

# **K2's EXCEL CHARTING AND VISUALIZATIONS**

**CONTINUING PROFESSIONAL EDUCATION SERIES**



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# Introduction

## Three Rules of this Seminar

1. **There Are No Dumb Questions.** Please ask questions if you need further explanation. We welcome your questions and will do our best to provide accurate and meaningful answers.
2. **Obtain the Information for Which You Came.** If you have a specific interest in a topic, please let us know. If your topic is not part of the course materials, we will do our best to accommodate your request. Your instructor is anxious to meet your needs.
3. **Share and Share-Alike.** Your instructor is here to share relevant information about the course. We hope that you will be willing to do the same. If you have helpful tips or experiences, please share them with the other participants and us.

## Course Development

The shareholders, associates, and staff of K2 Enterprises and K2E Canada Inc. developed this course and the related course materials. We aim to deliver high-quality educational practices that help you use and understand the tools and concepts discussed in this session more effectively.

We designed our course presentation style for busy professionals. Through numerous short case studies and feature reviews, we deliver concise, easy-to-understand, easy-to-absorb information.

To maximize your time and the value of attending this course, we have carefully filtered out trivial and obscure features. Our goal is not to cover every keystroke and menu option, but to provide a fast-paced course that focuses on state-of-the-art information technology and how it can benefit you and your staff.

## About K2 Enterprises

For over three decades, our team members have delivered more than 45,000 technology-focused seminars, webinars, and conferences worldwide. To stay on top of technology, our team members read numerous technology trade magazines, attend conferences, and speak with technology companies each year to stay current with the latest information for our courses. Also, we experience everything we teach and recommend to our audiences. Because our shareholders and associates are based in different states and provinces, using technology efficiently and appropriately is essential to our business's success and survival.

## Our Mission Statement

K2 aims to develop and deliver the highest-quality technology seminars and conferences for business professionals. We work cooperatively with professional organizations such as state CPA societies, associations of Chartered Professional Accountants, and technology vendors. We make every effort to maintain high integrity, family values, and friendship among all involved.

## Our Instructional Team

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## On-Site Training

Working cooperatively with state CPA organizations and associations of Chartered Professