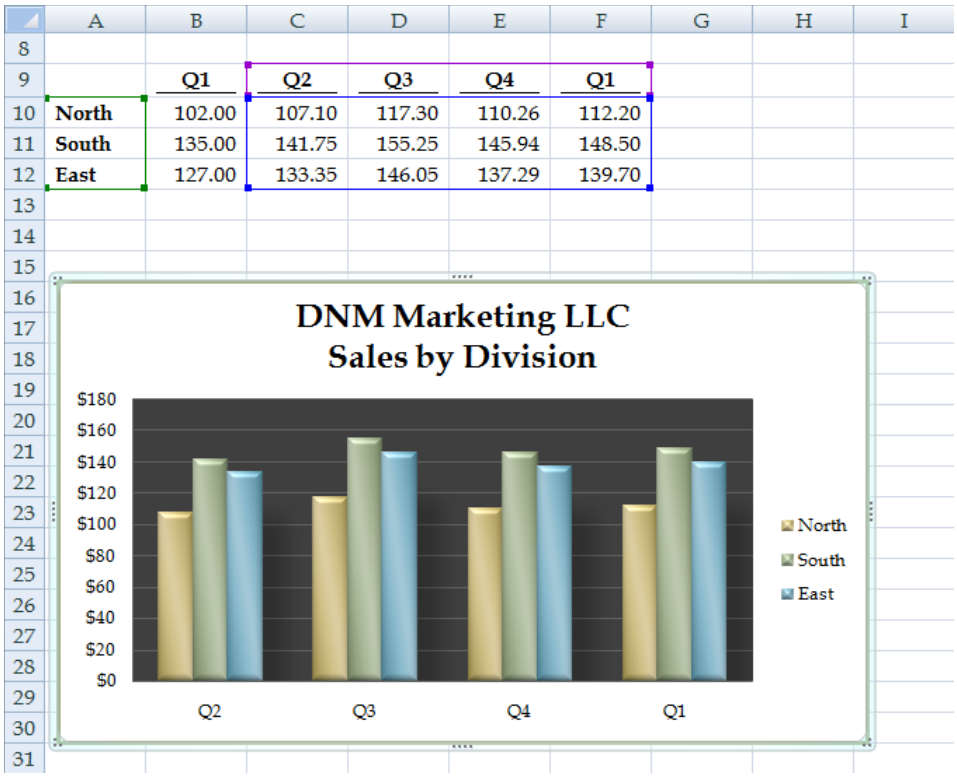


Figure 12 - Adding Data and Adjusting the Data Range of an Existing Chart

Manipulating Axes

The next example is designed to demonstrate the ease with which users can switch axes and delete unwanted data series in a chart. Position the cursor in the chart data and press **ALT + F1** to create the initial chart. Resize and reposition the chart as desired. Change the chart layout so that the chart includes a chart title and a legend on the right. Note that the chart displays quarters as the legend elements and the product groups as the X-axis elements. Switch the axes so that the product groups become the legend elements, and the quarters become the X-axis elements. Click on the chart and select the **Chart Tools, Design** contextual tab. Now, click on **Switch Row/Column** in the **Data** group. The chart now displays quarters as the X-axis elements. Debbie, the owner of DNM Marketing, wants a chart to help her understand whether the new lotion line is cannibalizing the old crème line. Click on the chart columns for Mask, Astringent, and Scrub, in turn, and press **DELETE** to delete these three data series from the chart. The process described and the resulting chart is shown in **Figure 13**.

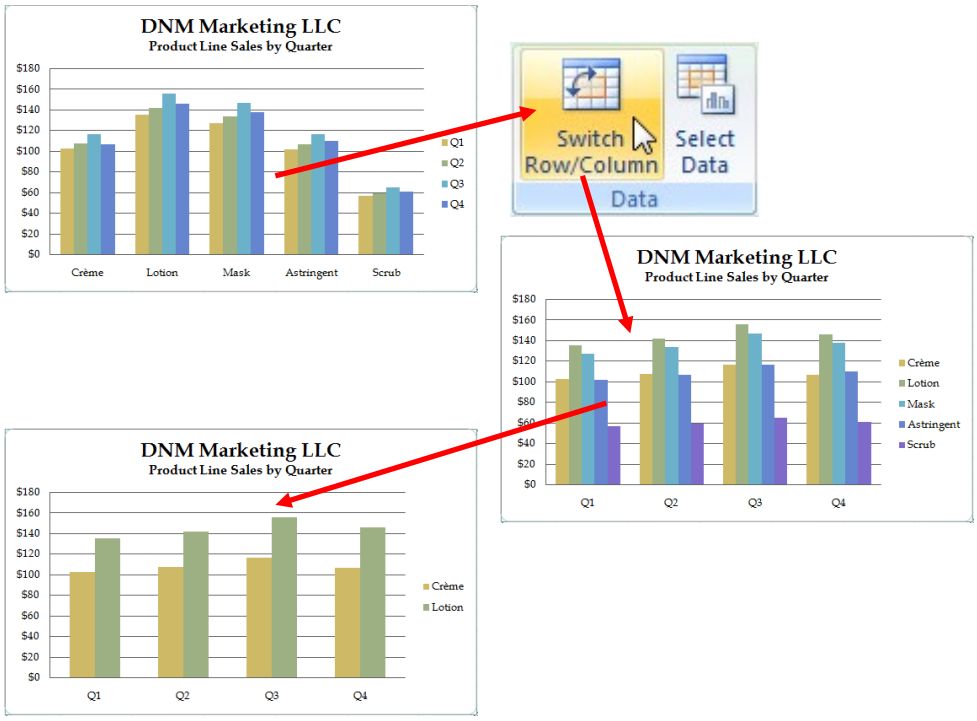


Figure 13 - Switching Axes and Deleting Data Series

Building Effective Charts in Microsoft Office

Moving beyond basic charting capabilities, to communicate visually with charts, you will need to know how take advantage of several techniques for fine-tuning your charts so that they are truly effective. In this chapter, we review some of the techniques for creating charts that communicate your message more effectively than the basic charts described in the preceding chapter.

Learning Objectives

Upon completing this chapter, participants should be able to:

- Modify default chart settings, including chart type, color scheme, and save custom chart templates;
- Create charts from variable data ranges by using Tables and Dynamic Defined Names;
- Build mixed charts that combine elements from multiple chart types;
- Add dynamic text boxes to charts to explain the true meaning of the chart to information consumers; and
- Apply conditional formatting to charts to highlight items requiring attention or action.

Modifying Default Chart Settings

Changing the Default Chart Type

The default chart type in all Office applications is a traditional column chart. What if you find that you create few such charts and wish to change the default type to a line chart instead? Among the benefits of doing so would be one-click access to building charts in Excel using the **F11** and **ALT+F1** keystrokes discussed earlier. To change the default chart type, open the **Insert Chart** dialog box, click the type of chart you desire for the new default chart type, and click **Set as Default Chart** as shown in **Figure 14**.

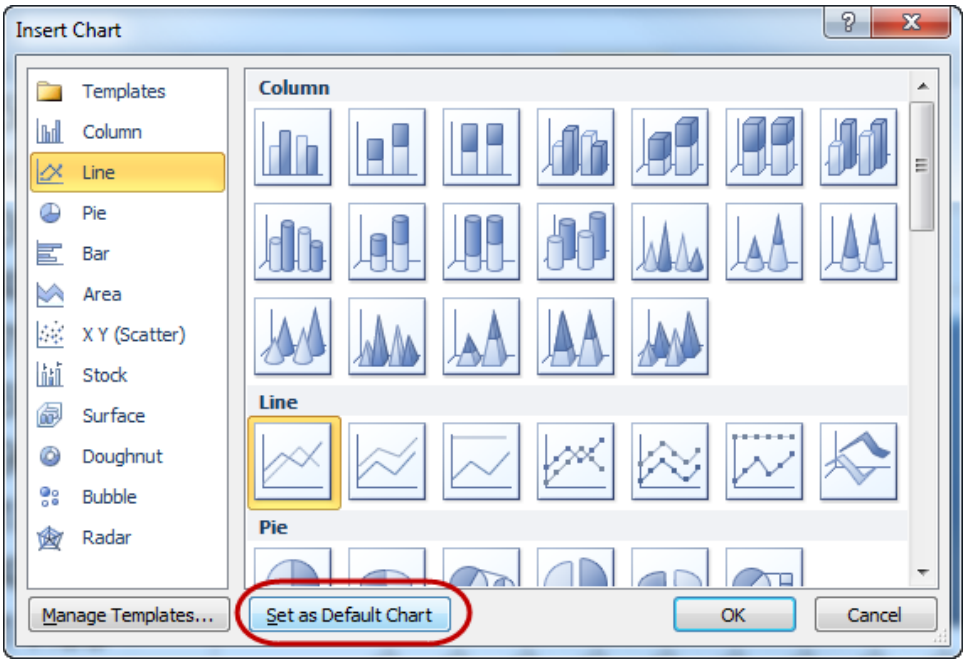


Figure 14 - Changing the Default Chart Type

Upon making this change, whenever you use a keyboard shortcut to create a chart, the resulting chart will be your new default chart, allowing you quicker access to the type of chart you intended to create.

Changing the Default Color Scheme

Beginning with Office 2007, Microsoft introduced **Themes** into the Office suite. Themes are predefined groupings of colors and fonts. The default theme in each of the major Office applications is one entitled **Office;** the default theme controls the colors appearing in your charts. Of course, you can change these colors on a chart-by-chart basis. Alternatively, you can change your default theme to one of the other predefined themes, or you can create your own theme and make it the default setting. To change the default theme, you change your default template file – **book.xltx** for Excel, **normal.dotx** for Word, and **blank.potx** for PowerPoint – saving the desired theme in the template file.

Saving Custom Chart Templates

Suppose you have spent a significant amount of time creating a specific chart design with multiple formatting attributes applied. You would like to save this chart as a template so that you can recall it and use it as the foundation for other charts in the future. To do so, simply save the chart as a new chart template. To save a chart as a template, select the chart and then click **Save As Template** from the **Chart Tools, Design** contextual tab.

After saving the chart as a template, you can create new charts based on the template by choosing the **Templates** option from the **Insert Chart** dialog box shown in **Figure 15**. Of course, once you create a chart from a user-defined template, you can still "tweak" the formats of the various chart elements to achieve the desired look.

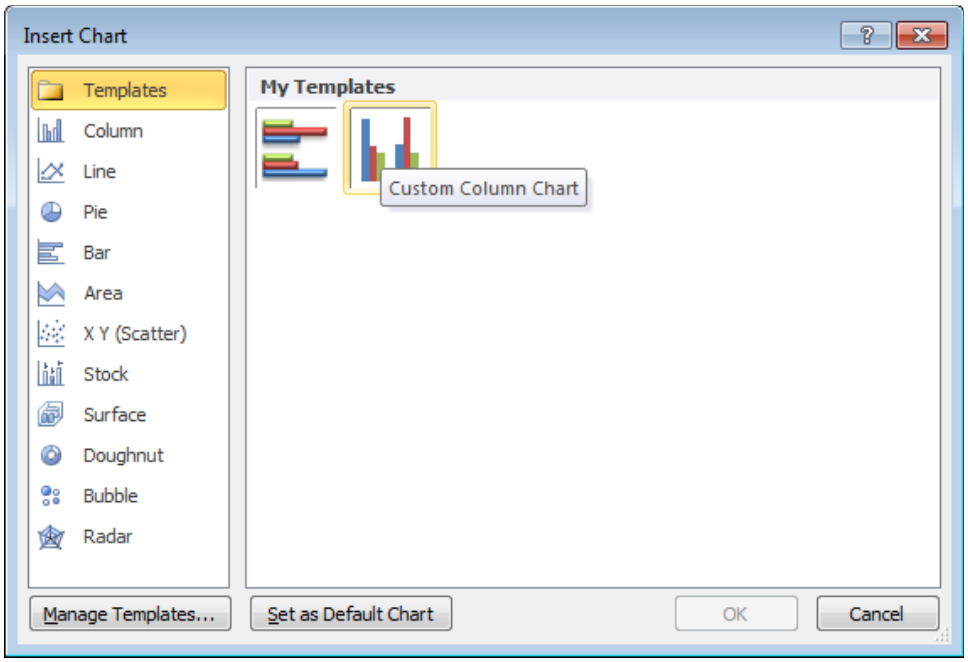


Figure 15 - Inserting a Chart from a User-Defined Template

Charting with Variable Data Ranges

Tables

Interactive charts are among the most highly sought-after forms of charts. In versions of Excel prior to 2007, users typically built interactive charts by creating dynamic defined names tied to form controls. End users changed the values in the form controls that caused the dynamic defined names to display different volumes or sets of data. While those techniques are still viable in Excel 2007 and Excel 2010, the advent of **Tables** provides an easier-to-implement solution in many cases.

Tables are dynamically adjusting ranges of data. Because the definition of a table changes dynamically as the volume of data in the table changes, objects – including charts – that are built using tables as their data sources automatically change. This means that if you build a chart based on a table and later add more data to the table, the chart will automatically include the

new data; likewise, if you delete data from the table, the chart will contract. For example, the data in **Figure 16** is a table named **RegionalSales**.

	A	B	C	D
1				
2	Region	1st Quarter	2nd Quarter	3rd Quarter
3	North	850	792	651
4	Southeast	487	679	670
5	Midwest	578	558	561
6	Mountain	1200	541	521
7	West	514	728	493

Figure 16 - Table Data for a Chart

Clicking inside the RegionalSales table and pressing ALT+F1 builds a chart in the default style based on the table. Now for the power of tables: as shown in **Figure 17,** adding the fourth quarter column to the table causes the chart to automatically add fourth quarter data without any manual intervention whatsoever! Likewise, if we apply filters to the table, the chart automatically filters as well. This, of course, only begs the question, "Why would we ever build charts based on traditional data ranges?"

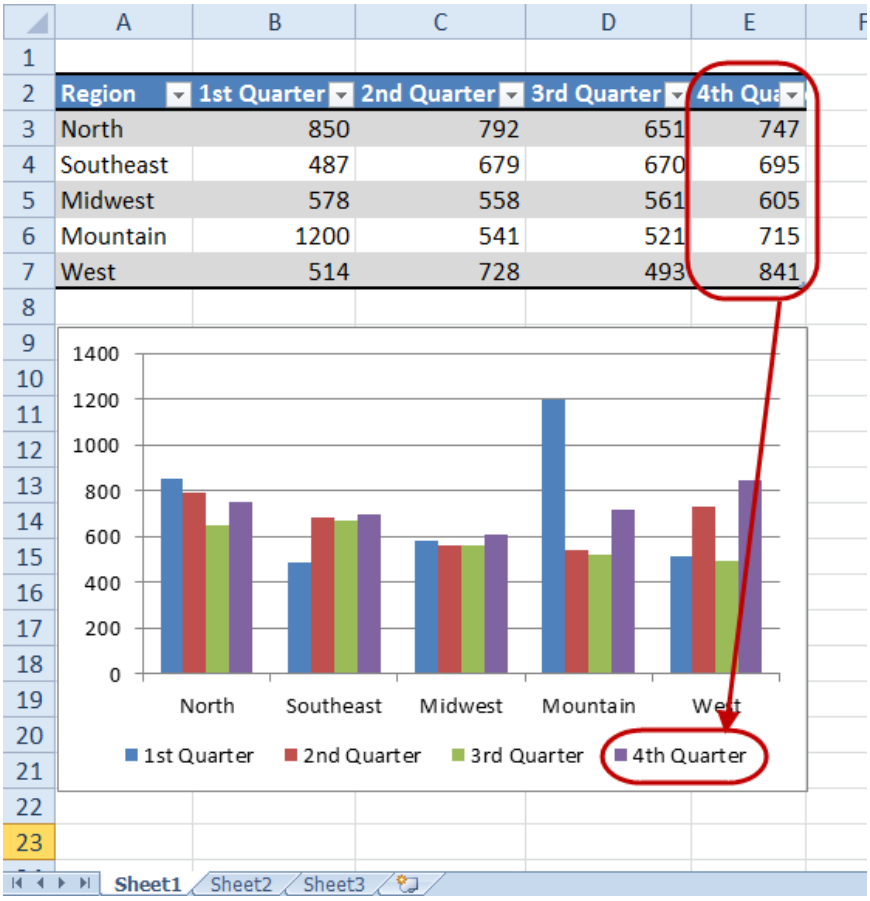


Figure 17 - Adding Data to a Table Causing Charts Built Based on the Table to Expand Automatically

Dynamic Defined Names

A minority of Excel users are familiar with *defined names*. In the simplest of terms, defined names are simply nicknames for cells in an Excel worksheet and can be used in lieu of traditional row-and-column addresses throughout Excel. To illustrate, in the simple example shown in **Figure 20**, defined names were assigned to cells B5 and E3. The formula in cell B6 utilizes these defined names instead of the associated row-and-column addresses to create a self-documenting formula.

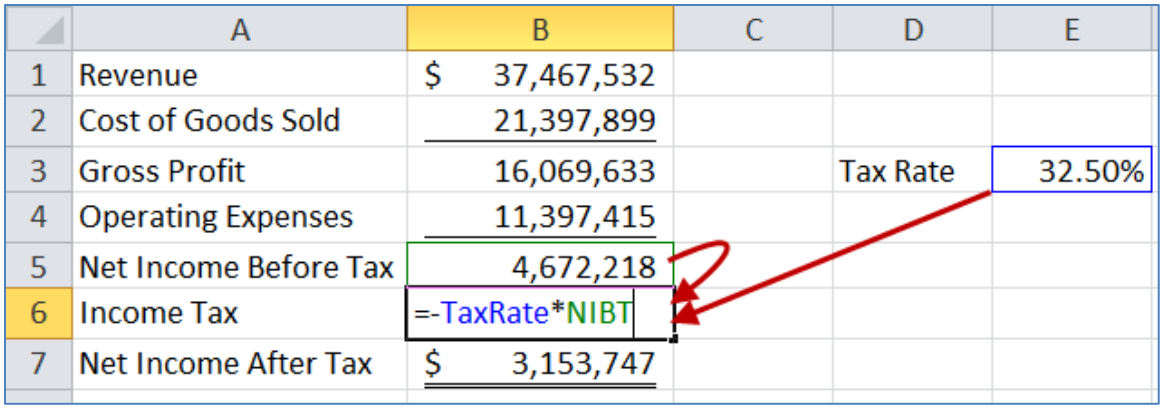


Figure 18 - Example of Simple Defined Names Used in Formulas

A second type of defined name is a *dynamic defined name*. A dynamic defined name is one created by a formula to provide for elasticity in the vertical dimension of the range, the horizontal dimension of the range, or both. In other words, similar to Tables, dynamic defined names can expand and contract vertically, horizontally, or both.

Referring to **Figure 19**, the formulas encircled in the **New Name** dialog box creates the dynamic defined name "dynaSales" that begins in cell A1, is three columns wide, and extends vertically for as many non-blank rows as there are in column A. While an extended discussion of the **OFFSET( )** formula is beyond the scope of this session, when used in this context, it essentially instructs Excel to start in a particular location and create a range that is *x* number of rows long and *y* number of columns wide. Because a formula creates the dynamic defined name, every time the formula recalculates, the definition of the range is subject to update. Thus, when users append or delete data, the workbook recalculates the ranges defined by the formula, and any objects that use these ranges as data sources – such as charts – also automatically update with additional data.

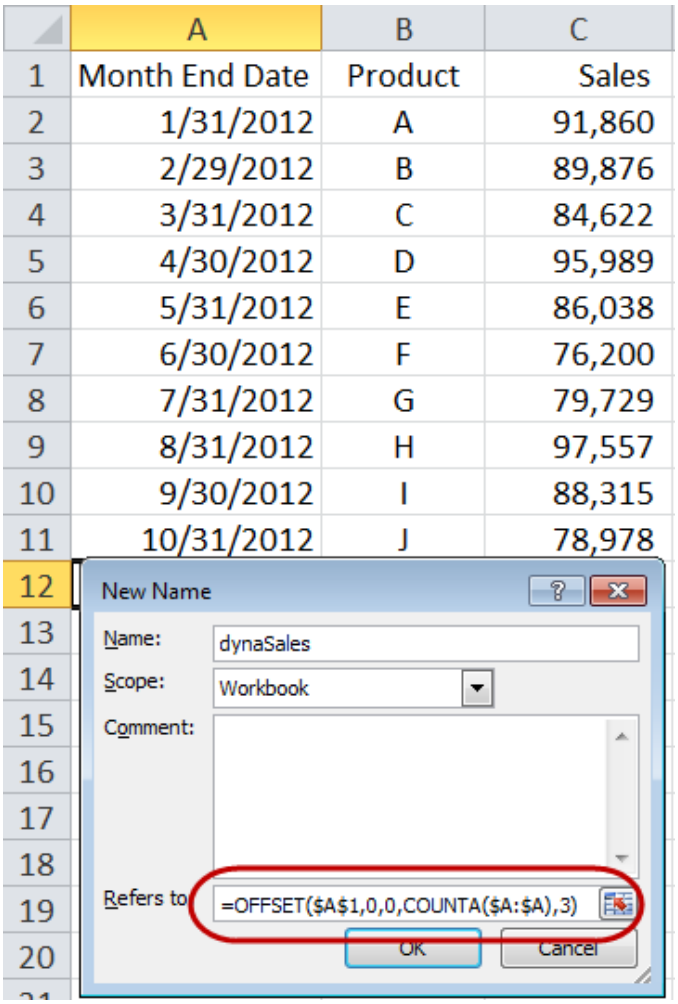
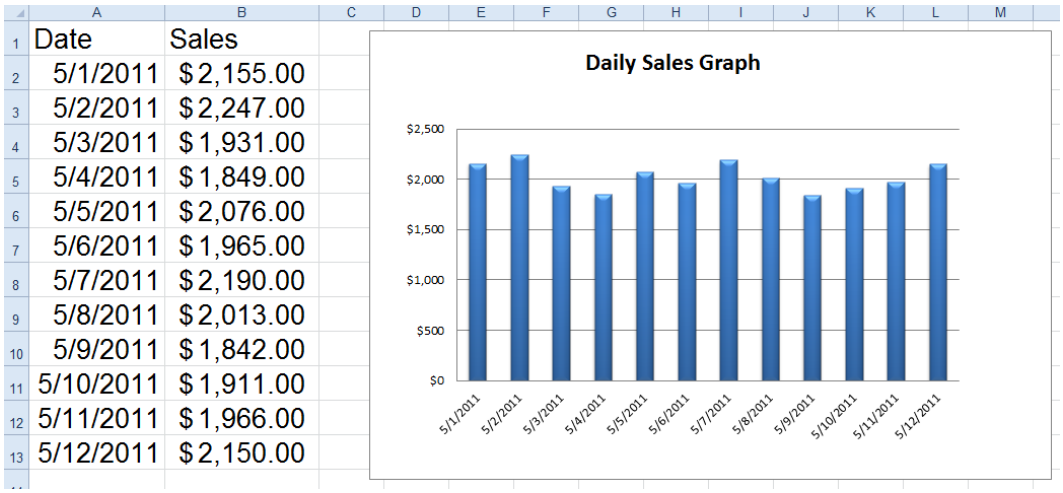


Figure 19 - Sample Dynamic Defined Name

To begin to understand the concept of dynamic defined names in Excel-based charting environments, examine the data and the chart shown in Figure 20. In this example, the business owner would like the chart to update automatically whenever additional rows of data are appended to the range in columns A and B; in other words, we want this range to mimic a Table, discussed previously.



	Date	Sales
2	5/1/2011	$2,155.00
3	5/2/2011	$2,247.00
4	5/3/2011	$1,931.00
5	5/4/2011	$1,849.00
6	5/5/2011	$2,076.00
7	5/6/2011	$1,965.00
8	5/7/2011	$2,190.00
9	5/8/2011	$2,013.00
10	5/9/2011	$1,842.00
11	5/10/2011	$1,911.00
12	5/11/2011	$1,966.00
13	5/12/2011	$2,150.00

Figure 20 - Sample Chart Built Based on Dynamic Defined Name

To accomplish this, create two dynamic defined names in the **Name Manager** on the **Formulas** tab of the **Ribbon**. The first, entitled **DynamicSales**, selects the data the chart is to plot. The actual formula used to create **DynamicSales** follows.

=OFFSET(B2,0,0,COUNTA($B:$B)-1,1)

The second, entitled **DynamicDate**, selects the data to include on the horizontal axis. The formula used to create **DynamicDate** is shown below.

=OFFSET(A2,0,0,COUNTA($A:$A)-1,1)

Once you have created the dynamic defined names, the rest is easy; insert a chart and specify the dynamic defined name for the series data and the dynamic defined name for the axis labels as shown in **Figure 21**. Note that in both cases, the name of the *workbook* prefaces the dynamic defined name; this is a **requirement** of using dynamic defined names as data sources for charts.

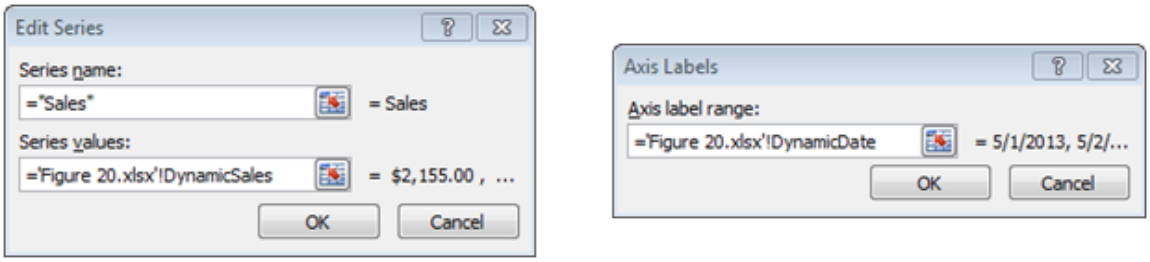


Figure 21 - Creating a Chart Based on Dynamic Defined Names

Adding Interactivity with Dynamic Defined Names

The preceding discussion on building charts from dynamic defined names is not merely an academic one. Rather, dynamic defined names are a cornerstone of *interactive charts* in Excel–charts that allow users to self-select the data that appears.

The three following steps contain the basic workflow for creating interactive charts that use dynamic defined names.

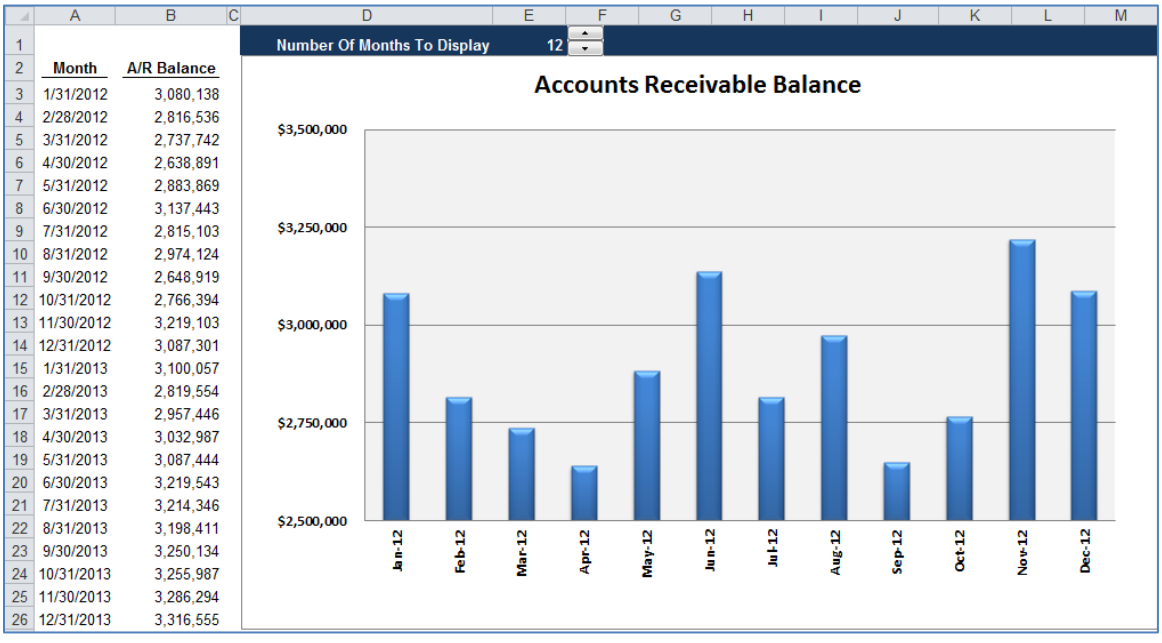
1. Create form controls with which the information consumer will interact.

2. Create dynamic defined names for each data series and axis you will plot. These dynamic defined names will be partially affected by the data input from the form controls.

3. Create and format the chart using the dynamic defined names as the data source.

Form controls are useful for giving users control over the amount of data that is included in a chart. For example, it may be desirable in one instance to plot the latest twelve months of ending balances for accounts receivable and in another instance to plot only the last three months of data. Unlike creating charts that automatically update as the data expands or contracts, a scenario such as this is facilitated by controlling the size of the data range.

With dynamic defined names, the data ranges automatically expand or contract as the volume of data changes. In this case, the data range expands and contracts based on user input. Form controls give the creator of a chart much greater control over the input of a chart user. In our example, a form control links to a cell that is an input to an **OFFSET** function. The OFFSET function controls the vertical size of the data range, which is a defined input to the chart. As a user manipulates the control, the size of the data range expands or contracts, and the chart changes to reflect the data range. **Figure 22** shows a chart that uses a spinner form control to specify the number of months of data to display.



Month	A/R Balance
1/31/2012	3,080,138
2/28/2012	2,816,536
3/31/2012	2,737,742
4/30/2012	2,638,891
5/31/2012	2,883,869
6/30/2012	3,137,443
7/31/2012	2,815,103
8/31/2012	2,974,124
9/30/2012	2,648,919
10/31/2012	2,766,394
11/30/2012	3,219,103
12/31/2012	3,087,301
1/31/2013	3,100,057
2/28/2013	2,819,554
3/31/2013	2,957,446
4/30/2013	3,032,987
5/31/2013	3,087,444
6/30/2013	3,219,543
7/31/2013	3,214,346
8/31/2013	3,198,411
9/30/2013	3,250,134
10/31/2013	3,255,987
11/30/2013	3,286,294
12/31/2013	3,316,555

Figure 22 - Chart Using a Spinner to Control the Chart Range

Let us examine some of the steps to build a chart using a spinner to control the chart data range.

1. Enter the data in columns A and B as shown. Label the columns accordingly.

2. Narrow column C for use as a spacer. Enter the label **Number of Months to Display:** in cell D1. Widen the column sufficiently so that the label fits within the cell borders.

3. Now, create three defined names.

    a. The input range for the spinner control is easy. Place the cursor in cell E1 and then type **Input** in the **Range** box on the toolbars to create the defined name "Input."

    b. The dynamic defined names for the chart data range and X-axis range are a bit more difficult because they must be defined so that their size may be altered by the value in **Input**, the input cell for the spinner control. These defined names must be defined by *formula*, not cell references.

        i. In the **New Names** dialog box, type in **ARBalance** in the **Names**. In the **Refers to** box, enter the following formula and click **OK**.

        =OFFSET(B3,0,0,Input,1)

        ii. Create another defined name for **Months** that refers to the following formula.

        =OFFSET(A3,0,0,Input,1)

4. Add and format the spinner form control. Locate the spinner just to the right of cell E1. Format the spinner with the values shown in **Figure 23**.

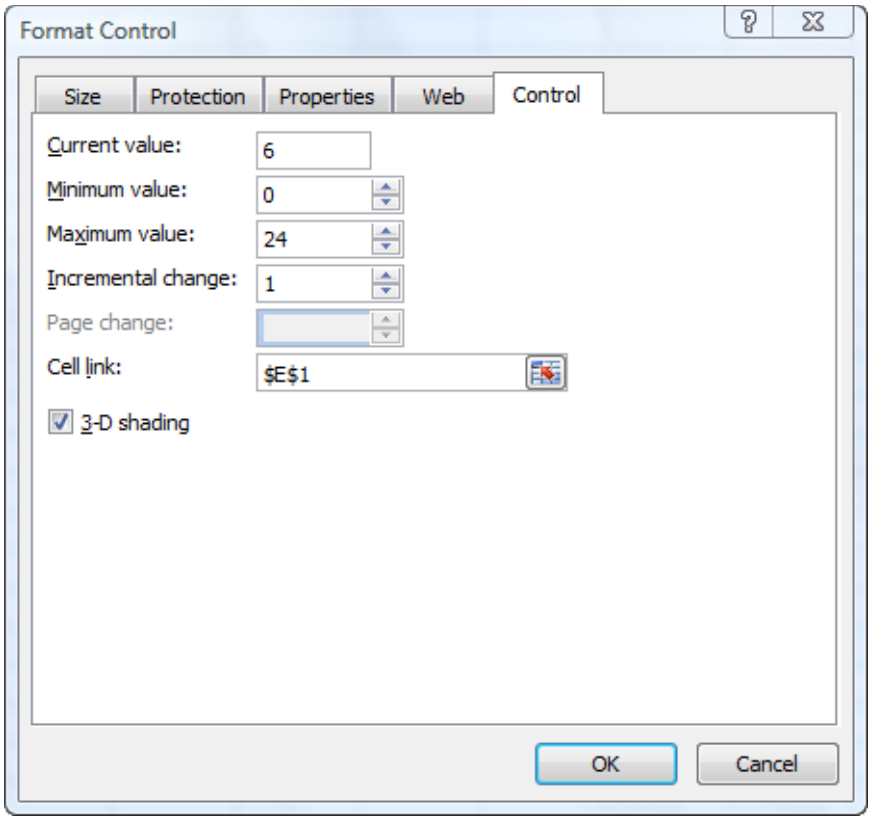


Figure 23 - Formatting the Spinner Form Control

5. Create a new column chart in Excel. Add **ARBalance** as the range for the data series and **Months** as the range for the X or Horizontal axis, keeping in mind that the workbook name must be entered as part of the dynamic defined name.

6. Enter **Accounts Receivable Balance** as the **Chart Title**.

Finally, format, resize, and reposition the chart to complete the task of creating an interactive chart.

Building Mixed Charts

The next example uses a combination line and area chart on two axes to display quarterly sales dollars and gross margin percentage. Position the cursor in the data and press **ALT + F1** to create the initial chart. Select the **Chart Tools, Design** tab and choose **Change Chart Type**. Select a line chart – **Line with Markers--** and click **OK**.

Immediately, you can see that the gross Margin Rate is hugging the X-axis because of the scale difference with sales dollars. The gross Margin Rate needs to be put on a Y-axis of its own. Click on one of the Margin Rate markers to activate the data series and then right-click and choose **Format Data Series**. Select **Series Options** in the Navigation Pane on the left and then click **Secondary Axis** in the Series Options pane on the right. Click **Close**. The new axis formatted as percentages appears on the right.

For better impact, sales dollars should to be plotted as an area chart. Click on one of the Sales markers. From the **Chart Tools, Design** tab, choose **Change Chart Type**. Select a simple **Area** chart and click **OK**. Immediately, the sales distribution fills solid to the X-axis, but the distribution does not extend to the Y-axes on the left and right. Click in the horizontal (X-axis) area to activate the axis. A gray box will appear around the axis area. Then, right-click and choose **Format Axis**. In the Navigation Pane, choose **Axis Options**. In the pane on the right, select Position Axis **On tick marks** and click **Close**. The partially completed chart is shown in **Figure 24**.

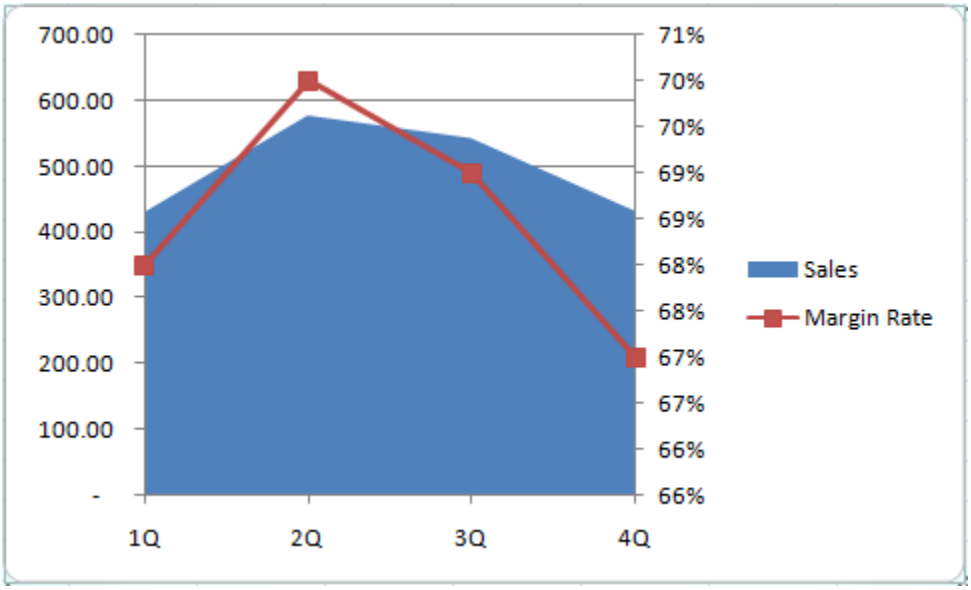


Figure 24 - Partially Completed Line and Area Chart on Two Axes

Now, choose a combination of chart layouts, chart styles, and themes to add the visual effects necessary to communicate your message effectively. When complete, the chart might resemble the one in **Figure 25**.

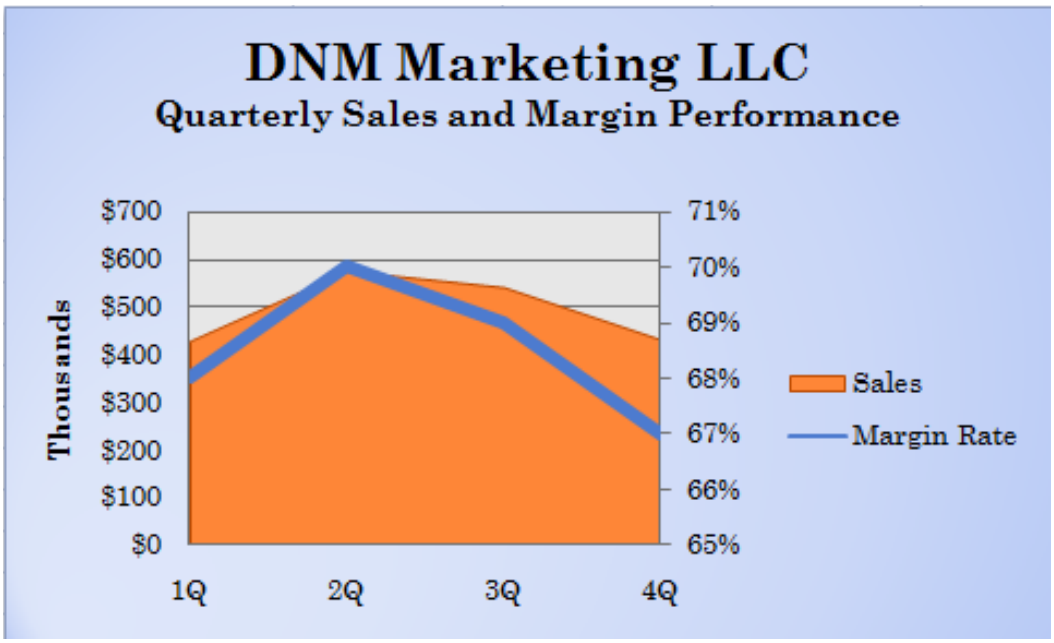


Figure 25 - Combination Line and Area Chart on Two Axes

Adding Dynamic Text Labels to Charts

While the concept of adding a text box to a chart to enhance a reader's understanding of the chart sounds appealing, this could prove to be problematic from a practical standpoint because of the constantly changing nature of the data. What users really need is the ability to create text boxes that change based on changes in the underlying data. In other words, we need *dynamic* text boxes that provide analytical insight based on predefined criteria. Fortunately, creating dynamic text boxes in Excel charts is rather easy, as described below.

1. Create a chart based on the data in columns B and C below; a simple column chart similar to the one shown in **Figure 26** will suffice.

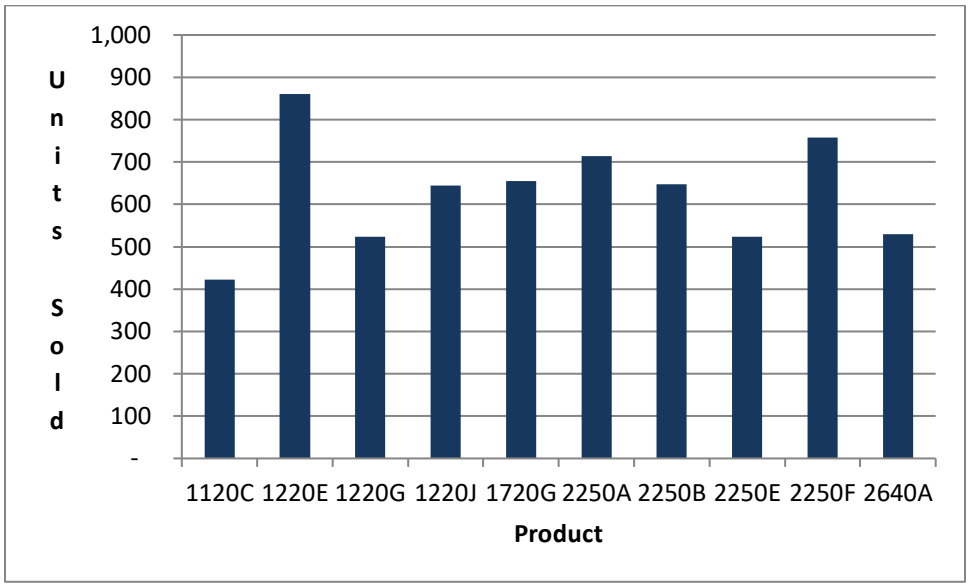


Figure 26 - Column Chart Displaying Sales Data by Product

2. Next, create appropriate text strings providing the desired analytical messages. Excel's TEXT( ), CONCATENATE( ), DOLLAR( ), and & functions are catalysts for such text strings. For example, consider the data pictured in **Figure 27**.

	A	B	C
1	Rank	Item	Units Sold
2	10	1120C	422
3	1	1220E	861
4	9	1220G	523
5	6	1220J	645
6	4	1720G	655
7	3	2250A	714
8	5	2250B	648
9	8	2250E	524
10	2	2250F	758
11	7	2640A	529
12			
13		Average	628

Figure 27 - Data Used to Create Dynamic Text Boxes

- In cell A15, a formula was entered to create a text string displaying the average of all sales for the period; that formula, which contains a TEXT( ) function, is shown in **Figure 28**.

```
="Average sales for the period was "&TEXT(C13,"#")&" units."
```

Figure 28 - Formula for Displaying Average Sales

- In cell A16, a formula has been entered to create a text string displaying the best selling item for the period; that formula, which uses two VLOOKUP( ) functions, is shown in **Figure 29**.

```
="The best selling item for the period was "&VLOOKUP(1,data,2,FALSE)&
" with total sales of "&VLOOKUP(1,data,3,FALSE)&"."
```

Figure 29 - Formula for Displaying Best Selling Item

- In cell A17, a formula has been entered to create a text string displaying the slowest selling item for the period; like the formula above, this formula also uses two VLOOKUP( ) functions and is shown in **Figure 30**.

```
="The slowest selling item for the period was "&VLOOKUP(10,data,2,FALSE)
&" with total sales of "&VLOOKUP(10,data,3,FALSE)&"."
```

Figure 30 - Formula for Displaying Slowest Selling Item

3. In the chart created in Step 1, insert a blank text box. With the text box selected, click in the formula bar and type the equals sign (=). Then, click in cell A15 so that the following formula is entered in the formula bar.

```
=Sheet1!$A$15
```

Figure 31 - Formula for Entering Dynamic Text into Text Boxes

Note that you must enter the formula directly into the formula bar and not into the text box. Also note that you must build the formula by clicking on the appropriate cells as described above; if you type the formula into the formula bar, it will not work correctly. Repeat this process for the other two formulas created above and align the text boxes as desired so that the chart resembles the one shown in **Figure 32**.

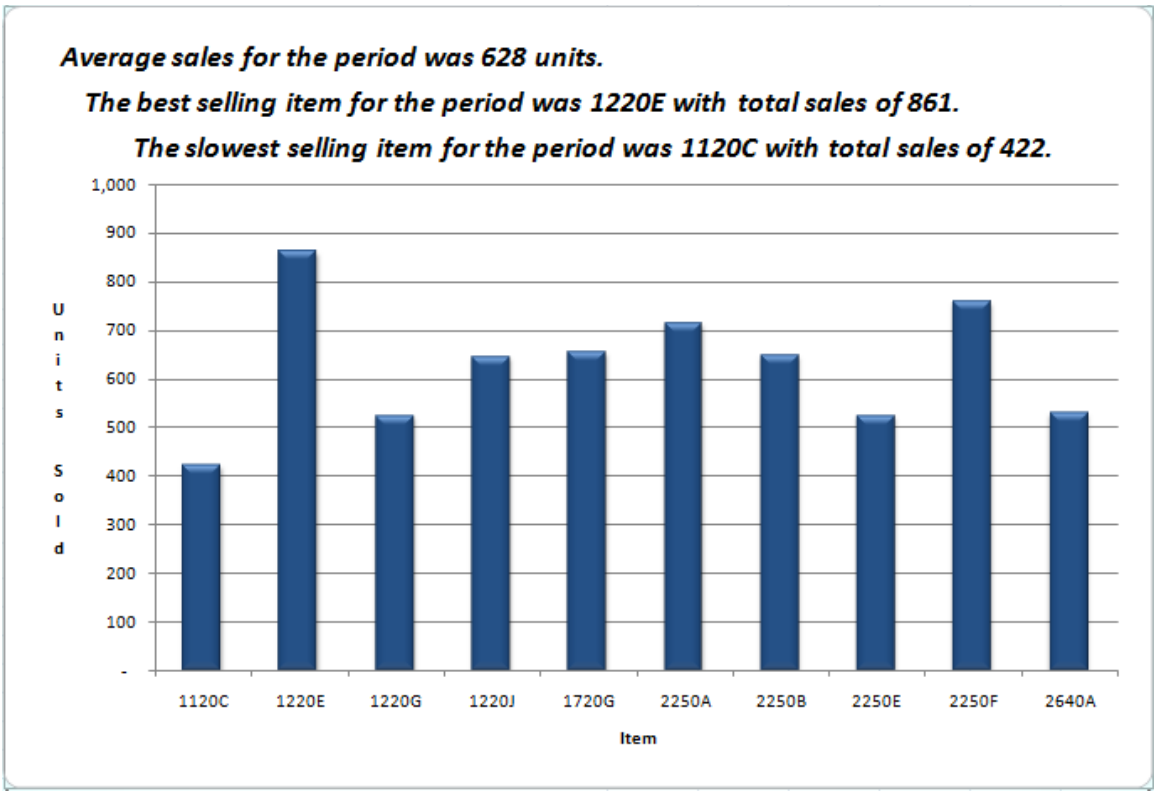


Figure 32 - Chart with Dynamic Text Boxes

Applying Conditional Formatting on Charts

Can we apply conditional formatting to charts? The short answer is "No, conditional formatting does not work on chart data." The longer answer is "With a little creativity, we can trick PowerPoint into applying what *appears* to be conditional formatting."

Consider the data presented in **Figure 33**; sales data is presented for each of thirteen salespersons. You have been charged with the responsibility of creating a chart containing this data and also having the top-performing salesperson's data as well as the bottom-performing salesperson's data formatted differently than the rest of the data on the chart.

	A	B
1		1st Qtr Sales
2	Washington	200000
3	Adams	175000
4	Jefferson	250000
5	Madison	325000
6	Monroe	275000
7	Adams	190000
8	Jackson	180000
9	Van Buren	225000
10	Harrison	250000
11	Tyler	375000
12	Polk	425000
13	Taylor	400000
14	Fillmore	385000

Figure 33 - Raw Data for Conditional Formatting on a Chart

To accomplish this task, you will need to create three additional columns of data and plot those three columns of data – and not the original column of sales data – in a stacked column chart. The revised data should resemble that shown in **Figure 34**.

	A	B	C	D	E
1		1st Qtr Sales	Max	Min	Residual
2	Washington	200000	0	0	200000
3	Adams	175000	0	175000	0
4	Jefferson	250000	0	0	250000
5	Madison	325000	0	0	325000
6	Monroe	275000	0	0	275000
7	Adams	190000	0	0	190000
8	Jackson	180000	0	0	180000
9	Van Buren	225000	0	0	225000
10	Harrison	250000	0	0	250000
11	Tyler	375000	0	0	375000
12	Polk	425000	425000	0	0
13	Taylor	400000	0	0	400000
14	Fillmore	385000	0	0	385000

Figure 34 - Revised Data for Conditional Formatting on a Chart

In cell C2 (and the remainder of the cells in the range extending through cell C14), the formula shown below is used to identify the maximum value in the range and to populate that value into the appropriate cell in Column C.

=IF(B2=MAX(B$2:B$14),B2,0)

The formula populates all other cells in Column C with zero.

In cell D2 (and the remainder of the cells in the range extending through cell D14), the formula below was used to identify the minimum value in the range and to populate that value into the appropriate cell in Column D.

=IF(B2=MIN(B$2:B$14),B2,0)

The formula populates all other cells in Column D with zero.

Finally, in cell E2 (and the remainder of the cells extending through cell E14), the formula given below was used to enter all values other than minimum and maximum values.

=(B2-C2-D2)

The formula populates the cells in column E corresponding to the rows that contain minimum and maximum values with zero.

Once the data has been arranged as shown in Figure 34, a simple stacked column chart similar to the one shown in **Figure 35** can easily be created. This chart consists of three data series: one for column C, one for column D, and one for column E. Each of these series is formatted differently than the others; column C is formatted in blue, column D is formatted in red, and column E is formatted in light yellow. Notice, however, that the zero values are effectively hidden from the chart because they are, in fact, zero values; thus, the chart gives the impression of applying conditional formatting to maximum and minimum values in column B.

Figure 35 - Chart with Conditional Formatting Applied

Analyzing Data with Charts and Graphs

Among the benefits associated with charting are the analytics and insights that are often provided by charts. In addition to built-in analytic tools, you can analyze data in Excel charts by using, among other techniques, histograms, Sparklines, and custom charts, as discussed in this chapter.

Learning Objectives

Upon completing this chapter, participants should be able to:

- Create and use Trendlines to analyze data plotted in a chart;
- Build histograms using Excel's Data Analysis tools;
- Work with Sparklines, a visualization tool added to Excel 2010;
- Create Paired Column charts to assist with analyzing data;
- Compare data between upper and lower boundaries using charts; and
- Construct PivotCharts, perhaps the most powerful charting tool for analyzing data.

Using Trendlines for Analyzing Data

Excel offers four chart elements for analysis – trendlines, error bars, drop lines, and up/down bars. These elements are briefly defined as follows.

- **Trendlines** – Statistical trends fitted to data using least squares regression
- **Error bars** – Used to show the standard error of an estimate
- **Drop lines** – Vertical lines from data points to the x-axis so that users can ascertain the exact location of the data point on the x-axis
- **Up/down bars** – Boxes drawn between two data series at each X-axis interval on a line chart to highlight differences

Of these four tools, trendlines are perhaps most common. Suppose that Jill Harris, the CFO of GTM manufacturing, is trying to determine whether sales revenues for 2012 are reasonable in relation to sales revenues from prior years. **Figure 36** presents summarized sales data for the company. Jill believes a chart with a trend line added will be the best way for her to confirm that sales are reasonable and in line with company trends. She also likes the visual impact that the chart will have in tomorrow's Board of Directors meeting during which she will be called upon to brief the Board on GTM's financial performance.

	A	B
1	Year	Sales (millions)
2	2003	15.00
3	2004	18.60
4	2005	28.20
5	2006	26.64
6	2007	28.08
7	2008	30.48
8	2009	30.60
9	2010	33.00
10	2011	37.32
11	2012	38.88

Figure 36 – Summarized Sales Data

To create the chart with a trend line, Jill begins by clicking in the data and choosing **Line** chart from the **Insert** tab of the Ribbon, followed by **2-D Line chart**. She edits the data so that **Year** becomes the horizontal axis, and she deletes the **Legend** to create the chart shown in **Figure 37**.

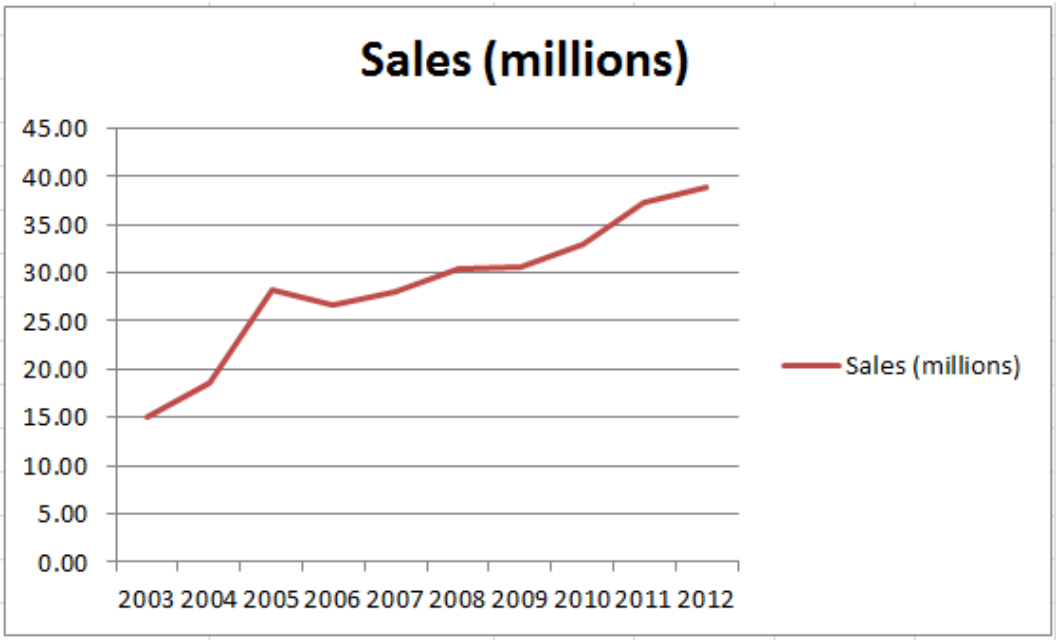


Figure 37 - Initial Draft of Chart for GTM Manufacturing Sales Performance

Next, Jill adds the trendline by right-clicking on the Sales line on the chart and choosing **Add Trendline…** from the pop-up menu. She accepts the default of a linear trendline and clicks **OK** to produce the chart shown in **Figure 38**.

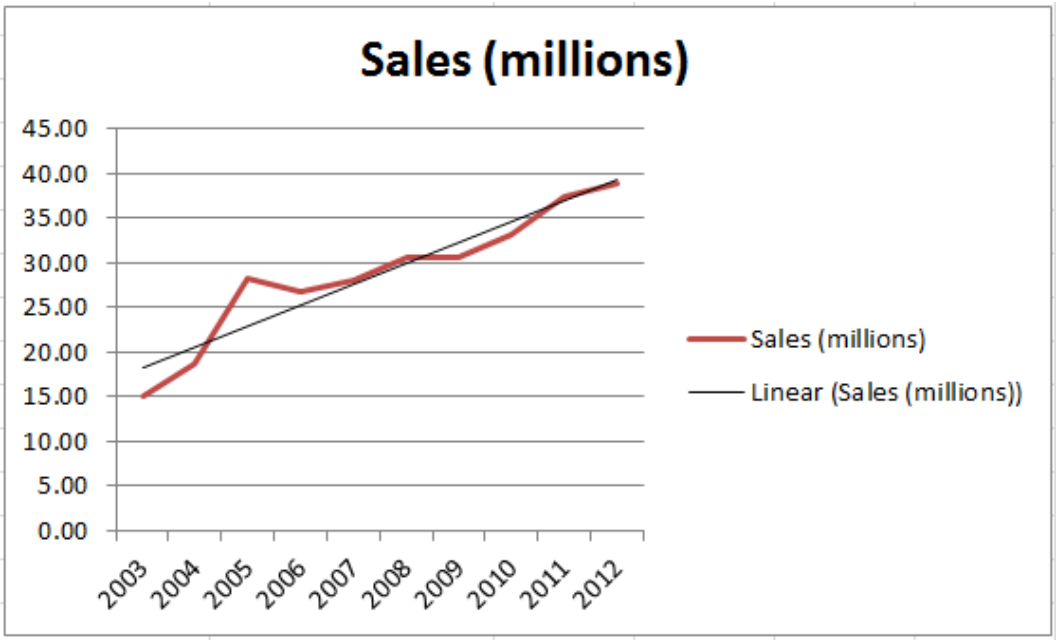


Figure 38 - Sales Chart with Trendline

Based on the presence of the trendline on this chart and its very close proximity to the line for actual Sales revenue, Jill is comfortable with the reasonableness of the amount of recorded

revenue for 2012. She changes some of the chart's formats so that the final product appears as shown in **Figure 39**.

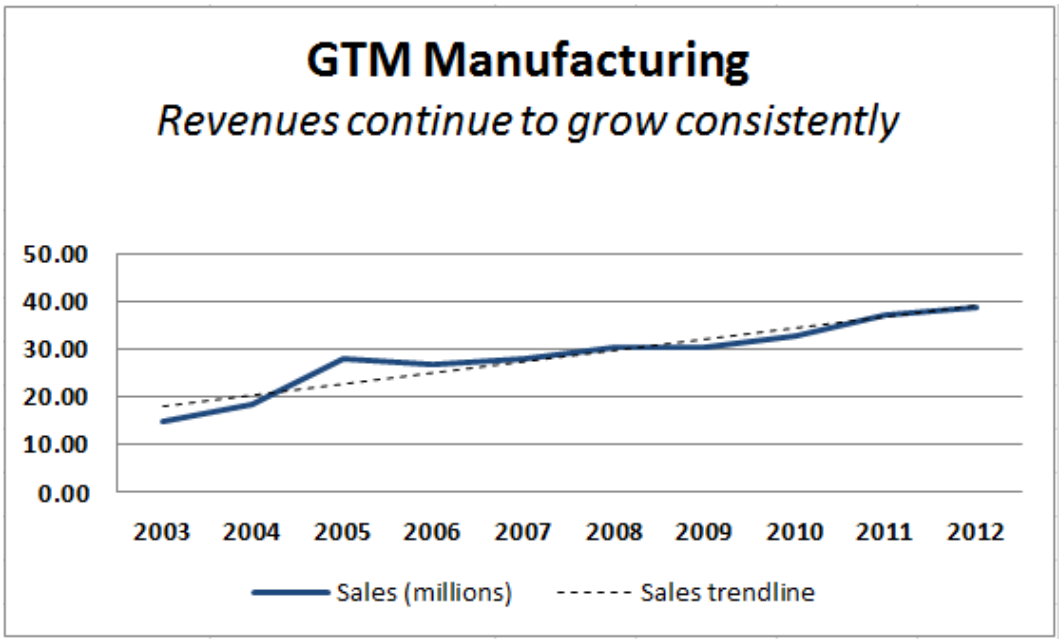


Figure 39 - Completed Sales Chart with Trendline

Creating Histograms

According to Merriam-Webster, a histogram is:

> *a representation of a frequency distribution by means of rectangles whose widths represent class intervals and whose areas are proportional to the corresponding frequencies.*

Stated perhaps a bit more succinctly, a histogram is a column chart where the height of the columns represent the number of instances that a particular value or range of values occur. From the standpoint of accounting and financial professionals, histograms can be useful, for example, when attempting to analyze a large number of transactions such as cash disbursements to determine the most common disbursement amounts when conducting risk analysis in an internal or external audit. For instance, suppose you imported a list of cash disbursements into an Excel worksheet, similar to the extract shown in **Figure 40**.

	A	B	C	D
1	Invoice Number	Check Amount	Vendor ID	Check Date
2	1001	41.90	1	12/15/2012
3	1010	14,872.30	54	12/5/2012
4	1012	10,259.10	66	12/7/2012
5	1014	29.00	8	12/8/2012
6	1023	890.61	73	12/9/2012
7	1025	8,819.55	64	12/11/2012
8	1030	890.55	52	12/17/2012
9	1032	12,323.10	9	12/16/2012
10	1037	49.50	73	12/17/2012
11	1041	764.85	1	12/15/2012

Figure 40 - Extraction of Cash Disbursements Worksheet

You would like to summarize the approximately 2,200 checks into four different "buckets" – 1) $0 to $100, 2) $100.01 to $500.00, 3) $500.01 to $1,000.00, and 4) over $1,000.00 – and upon doing so, express the results graphically. This is the type of analysis for which a histogram is well suited.

To build a histogram, begin by enter your "bucket" ranges – formally known in Excel as "bin ranges" – anywhere on the worksheet as shown in **Figure 41**.

	F	G
1		
2	Categories	
3	-	
4	100.00	
5	500.00	
6	1,000.00	

Figure 41 - Adding Bin Ranges to Excel Worksheet

Next, on the **Data** tab of the Ribbon, choose **Data Analysis** to open the **Analysis Toolpak**. Choose **Histogram** to open the **Histogram** dialog box. In the dialog box, enter the **Input Range** (the data you want to analyze), the **Bin Range**, and specify your **Output options**, specifically including **Chart Output** as shown in **Figure 42**.

If you do not see **Data Analysis** on the **Data** tab of the Ribbon, it is likely because the **Analysis Toolpak** has not been activated. You can activate the Analysis Toolpak by visiting the **Add-ins** section of **Excel Options**.

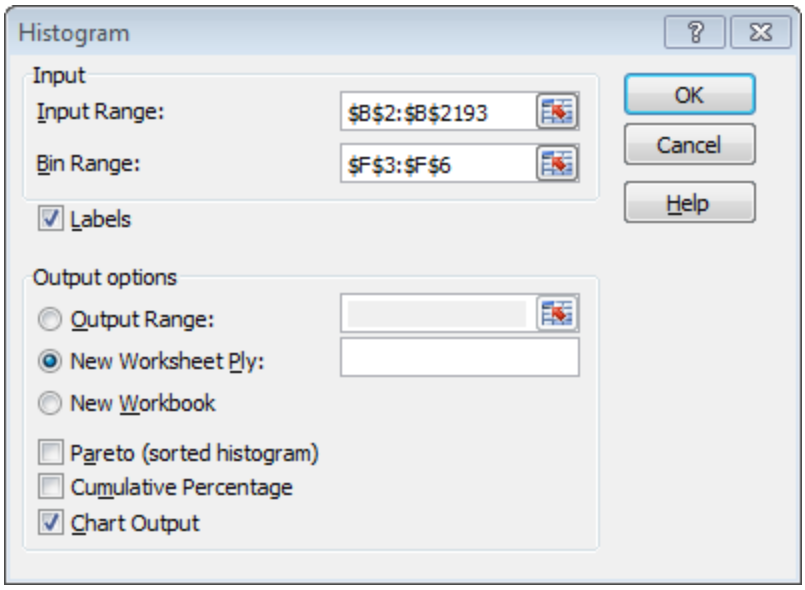


Figure 42 - Histogram Dialog Box

Upon clicking **OK**, Excel creates the histogram for you, an example of which is shown in **Figure 43**.

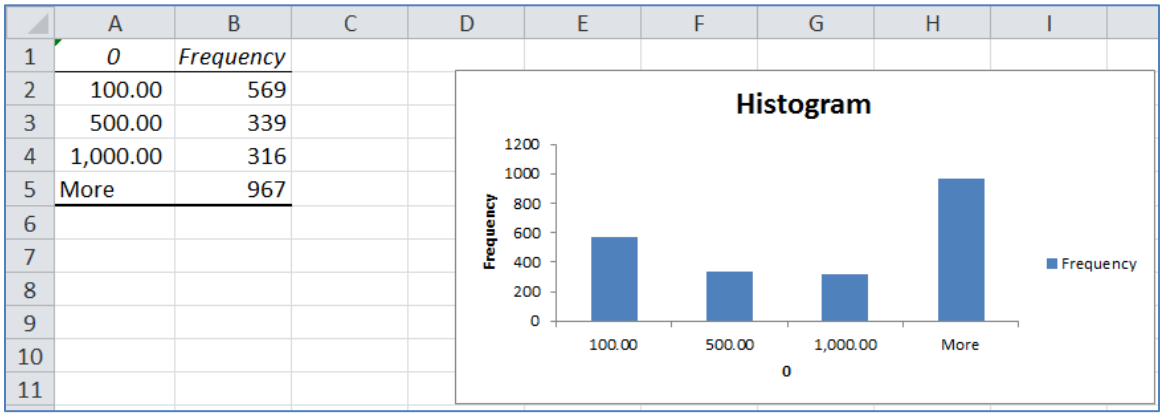


Figure 43 - Completed Histogram

Of note, the chart component of the histogram is like any other chart; that is, you can edit any element of the histogram to adapt it to your specific needs. For instance, **Figure 44** contains a modified version of the basic histogram chart shown in Figure 43. The chart in Figure 44 has been modified to provide a bit more "curb appeal" than its predecessor.

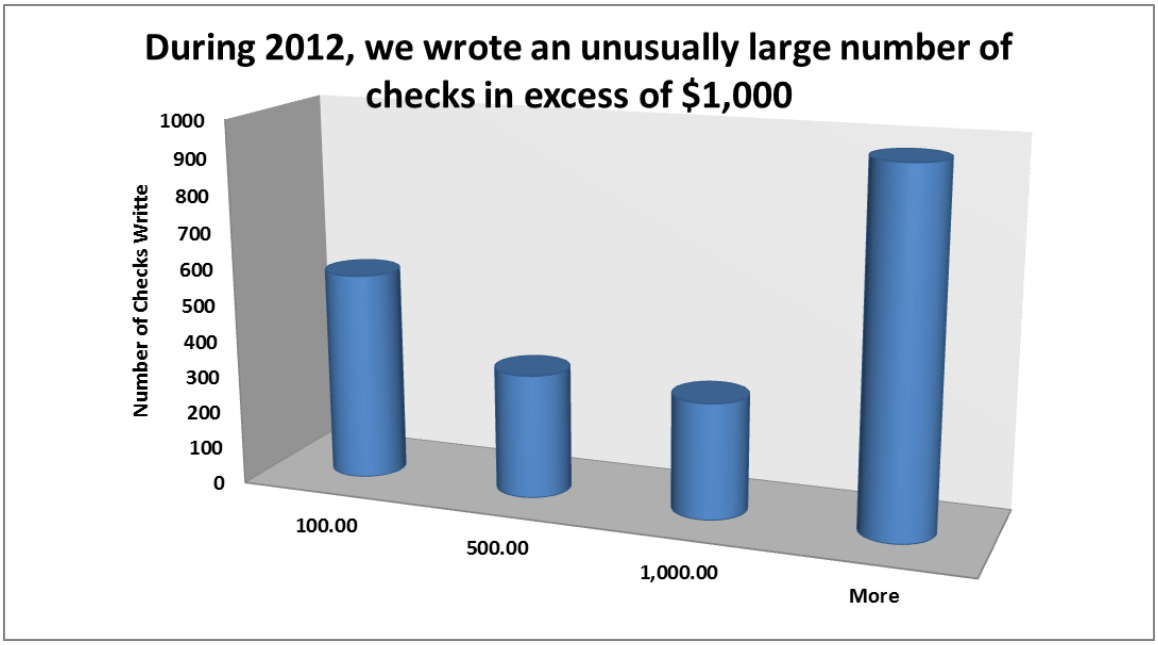


Figure 44 - Edited Histogram

Working with Sparklines

Excel 2010 contains a new type of chart known as a **Sparkline**. Sparkline charts are simple one-cell charts used to provide quick visual analysis of a data set. Typically, Sparklines forego most of the formatting characteristics otherwise applied to traditional charts; for instance, titles, axis labels, and legends are normally not present in Sparklines.

Creating Sparklines is an easy process, even for those who otherwise have difficulty creating polished and professional-quality Excel charts. Simply highlight the data from which the Sparkline is to be created, choose **Insert** from the Ribbon, and select whether the Sparkline should be in the **Line**, **Column**, or **Win/Loss** format. For example, **Figure 45** demonstrates creating the Line form Sparkline shown in cell H4 from the data residing in cells B4 through G4.

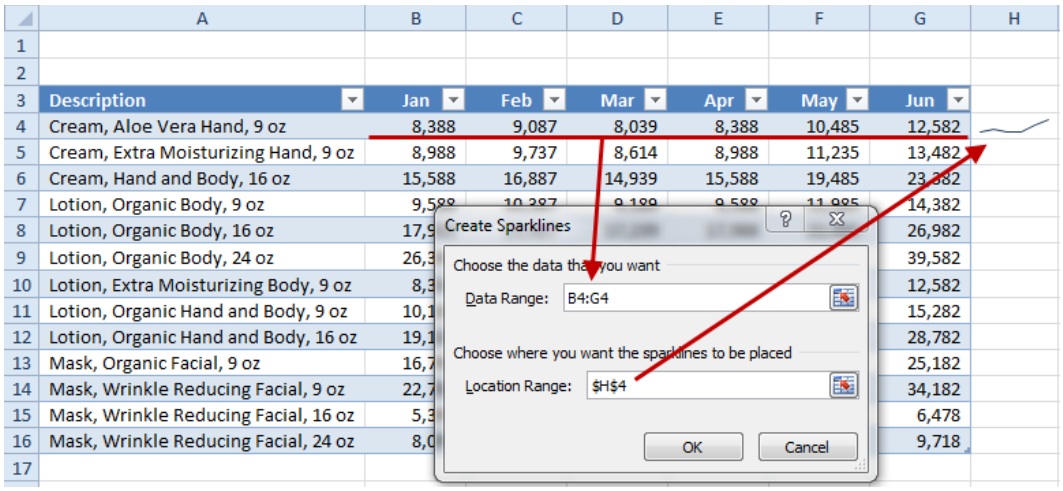


Figure 45 - Creating a Sparkline Chart in Excel 2010

Users can create multiple Sparklines simultaneously. To do so, select multiple data ranges at the same time and multiple location ranges in the **Create Sparklines** dialog box as shown in **Figure 46**.

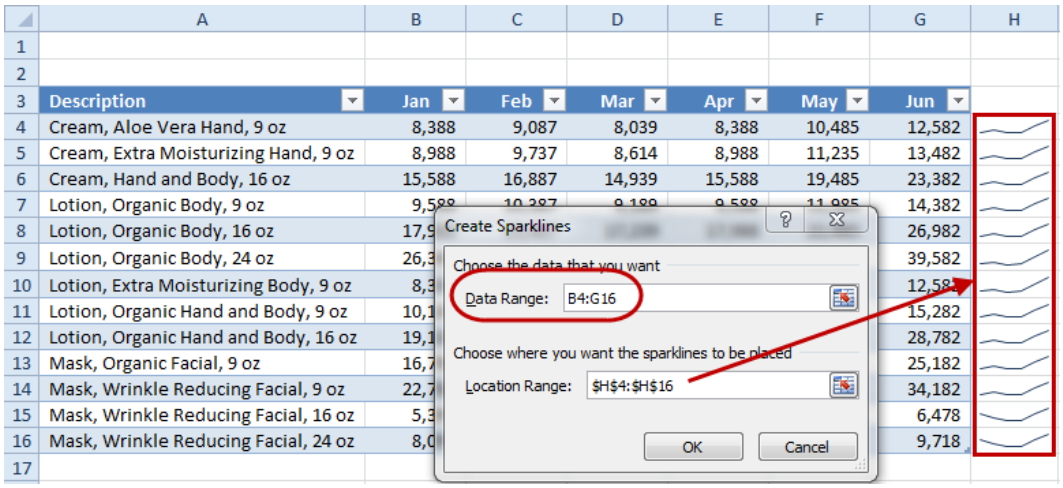


Figure 46 - Creating Multiple Sparklines Simultaneously

Once created, clicking on a Sparkline activates the **Sparkline Tools** contextual tab on the Ribbon pictured in **Figure 47**. From this tab, users can edit and format a Sparkline or series of Sparklines. Examples of functionality accessible from this tab of the Ribbon include:

- The ability to change the input data ranges for a Sparkline;
- The ability to change the type of Sparkline;
- Whether the Sparkline highlights specific data points – high, low, negative, first, last, and/or all;
- The color of the Sparkline; and
- Axis options.

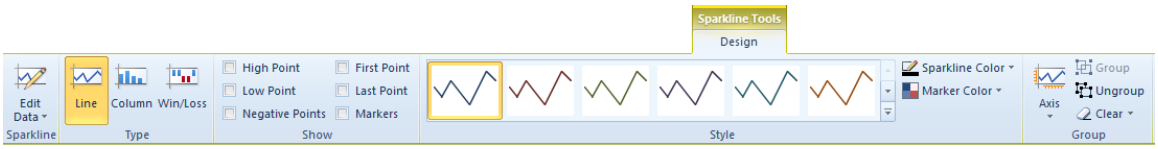


Figure 47 - Sparkline Tools Contextual Tab

When creating dashboards, Sparklines offer an opportunity to incorporate small, unobtrusive objects in an Excel workbook that provide visual enhancements to traditional column and row-oriented data.

Analyzing Data with Paired Column Charts

Paired column charts mix clustered column charts with stacked column charts to allow an information consumer to see not only the relative mix of values within a particular product division, for instance, but also a comparison of one division to another. **Figure 48** provides the data we would like to use in our paired column chart. With this chart, we would like to create a stacked column for the Retail – Brick and Mortar and Retail – Internet Sales data series and compare this stacked column to a traditional column for the Wholesale division.

	A	B	C	D	E
1		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2	Retail - Brick and Mortar	47,368,952	43,478,641	37,148,717	51,945,463
3	Retail - Internet Sales	21,564,586	24,656,464	29,444,647	33,456,486
4	Wholesale	49,131,417	45,616,633	52,946,647	49,466,467

Figure 48 – Initial Data for Paired Column Chart

To create the paired column chart, perform the following nine steps.

1. Insert two placeholder data series into the data, including temporary data points that will later be changed to zeroes. Upon doing so, the revised data set should appear similar to that shown in **Figure 49**.

	A	B	C	D	E
1		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2	Retail - Brick and Mortar	47,368,952	43,478,641	37,148,717	51,945,463
3	Retail - Internet Sales	21,564,586	24,656,464	29,444,647	33,456,486
4	Holder 1	10,000,000	10,000,000	10,000,000	10,000,000
5	Holder 2	10,000,000	10,000,000	10,000,000	10,000,000
6	Wholesale	49,131,417	45,616,633	52,946,647	49,466,467

Figure 49 - Revised Data for Paired Column Chart

2. Create a stacked column chart for the data shown in Figure 49. If necessary, select **Switch Row/Column** option on the **Design** tab of the Ribbon so that the quarters are on the horizontal axis.

3. Right-click on the **Wholesale** data series, choose **Format Data Series**, and select the **Plot Series On Secondary Axis** option. Additionally, move both the **Holder 1** and **Holder 2** data series to the secondary axis, though you may have to do so by selecting them in the **Current Selection** group on the **Chart Tools Layout** contextual tab of the Ribbon.

4. Right-click on the **Holder 2** data series, choose **Change Series Chart Type**, and select a clustered column chart.

5. Return to the data grid and set the values for the **Holder 1** and **Holder 2** data series to zeroes.

6. Click on the secondary axis and press **Delete**.

7. Right-click on the **Wholesale** data series, choose **Format Data Series**, and set the **Gap Width** option to **0%**.

8. Click the **Legend**; then execute a single click on **Holder 1** to select just that entry. Upon doing so, press **Delete**. Repeat this process for the **Holder 2** entry in the Legend.

9. Lastly, modify the formatting of individual data elements on the chart to suit your particular needs.

Upon completing the nine steps outlined above, your completed chart should resemble that shown in **Figure 50**.

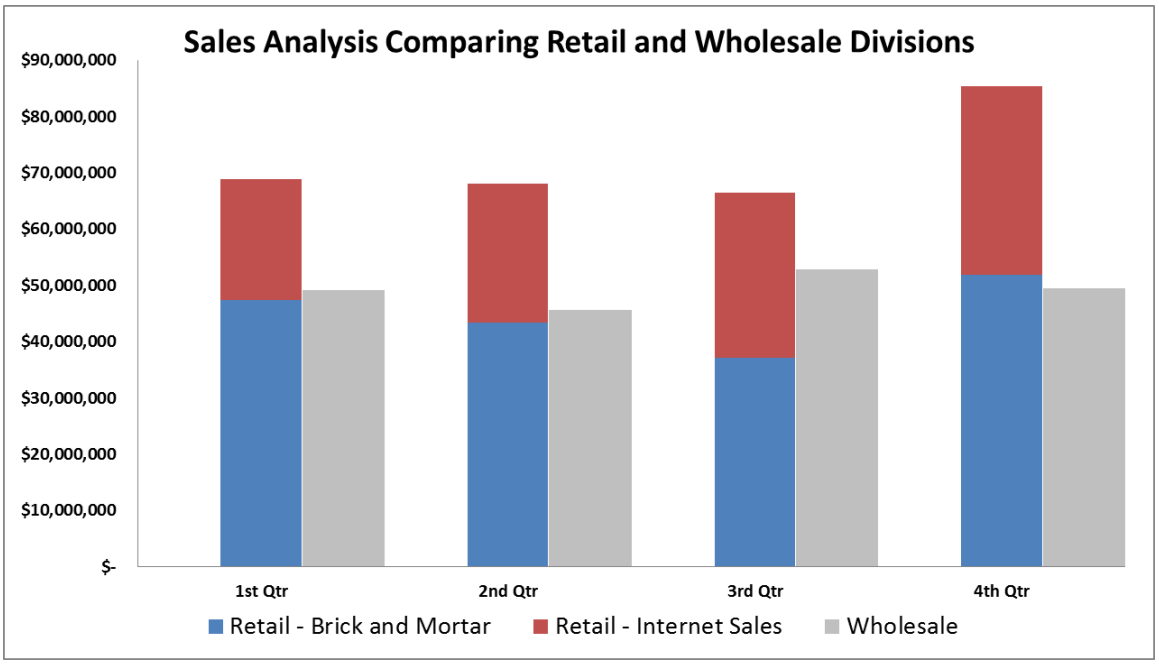


Figure 50 - Completed Paired Column Chart

Comparing Data between Upper and Lower Limits

With a little creativity, we can use charts to help identify situations when data falls both inside and outside of established upper and lower boundaries. Suppose, for example, that you manage inventory for a small business, and you have been charged with keeping the inventory investment within the boundaries shown in **Figure 51** during the first six months of the year.

	A	B	C	D	E	F	G
1							
2		January	February	March	April	May	June
3	Upper Limit	95,000	95,000	95,000	100,000	105,000	105,000
4	Lower Limit	75,000	75,000	75,000	80,000	85,000	85,000

Figure 51 - Established Targets for Inventory Investment

You could build a chart similar to the one shown in **Figure 52** to compare the actual investment to the targeted investment.

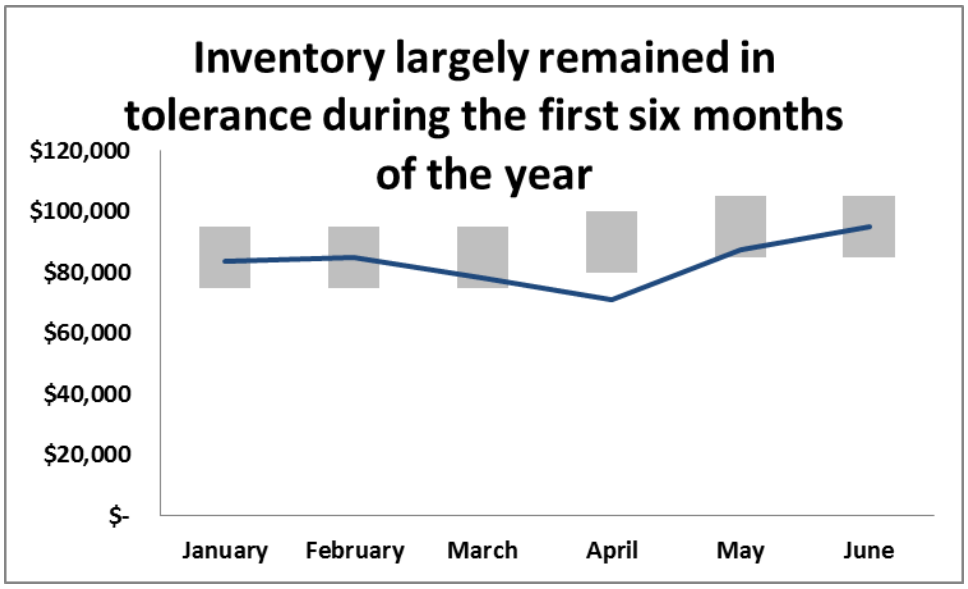


Figure 52 - Chart Comparing Inventory Investment to Upper and Lower Limits

To construct the chart shown in Figure 52, begin by constructing a worksheet similar to that shown in **Figure 53**. Notice in Row 11 of the lower half of the worksheet, a formula exists that subtracts the original lower limit from the original upper limit.

	A	B	C	D	E	F	G
1							
2		January	February	March	April	May	June
3	Upper Limit	95,000	95,000	95,000	100,000	105,000	105,000
4	Lower Limit	75,000	75,0			85,000	85,000
5							
6							
7							
8		January	Februa	March	April	May	June
9	Actual	83,500	85,000	78,000	71,000	87,500	95,000
10	Lower Limit	75,000	75,000	75,000	80,000	85,000	85,000
11	Upper Limit	=B3-B4	20,000	20,000	20,000	20,000	20,000
12							

This formula subtracts the established Lower Limit from the established Upper Limit

Figure 53 - Worksheet Used to Generate Actual versus Upper and Lower Limits Chart

Upon constructing the worksheet shown above, create a stacked column chart that plots the Actual (row 9), Lower Limit (row 10), and Upper Limit (row 11) data for each of the six months. Your initial chart should look similar to that shown in **Figure 54**.

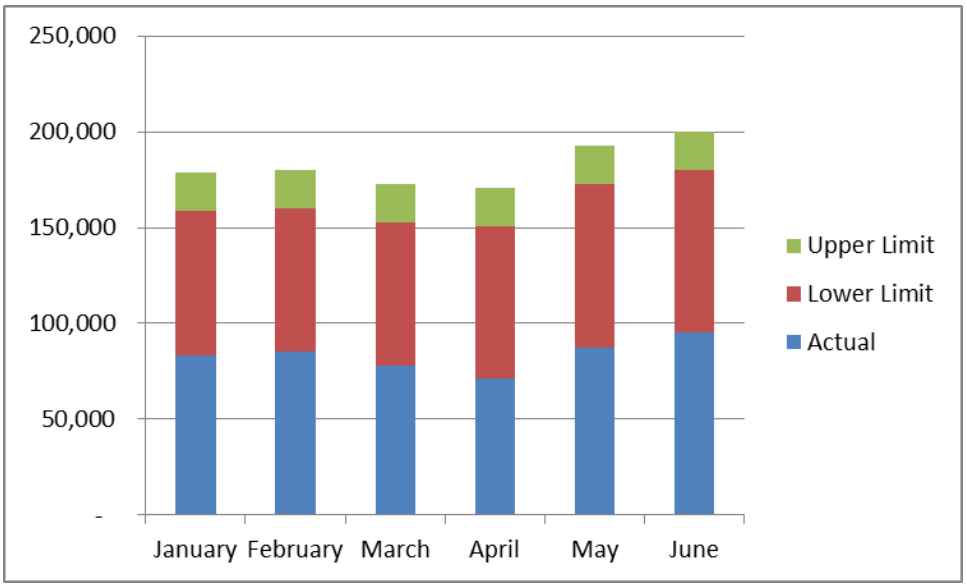


Figure 54 - Initial Chart Comparing Actual versus Upper and Lower Limits

On the initial chart, perform the following six steps to complete the process of creating the chart pictured in Figure 52.

1. Right-click the Actuals data series, select **Change Series Chart Type**, and change the chart type to a line chart. Click **OK**.

2. Right-click the Actuals data series again, choose **Format Data Series**, and choose **Plot Series On Secondary Axis**. Click **Close**.

3. Click on the newly created secondary axis on the right side of the chart and press **Delete**.

4. Right-click on the Lower Limit data series, choose **Format Data Series**, **Fill**, and select the **No Fill** option. Click **Close**.

5. Click on the Legend and press **Delete**.

6. Add any additional desired formatting to the chart to complete the process.

An alternative to this approach is to change the target ranges so that they are one continuous band of color across the chart instead of individual ranges for each month. To do this, right-click on any of the individual ranges, choose **Format Data Series**, and set the **Gap Width** option to **0%**.

Introducing PivotCharts

A PivotChart is a graphical representation of a PivotTable with all of the analytical power of the PivotTable. PivotCharts link inextricably to PivotTables so that changing the data or organization of one automatically changes the other. Because PivotCharts are just extensions of PivotTables, they are ideal tools for accountants and other business professionals to summarize large quantities of data and to present those summaries in an easy-to-understand graphical format.

Users create PivotCharts in numerous ways; we will create our first PivotChart from a PivotTable. Assuming you already have access to a PivotTable, start by clicking in the PivotTable. Then, from the **PivotTable Tools** contextual tab **Options**, select **PivotChart**. Choose the chart type – columns, line, bar, etc. – and click **OK** to create a PivotChart similar to the one shown in **Figure 55**.

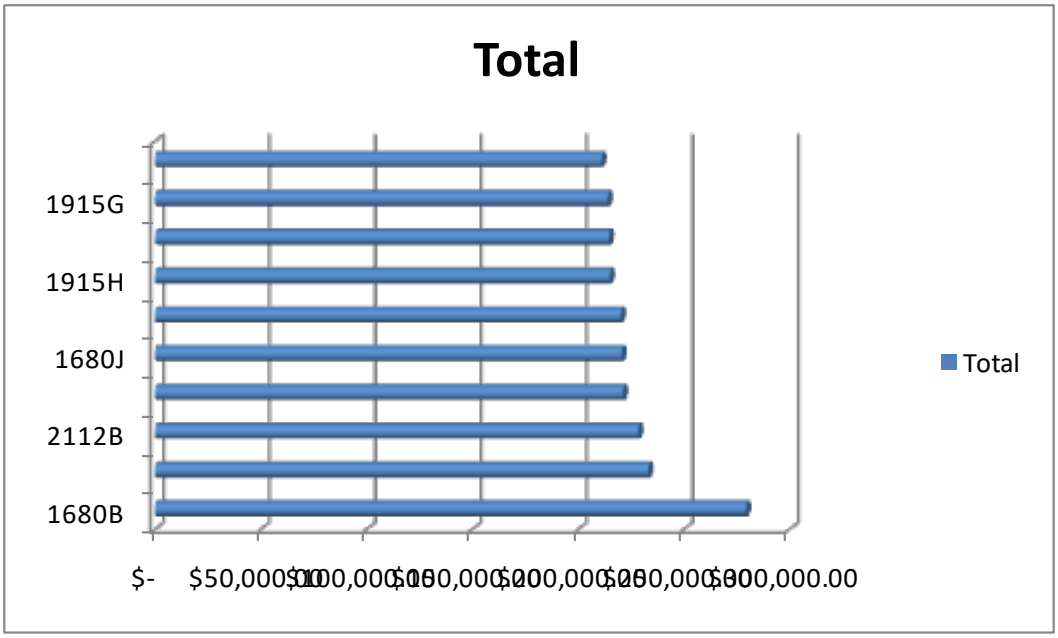


Figure 55 - Initial PivotChart

Having created the initial PivotChart, a little cleanup is in order. Using some of the techniques discussed earlier in this course, we can transform the PivotChart into that shown in **Figure 56**.

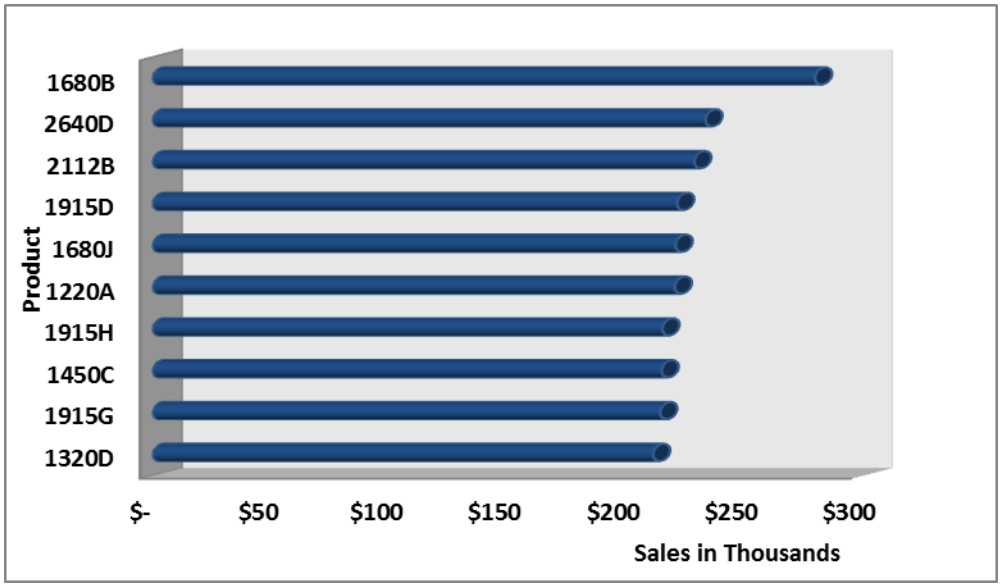


Figure 56 - Completed PivotChart Example

In our second example of working with PivotCharts, John Ward needs to convert the data from his client's Excel-based cash disbursements journal into a dashboard format the client can understand a bit better than a traditional row-and-column financial statement. John has already built a PivotTable to summarize the data; **Figure 57** presents a copy of that PivotTable.

3	**Summary of Cash Disbursements**					
4		⊞Qtr1	⊞Qtr2	⊞Qtr3	⊞Qtr4	Grand Total
5						
6	Beverages	$ 14,620.76	$ 14,630.86	$ 16,476.61	$ 14,706.65	$ 60,434.88
7	Food	72,545.64	70,502.27	69,699.27	75,644.18	288,391.36
8	Insurance	1,281.99	1,281.99	1,521.07	1,640.61	5,725.66
9	Payroll Expense	75,715.47	83,907.75	90,288.01	97,520.26	347,431.49
10	Rent	7,200.00	7,200.00	7,200.00	7,200.00	28,800.00
11	Supplies	4,778.96	6,032.00	5,235.41	5,689.92	21,736.29
12	Utility Expense	5,130.76	7,217.52	7,949.89	5,207.34	25,505.51
13	**Grand Total**	**$181,273.58**	**$190,772.39**	**$198,370.26**	**$207,608.96**	**$778,025.19**

Figure 57 - Copy of PivotTable Used to Summarize Excel-based Cash Disbursements Journal

To create a PivotChart from the PivotTable, John follows the process below.

1. John positions the cursor in the PivotTable and selects **PivotChart** from the **PivotTable Tools, Options** contextual tab to open the **Insert Chart** dialog box as shown in **Figure 58**. In the dialog box, John chooses a Stacked Column chart with 3-D effects.

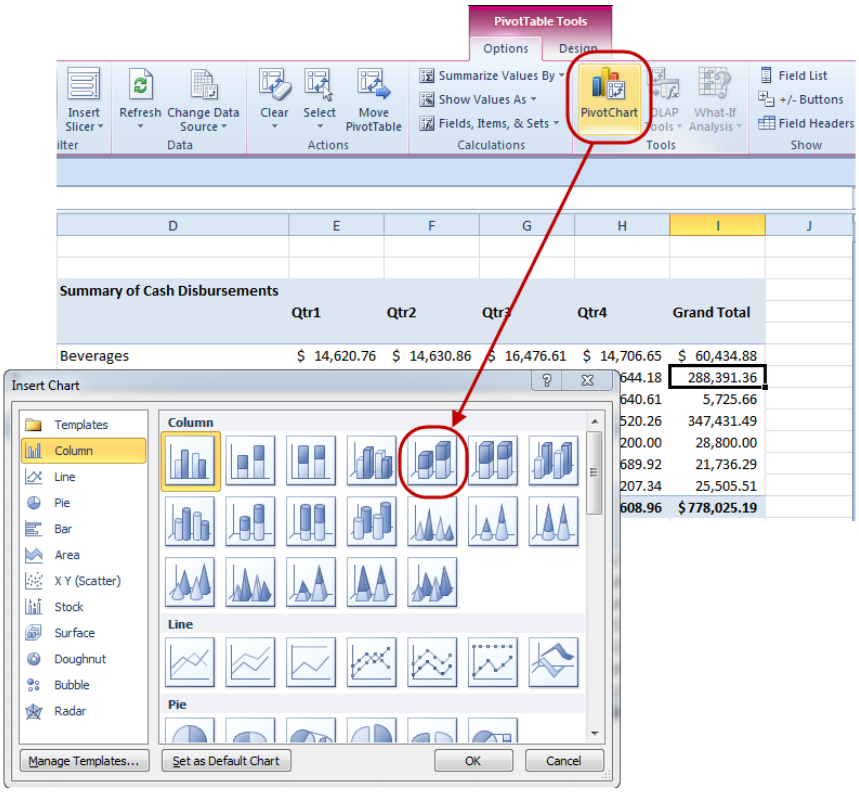


Figure 58 - Creating a PivotChart from a PivotTable

2. When John clicks **OK** in the **Insert Chart** dialog box, Excel creates the chart and displays the first draft of it on the same worksheet as the PivotTable. **Figure 59** shows that draft.

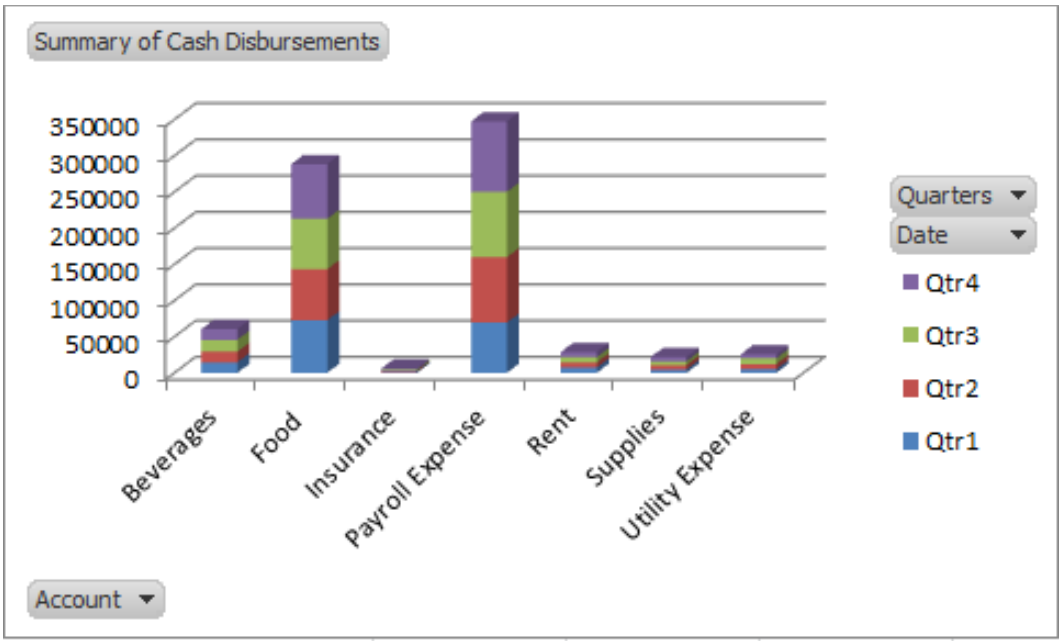


Figure 59 - First Draft of PivotChart

3. John is not satisfied with the draft. Principally, he wants to swap the position of the rows and columns – that is, he wants to summarize the data by quarter rather than by account on the horizontal axis. Fortunately, this is an easy customization, and John accomplishes it by clicking on the **Switch Row/Column** icon on the **PivotChart Tools**, **Design** contextual tab. Additionally, John adds some additional formats so that the final chart resembles the one shown in **Figure 60**.

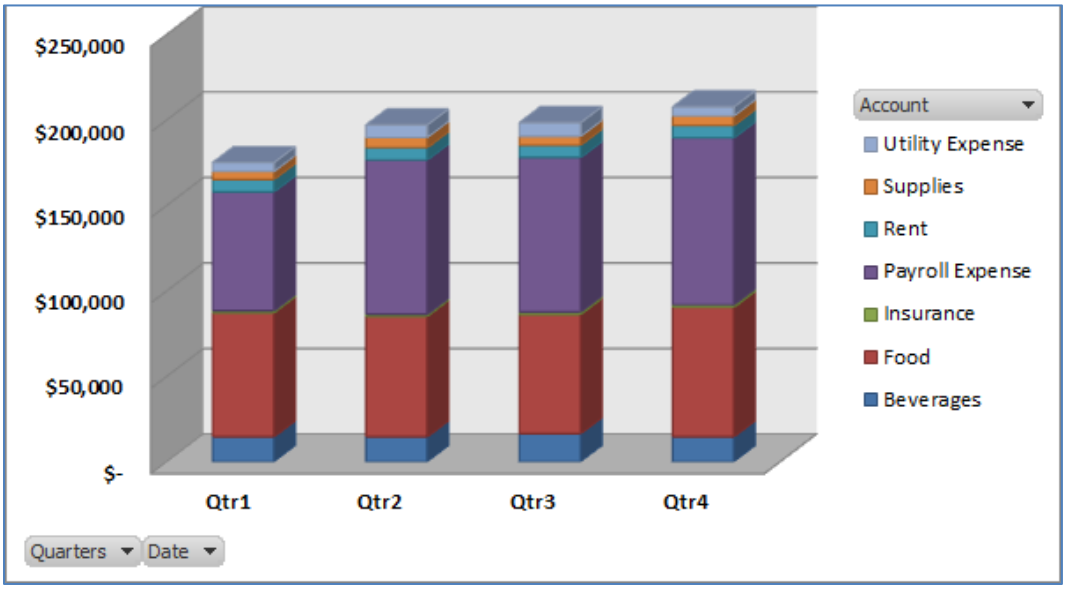


Figure 60 - Completed PivotChart Summarizing Cash Disbursements Journal

Now John has an easy-to-read supplement to the traditional financial statement he prepared for this client. In building this PivotChart, John noticed several interesting features of PivotCharts.

- A PivotChart inextricably links to its related PivotTable. If the PivotTable changes, so does the PivotChart; likewise, if the PivotChart changes, so does the PivotTable. This is advantageous because it ensures that the two objects always stay in sync.

- PivotCharts contain on-screen filter buttons. For instance, referring to the PivotChart shown in Figure 60, John could choose to filter the Accounts the PivotChart displays by clicking the drop-down arrow next to Account to open the filter pane as shown in **Figure 61**.

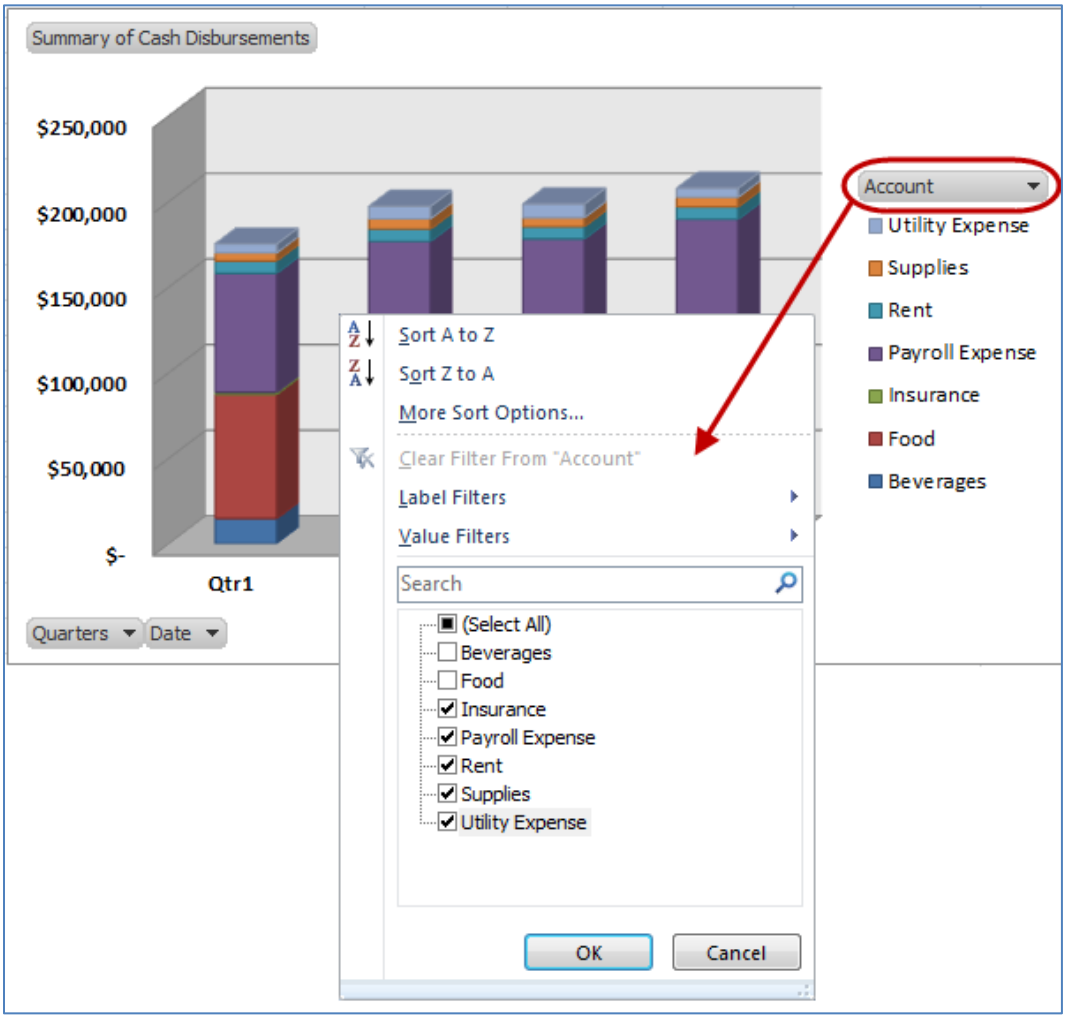


Figure 61 - Filtering a PivotChart in Excel 2010

Note that applying a filter to a PivotChart will change the related PivotTable as described above. Additionally, if John does not desire on-screen filtering capability, he can right-click on the button and choose the appropriate "hide" option from the pop-up menu.

- From a formatting perspective, a PivotChart is just like any other chart. In other words, all traditional formatting options are available. Thus, John can choose to format his chart using the same tools and options he would use if this were a "traditional" Excel chart.

PivotCharts are truly one of Excel's least known and least used tools, but one that offers tremendous power and flexibility to those who learn how to work with them.

Handling Special Charting Considerations

While Microsoft Office provides over seventy types of predefined charts, there may be occasions when the specific chart type you desire is not one of the "canned" charts available in Office. In these cases, you will need to build your custom chart by modifying a basic Office chart type. In this chapter, we present techniques for doing so.

Learning Objectives

Upon completing this chapter, participants should be able to:

- Create Thermometer charts from simple column charts;
- Build Gauge charts from pie charts and Tachometer charts from doughnut charts;
- Construct Bullet charts from column and line charts;
- Generate Waterfall charts from stacked column charts;
- Use macros to create drill-down charts; and
- Work with SmartArt to build objects such as Organizational Charts.

Thermometer Charts

Thermometer charts indicate progress made toward reaching a goal, such as progress toward sales goals or fund-raising goals. Although Microsoft Office does not directly support thermometer charts, they are easy to create as a variant of a common column chart.

To create a thermometer chart like the one shown in **Figure 62**, create a column chart based on a single data point. Here are some tips for successfully creating a thermometer chart.

1. Be sure that the data point has a blank row above and below. Otherwise, your Office application may attempt to plot additional points.

2. If the chart is to show relative percentages, modify the **Y-axis** so that the **Minimum** and **Maximum** values on the **Scale** tab are set to **0** and **1**, respectively. Adjust any other scaling option to meet your needs.

3. Format the **Data Series** and set the **Gap width** to **0** on the **Options** tab so that the column uses the entire width of the plot area.

4. Modify the **X-axis** to set **Tick Mark Labels** to **None** on the **Patterns** tab.

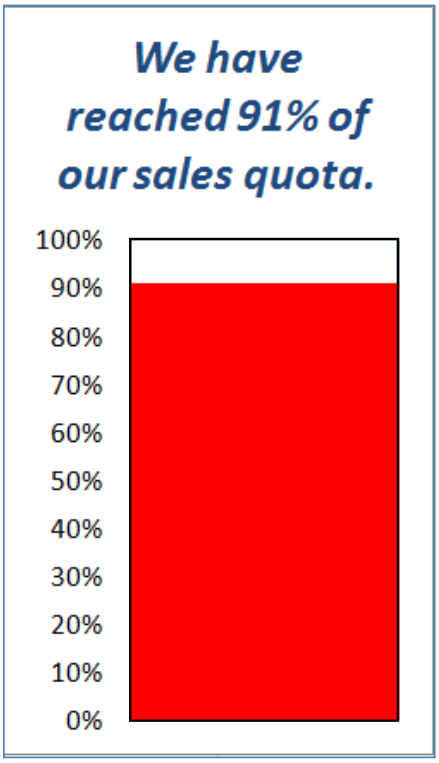


Figure 62 - Thermometer Chart

Upon completing the four steps outlined above, you should end up with a chart that resembles the one pictured in Figure 62.

Gauge and Tachometer Charts

Gauge Charts

Gauge charts are popular for showing one number as a percentage of a total and are used increasingly in digital dashboards. Gauge charts, shown in **Figure 63**, are not a standard chart type in Microsoft Office, but they can be constructed relatively easily from a standard pie chart. The trick is to plot the data in 50% of the chart space. To create a gauge chart like the one shown in Figure 63, perform the following steps.

1. Plot ***exactly*** three data points in a standard pie chart.

a. The first data point in the series ***must*** be set to 50% (or to one-half of the total of the three points if the points are not expressed as percentages).

b. The second data point should be set to one-half of the desired plot value. In other words, if you want the gauge chart to *appear* to plot 80% as the second data point, set the value of the second point equal to one-half of that amount or 40%.

c. The third data point should be a *plug* value such that the sum of the three data points is 100%.

2. Hide the 50% data point. To do this, double-click on the 50% section of the chart and then right-click and choose **Format Data Point**. On the **Fill** tab, select **No Fill** and on the **Border Color** tab, select **No line**.

3. On the **Series Options** tab, set the **Angle of the first slice** to **90** degrees.

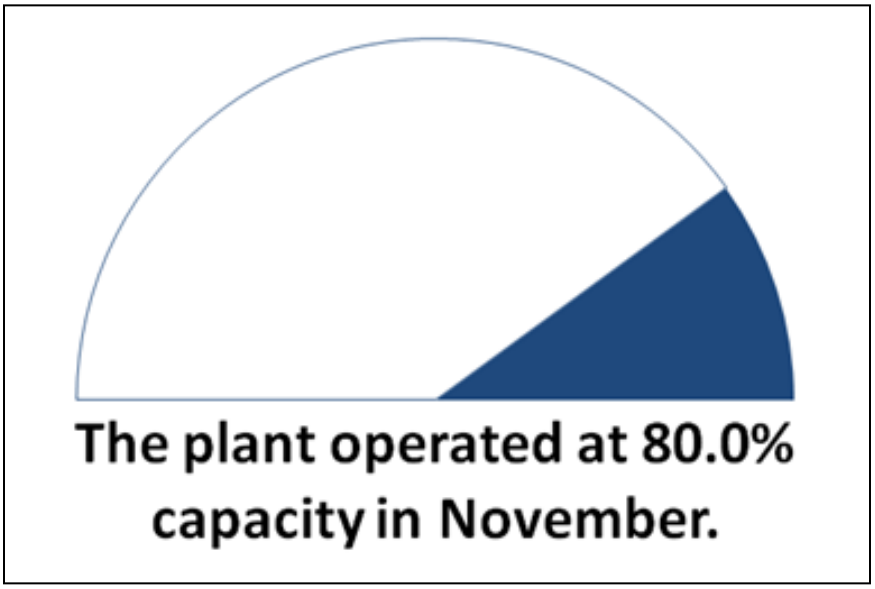


Figure 63 - Gauge Chart

Tachometer Charts

Tachometer charts such as the one displayed in **Figure 64** are similar to gauge charts because they show a relative measurement of one value to the total. Tachometer charts also frequently include some qualitative measurements such as poor, average, or excellent.

To build a tachometer chart using Microsoft Office, plot two data series on one doughnut chart. Both data series must contain a value of 50%, and the section of both doughnuts related to this value will be hidden just as in the gauge chart. The inner doughnut will be used to display a *needle* that points against the qualitative measurements shown in the outer doughnut. The needle is nothing more than the border between two data points that are formatted with the same color. The qualitative measurements are simply the category names plotted using the **Label Options** tab of the **Format Data Labels** dialog box.

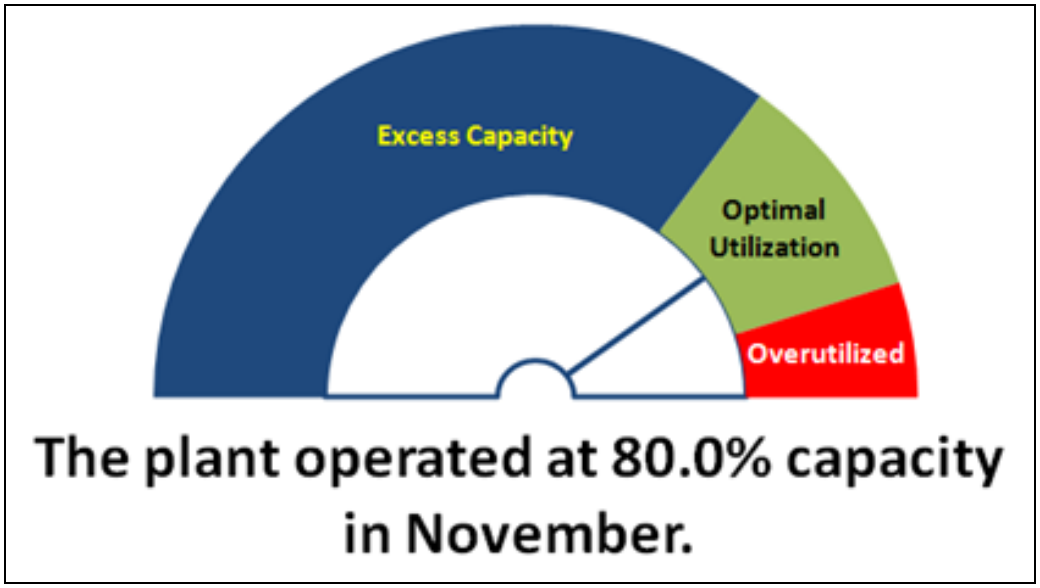


Figure 64 - Tachometer Chart

Bullet Charts

A bullet chart is a type of chart that allows information consumers to see multiple layers of information simultaneously. **Figure 65** presents an example of a bullet graph used to compare year-to-date results to year-to-date quota and to annual quota. This type of three-way comparison could be cumbersome for other types of charts.

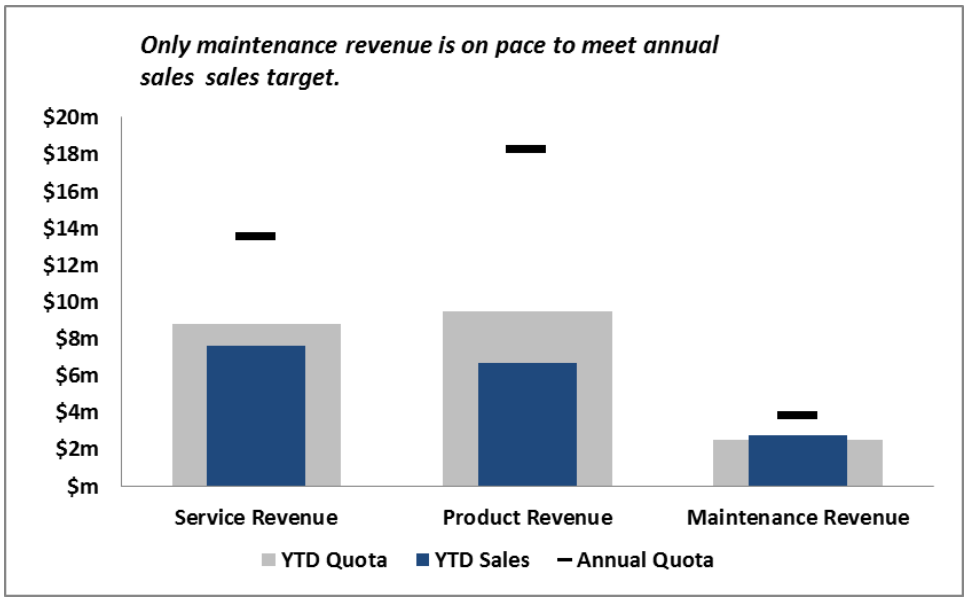


Figure 65 - Sample Bullet Graph Comparing YTD Results to YTD Quota and to Annual Quota

Figure 66 contains the data from which we will build a bullet chart.

	B	C	D	E
3	Product Line	Annual Quota	YTD Quota	YTD Sales
4	Service Revenue	$13,500,000.00	$8,812,328.77	$7,615,235.41
5	Product Revenue	$18,200,000.00	$9,443,287.67	$6,687,616.44
6	Maintenance Revenue	$ 3,804,000.00	$2,510,673.97	$2,739,179.62

Figure 66 - Data for Bullet Chart

To build the chart, perform the following nine steps.

1. Create a stacked column chart from the data in Figure 66. Your initial chart should resemble that shown in **Figure 67**.

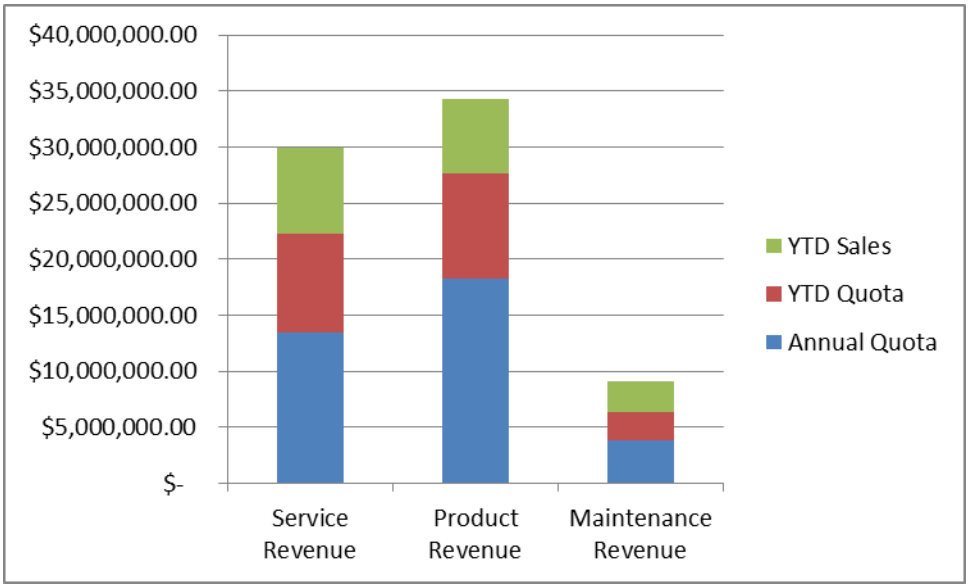


Figure 67 - Initial Chart for Bullet Chart

2. Right-click on the Annual Quota data series, choose **Format Data Series**, and select the option to **Plot Series On Secondary Axis**. Click **OK**.

3. Right-click on the Annual Quota data series, choose **Change Series Chart Type**, and select **Line Chart with Markers**. Click **OK**.

4. Right-click on the Annual Quota data series, choose **Format Data Series**, set **Marker Options** to **Built-in**, select the underscore character, and change the size to **15**. Additionally, click **Line Color** and select the **No line** option. Click **Close**.

5. Right-click on the YTD Sales data series, choose **Format Data Series**, and select the option to **Plot Series on Secondary Axis**. Additionally, change the **Gap Width** option to **175%**. Click **Close**.

6. Right-click on the YTD Quota data series, choose **Format Data Series**, and change the **Gap Width** option to **75%**. Click **Close**.

7. Click on the secondary axis and press **Delete**.

8. Right-click on the legend, choose **Format Legend**, and select **Bottom** for the **Legend Position**.

9. Add any additional desired formatting to the chart to complete the process.

Waterfall Charts

Waterfall charts are useful because they help to "tell a story" or explain how we get from point A to point B. For example, the waterfall chart shown in **Figure 68** explains how an organization's gross revenue of $50,000 was consumed when arriving at net income of $4,000 for a period.

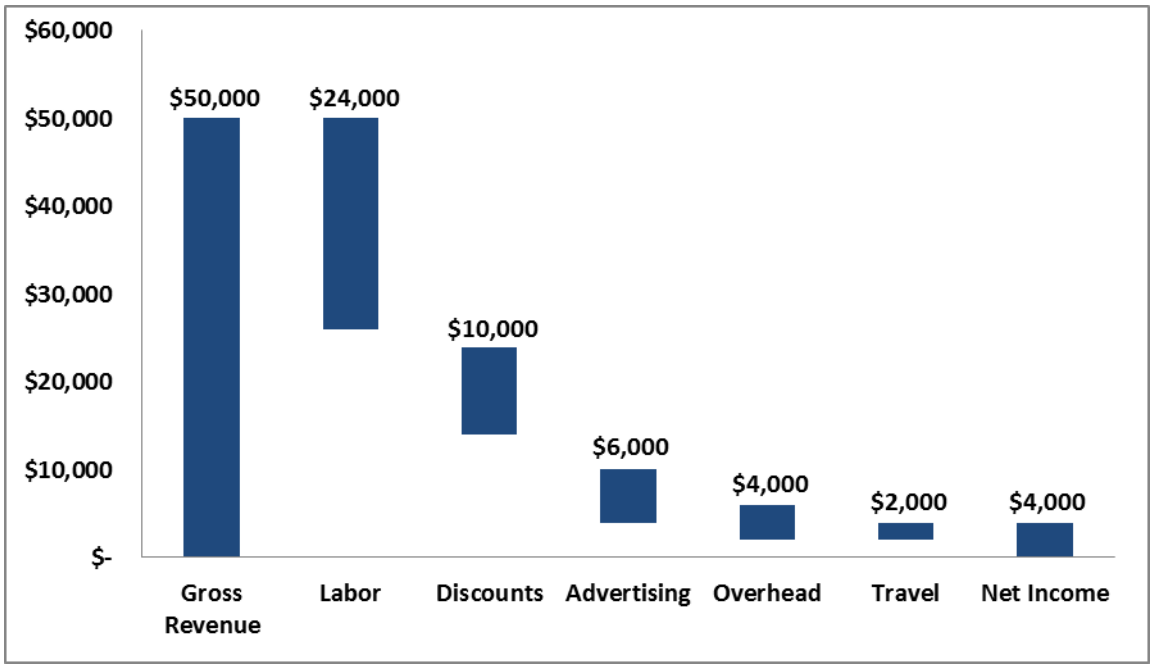


Figure 68 - Sample Waterfall Chart

Like many other useful charts, a waterfall chart is not a standard chart in Microsoft Office; yet, you can easily construct one by creating a stacked column chart and then hiding one of the data series. Consider the following data set.

Gross Revenue	50,000
Labor	24,000
Discounts	10,000
Advertising	6,000
Overhead	4,000
Travel	2,000
Net Income	4,000

To build a waterfall chart from this data set, begin by inserting a stacked column chart onto your slide, page, or worksheet. Next, in the resulting data grid, insert a column between the two columns shown above and add column headers above the two columns as shown below.

	Invisible	Visible
Gross Revenue		50,000
Labor		24,000
Discounts		10,000
Advertising		6,000
Overhead		4,000
Travel		2,000
Net Income		4,000

In the column labeled "Invisible," enter "0" for Gross Revenue and Net Income. In the column labeled "Invisible" for the "Labor" row, enter a formula that subtracts the amount from the "Visible" column for "Labor" from the amount for the "Visible" column for "Gross Revenue," e.g., "C2 - C3." Copy that formula down the range so that your data appears as shown below.

	Invisible	Visible
Gross Revenue	0	50,000
Labor	26,000	24,000
Discounts	14,000	10,000
Advertising	4,000	6,000
Overhead	2,000	4,000
Travel	2,000	2,000
Net Income	0	4,000

Upon doing so, right-click on the data series in the chart that displays the "Invisible" data and format that series so that there is "no fill." Continue formatting the chart as desired to complete your waterfall chart.

Drill-Down Charts

Excel-based dashboard designers would often like to provide users with the ability to drill down on a chart, exposing additional data and details. Unfortunately, Excel does not natively provide such functionality. However, as with applying conditional formatting on charts, with a little creativity and trickery, we can add this level of functionality to our dashboards.

For example, a sales manager of an organization might wish to see a year-to-date bar chart of sales. The manager might also wish to drill down on that chart to see additional details such as a year-to-date sales trend chart. As shown in **Figure 69** and as described below, dashboard designers can add buttons to charts to facilitate this drill-down capability. To each button, the designer will attach a simple macro that toggles the view back and forth between the desired charts.

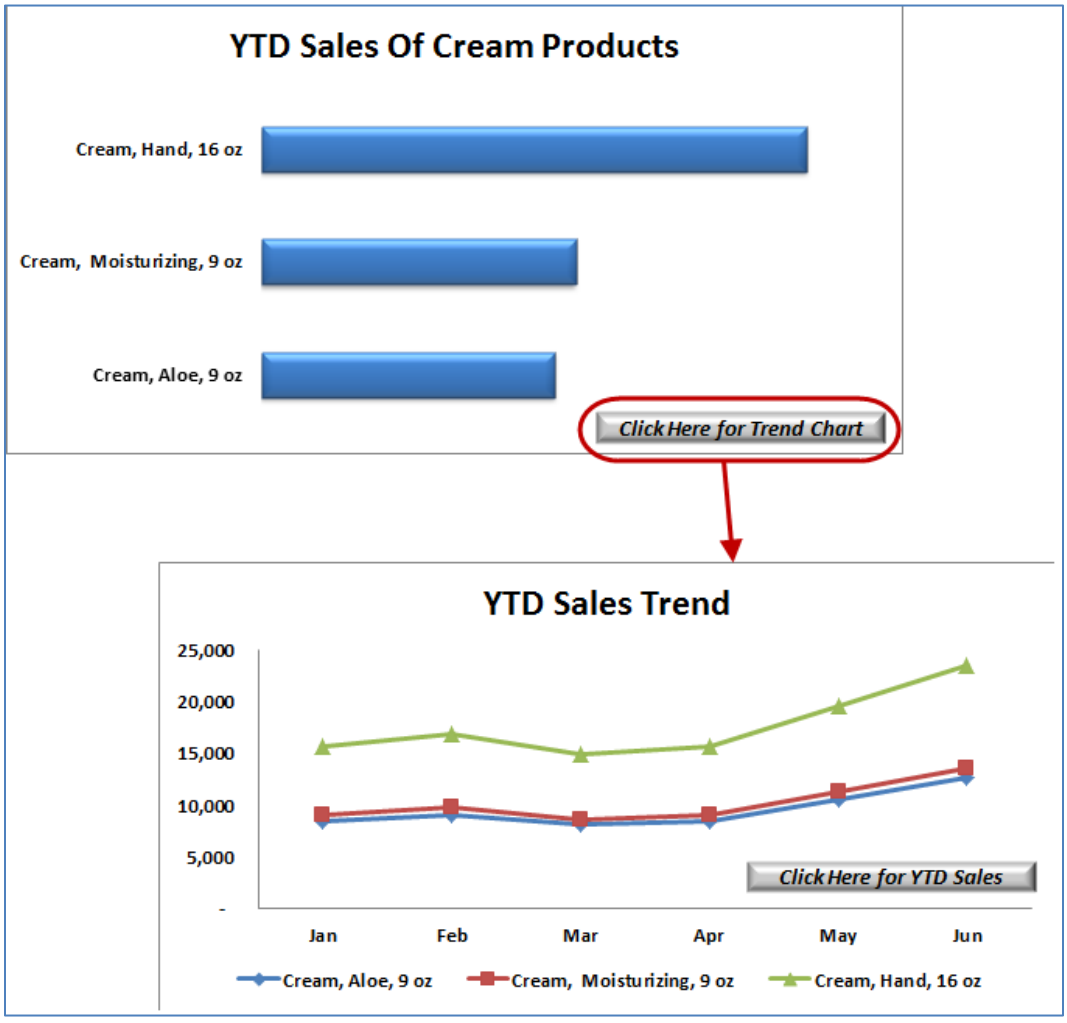


Figure 69 - Drilling Down on One Chart Causing Another Chart to Appear

To add such functionality to your dashboard, follow these five steps.

1. Begin by creating two charts of *exactly* the same size. If necessary, you can adjust the size of a chart by selecting the chart and modifying the height and width of the chart on the **Chart Tools Format** contextual tab as shown in **Figure 70**.

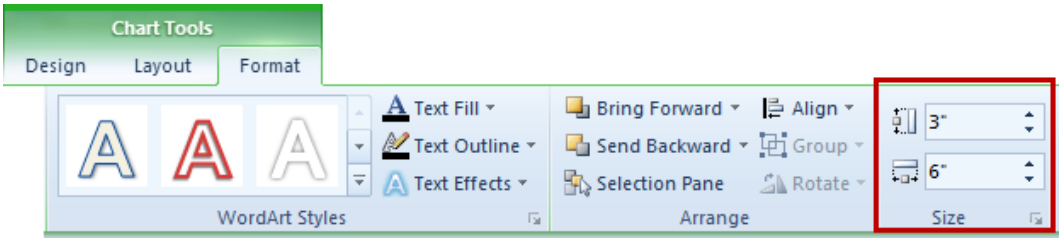


Figure 70 - Adjusting the Size of a Chart

2. Next, assign names to both of the charts. To assign a name to a chart, select the chart and, on the **Chart Tools Layout** contextual tab, enter the desired name in the **Chart Name** box as shown in **Figure 71**.

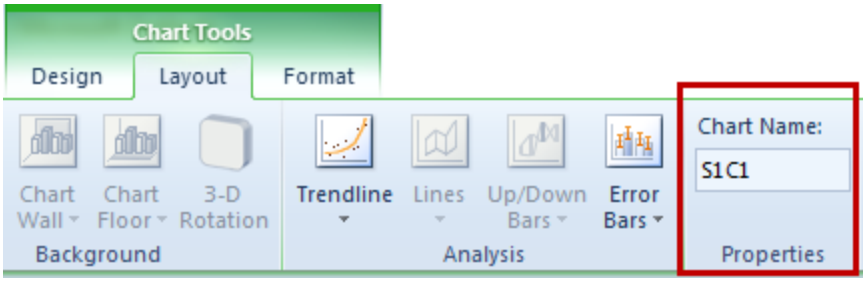


Figure 71 - Naming a Chart

3. Add the macro shown in **Figure 72** to the Excel workbook. When writing the macro, substitute the names of your charts for the references to "S1C1" and "S1C2" in the example. Also, substitute the name of your dashboard worksheet for the references to "Dashboard" in the example. Upon adding the macro, save your workbook as a macro-enabled workbook.

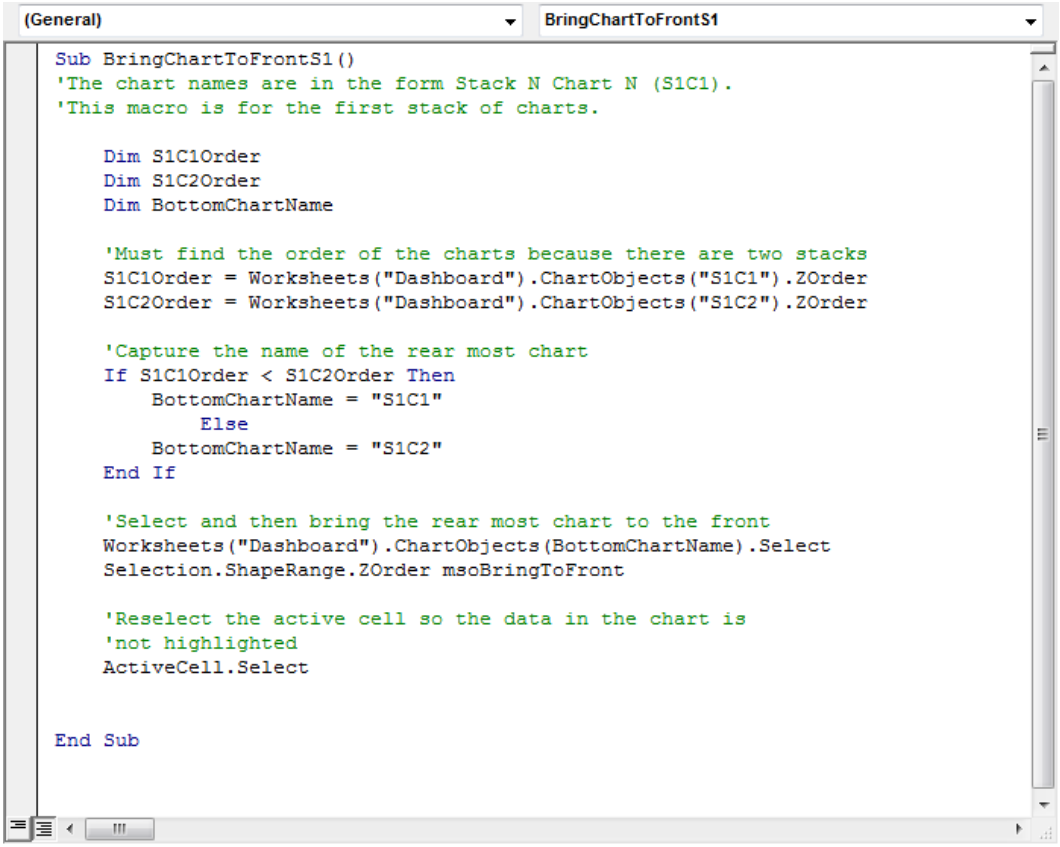


Figure 72 - Macro to Enable Drill Down on Charts

4. Add and format text boxes containing "Click here to…" instructions to each chart. Assign the macro added in step 3 to each of the text boxes by right-clicking on the text box and selecting **Assign Macro**.

5. Finally, position the charts so that one of the charts is stacked directly on top of another. You can do this by clicking and dragging the charts to the desired location. You can also use Excel's **Nudge** commands to fine-tune the position of the charts.

Upon completing these steps, you will have two charts stacked one on top of another. The chart at the bottom of the stack will be invisible to the dashboard user. However, upon clicking a button on the top chart, the chart on the bottom of the stack will rise to the top, and the chart on the top of the stack will recede to the bottom – an incredibly powerful tool for increasing the usability of your dashboard charts.

Using SmartArt in Microsoft Office Applications

Creating a SmartArt Graphic

Office 2007 introduced into Word, Excel, Outlook, and PowerPoint a new feature entitled **SmartArt**. SmartArt allows you to create presentation-quality graphics to communicate your message more effectively. SmartArt makes it easy to create business diagrams quickly and with a professional look. SmartArt layouts range from lists to organization charts to step-by-step processes. Some SmartArt shapes have special placeholders for inserting pictures.

To create a SmartArt graphic, click the **SmartArt** icon from the **Insert** tab of the Ribbon as shown in **Figure 73.** In the **SmartArt Graphic** dialog box, choose the graphic to create. The graphic names appear when moving the mouse pointer, and each shows a description for its use.

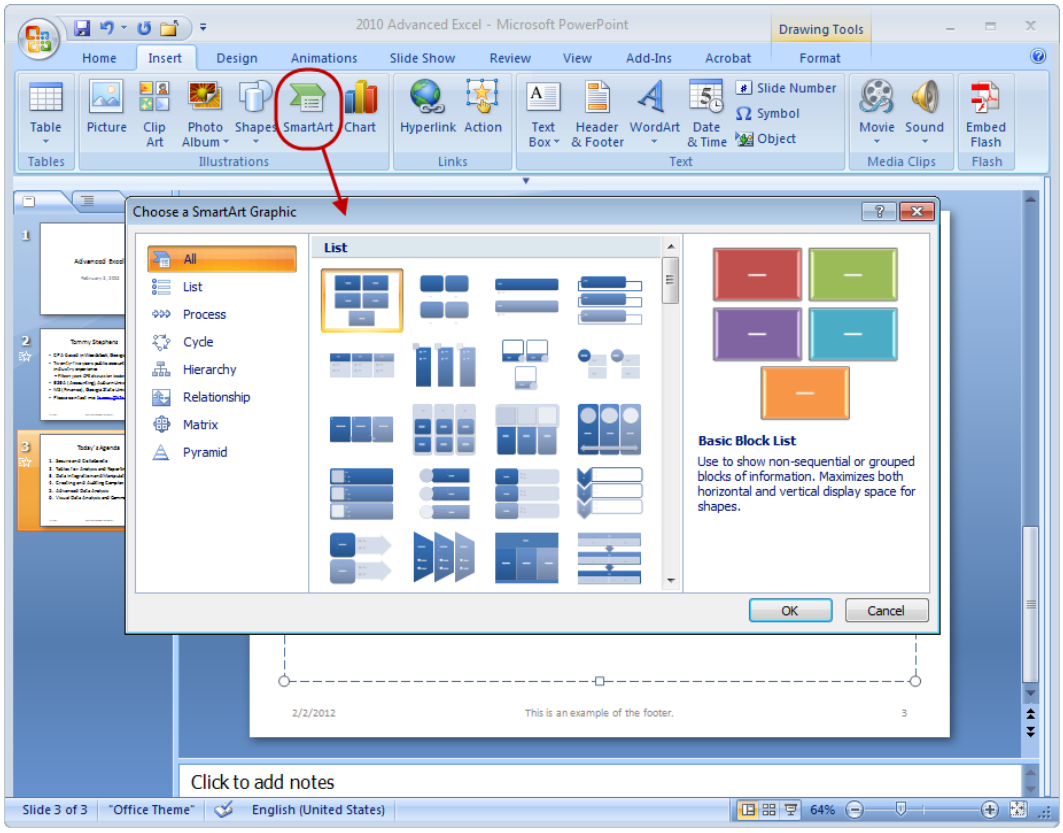


Figure 73 – Creating a SmartArt Graphic

Upon selecting the type of SmartArt graphic you wish to create, simply type the desired text into the SmartArt template; alternatively, you type the text into the **SmartArt Text Pane** that adjoins the graphic template. If the Text Pane does not appear, you can activate it on the **SmartArt Tools Design** contextual tab of the Ribbon. Notice that as you add text, the font size in all of the individual elements of the graphic adjusts automatically. **Figure 74** presents a completed example of a SmartArt graphic.

Figure 74 – Example of SmartArt's Table List

To edit the image to change colors, SmartArt styles, the layout, or any formatting option, click on the graphic and then choose the appropriate option either from the **SmartArt Tools**, **Design** or the **SmartArt Tools**, **Layout** contextual tab, both shown in **Figure 75**.

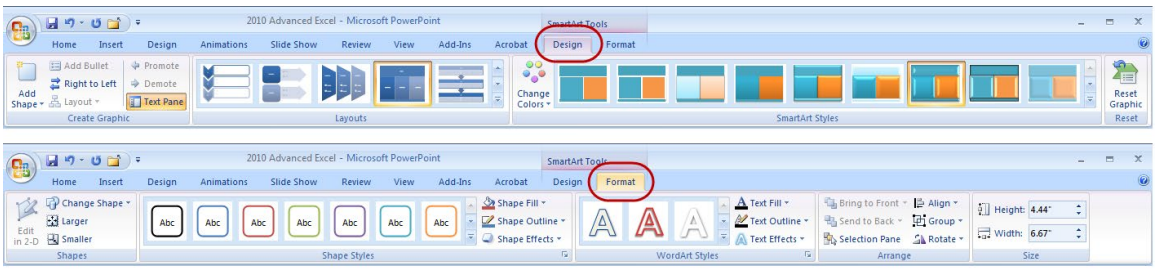


Figure 75 - SmartArt Tools Design and Format Contextual Tabs

Different Types of SmartArt

Office 2007 and Office 2010 provide seven broad categories of SmartArt. Each of these categories and its primary function is described below.

1. **List**. Lists are typically used to show text-based information that is not sequential, or when the order of the information presented is not necessarily important. SmartArt List objects are excellent alternatives to standard bullet points in a PowerPoint presentation.

2. **Process**. If the arrangement of data is sequential, then typically SmartArt Process objects are a good choice. Process objects diagram the flow of data from one item, task, workflow, etc. to another.

3. **Cycle**. Similar to Process objects, SmartArt Cycle objects illustrate a business process or workflow but show it in a repetitive or recursive fashion. Accordingly, these objects should be used when there is a continuing sequence of data.

4. **Hierarchy**. As their name implies, SmartArt Hierarchy objects are used to display hierarchical relationships of data. These are typically used to create objects such as organization charts and tournament rosters because they can show relationships vertically or horizontally.

5. **Relationship**. SmartArt Relationship objects generally present how individual parts relate to the whole, such as in a Venn diagram or an equation. These objects can also depict competing and counterbalancing ideas.

6. **Matrix**. Similar to Relationship objects, a SmartArt Matrix object shows the relationship of individual components to the whole. The primary difference between a Matrix object and a Relationship object is that Matrix objects are depicted in quadrants.

7. **Pyramid**. SmartArt Pyramid objects also show relationships of data but, in doing so, imply that some items are greater in importance, number, or stature than others.

Customizing SmartArt Objects

Adding Shapes

Once you have created a SmartArt object, you can customize the object to meet your specific needs. For example, suppose you created the Table List object pictured in Figure 74 and subsequently discovered that you needed to add a fourth item in the series of Inventory, Sales, and Investment. To do this, you will need to add an additional rectangle to the SmartArt object, and that can be accomplished in two different ways.

First, you could simply type the text for the fourth element directly into the Text Pane. Doing so will cause the Office application in which you are working to automatically add the fourth rectangle as shown in **Figure 76**.

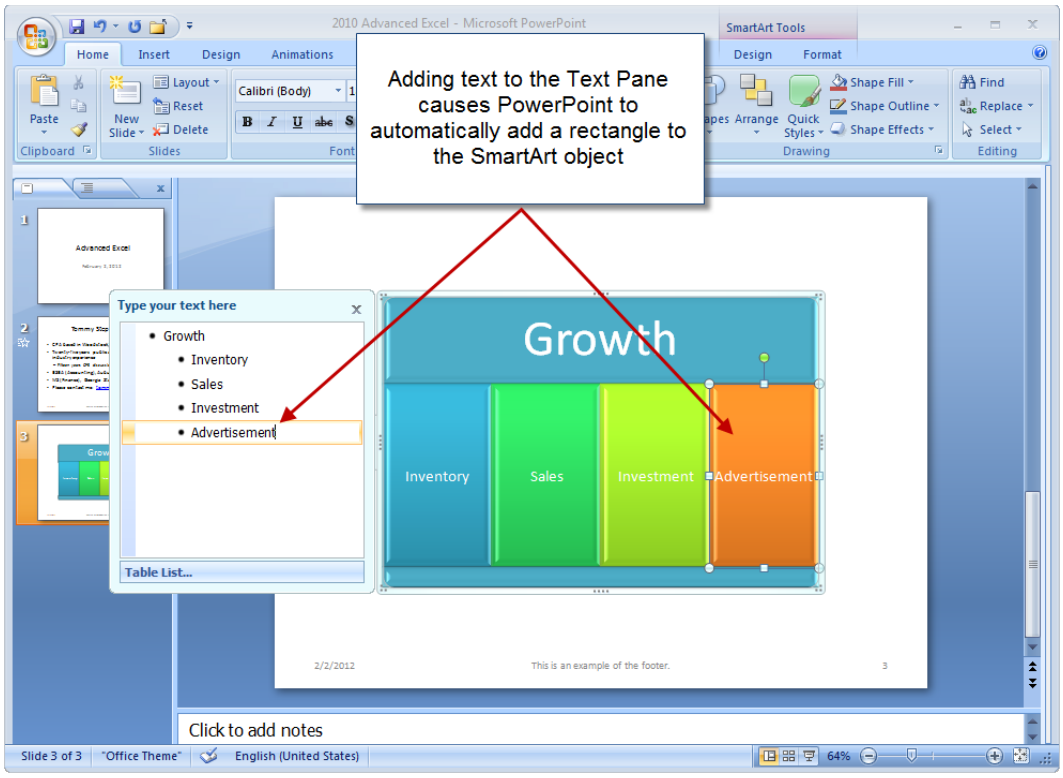


Figure 76 - Changing a SmartArt Object through the Text Pane

The second approach to adding a rectangle to the image would be to manually insert it into the object. To do so, right-click on the rectangle you want the new rectangle to immediately precede or follow and, from the resulting pop-up menu, choose **Add Shape** and then indicate whether you want the new shape added before or after the currently selected shape as shown in **Figure 77**.

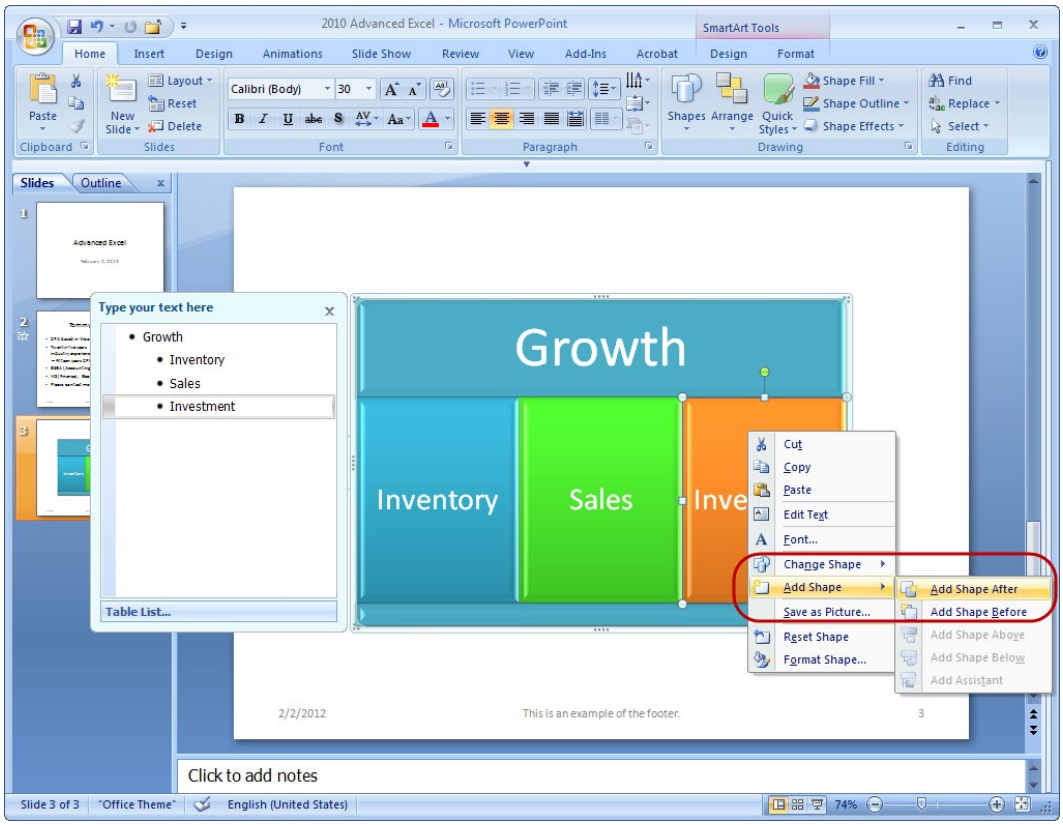


Figure 77 - Manually Adding a Shape to a SmartArt Object

Promoting, Demoting, and Repositioning Text

Another way of customizing a SmartArt object is to promote, demote, and reposition text in the Text Pane. Doing so causes the SmartArt object to update. For example, having added "Advertisement" to the object in Figure 76, see the impact on the object when the text is right-clicked, and the **Demote** option is selected as shown in **Figure 78**. Upon demoting the text, it is placed in the same text box as "Investment" and becomes a bullet point in that text box. To restore "Advertisement" to its original text box, right-click on the phrase in the Text Pane and choose **Promote**.

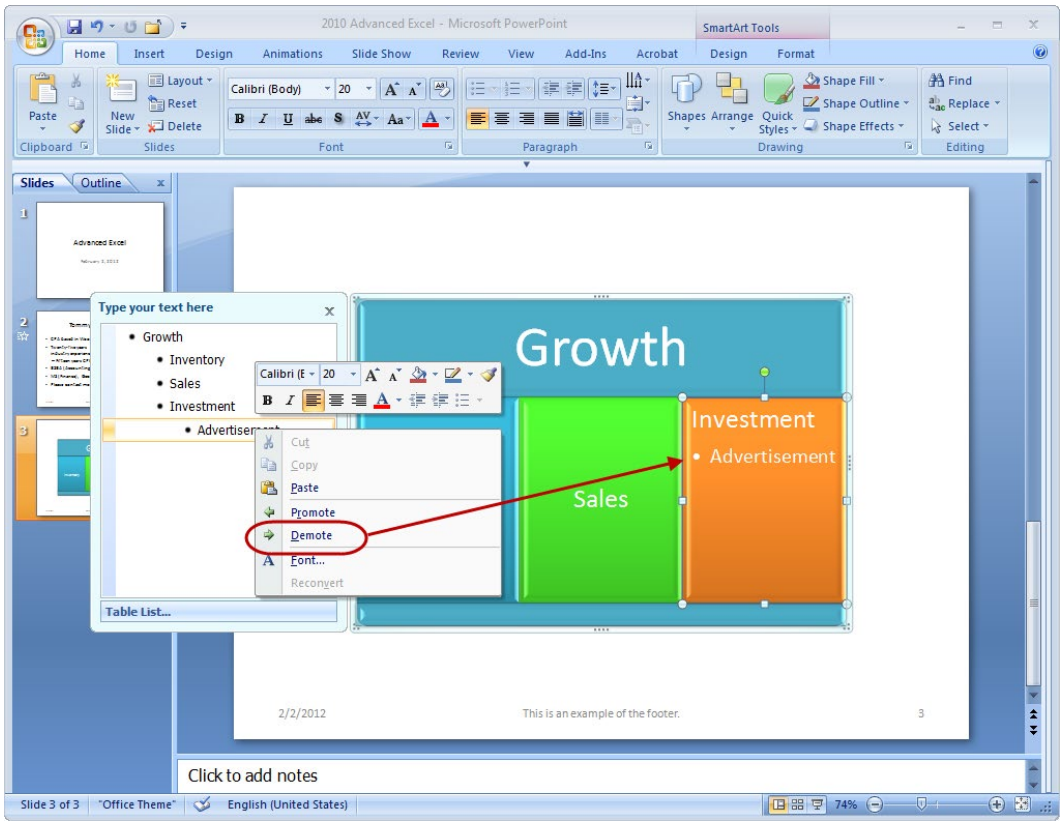


Figure 78 - Demoting Text in SmartArt

Likewise, text can be reordered and, in doing so, the arrangement of the SmartArt object will update also. Perhaps the easiest way to reorder text is to do so by cutting and pasting within the Text Pane. Alternatively, you can click and drag text boxes in the SmartArt object to reposition the objects and the text within them. If you choose this method, be sure to take advantage of your applications "Nudge" feature to ensure that the visual integrity of the object remains intact.

Organizational Charts

One of the strengths of SmartArt is its capability to assist you in creating organizational charts that allow for quick and easy modification. To begin this process, choose **SmartArt** from the **Insert** tab of the Ribbon, **SmartArt**, and in the **Choose a SmartArt Graphic** dialog box, select the **Organization Chart** object. Upon doing so, you should have a blank chart that appears as shown in **Figure 79**.

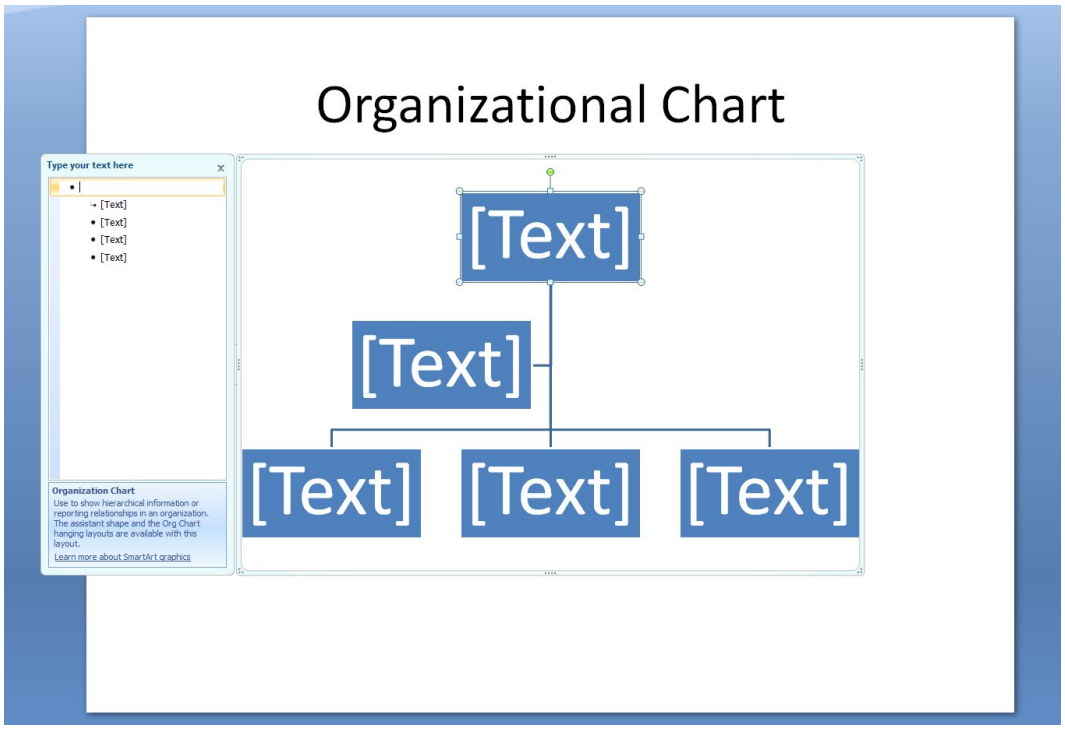


Figure 79 - Blank SmartArt Organization Chart

Next, in the Text Pane, enter the names of the team members to be included in the organization chart so that your chart resembles the one shown in **Figure 80**.

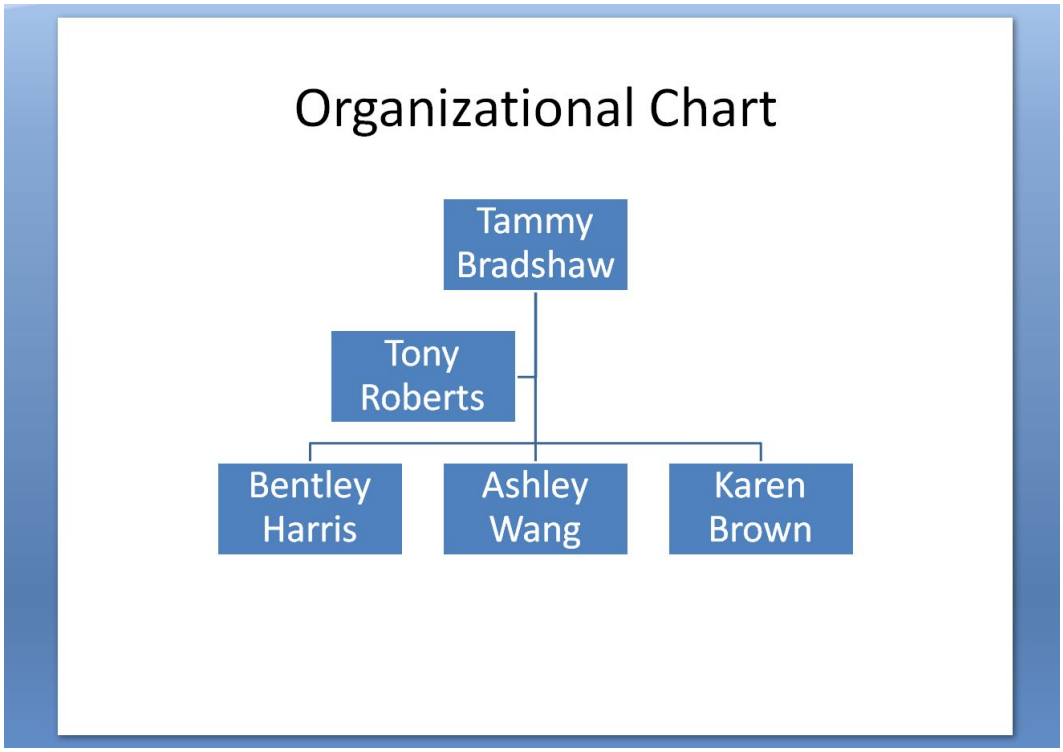


Figure 80 – Sample SmartArt Organization Chart

To add additional team members, simply add their names in the Text Pane and use the Promote and Demote functions discussed earlier to indicate their relative level in the organization. Notice that the modified chart in **Figure 81** includes additional subordinate positions reporting to Bentley Harris and George Washington.

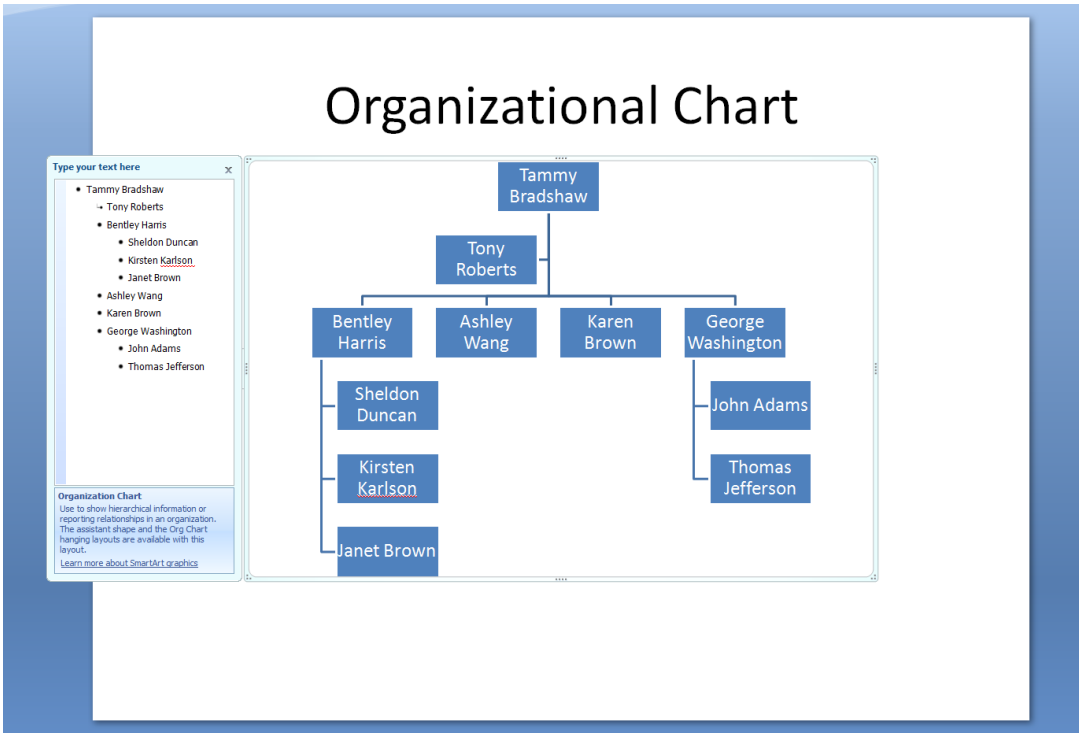


Figure 81 - Organization Chart with Additional Subordinate Team Members

To change the visual presentation of the organizational chart so that it is more horizontally oriented, perform the following three steps.

1. Either on the chart or in the Text Pane, click on the name of the particular supervisor for whom you want to change the layout.

2. On the **SmartArt Tools Design** contextual tab, click **Layout** in the **Create Graphic** group.

3. Choose from the options of **Standard**, **Both**, **Left Hanging**, or **Right Hanging**.

The organization chart presented in **Figure 82** uses the Standard layout in contrast to the Right Hanging layout employed by the organization chart presented in Figure 80.

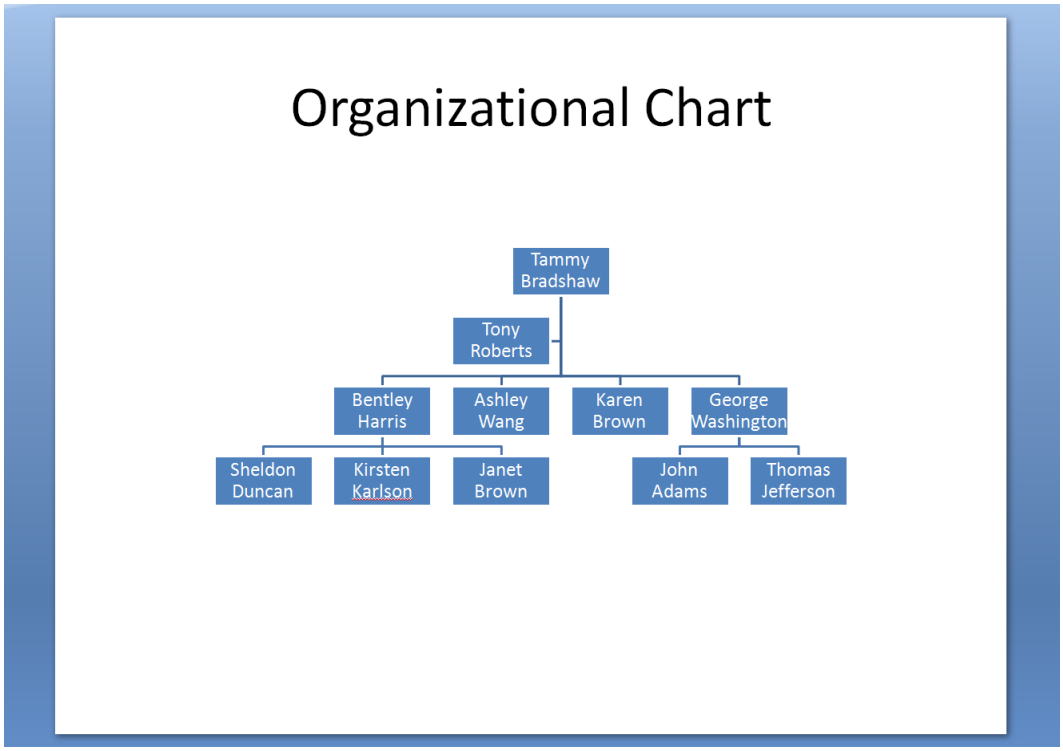


Figure 82 - Revised Organization Chart Using Standard Layout

Lastly, to add an Assistant to an individual in the organization chart, perform the following steps.

1. Select the individual to whom the Assistant will report and then choose **Add Shape** from the **Create Graphic** group on the **SmartArt Tools Design** contextual tab. Alternatively, right-click on the individual's name on the organization chart and choose **Add Shape** from the pop-up menu.

2. From the five options presented – **Add Shape After**, **Add Shape Before**, **Add Shape Above**, **Add Shape Below**, and **Add Assistant** – choose **Add Assistant**.

3. Enter the **Assistant's** information in the newly created box.

In the organization chart presented in **Figure 83**, an Assistant – Susie Jones – has been added to George Washington's organization.

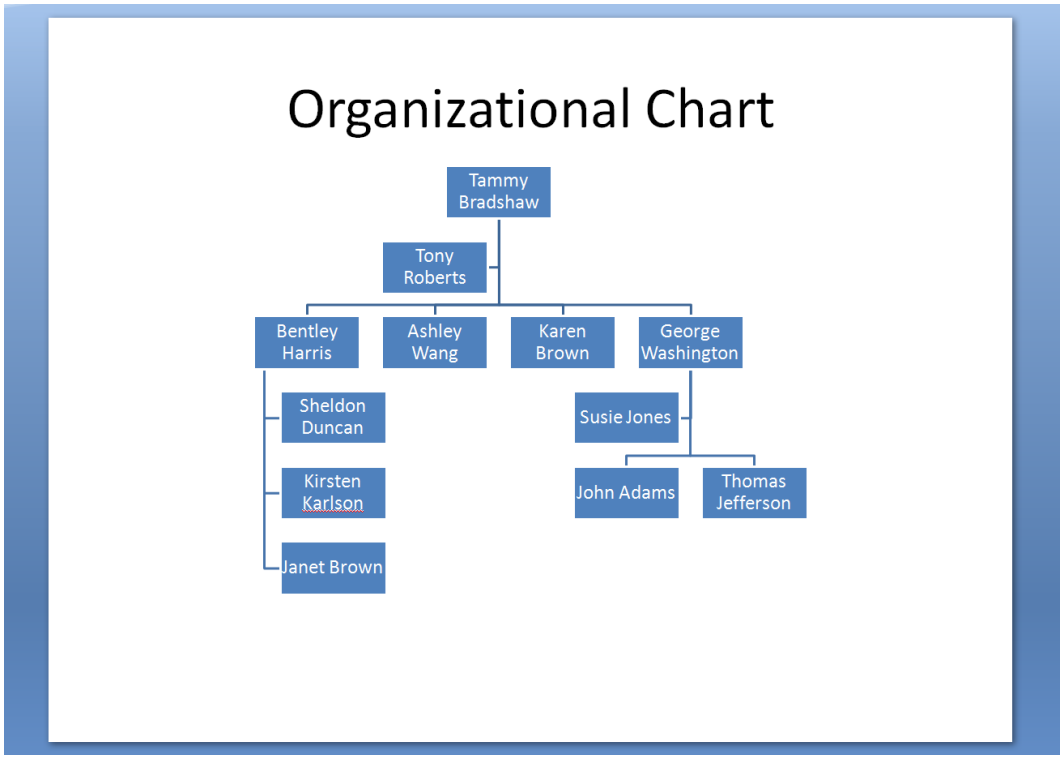


Figure 83 - Organization Chart with Additional Assistant Added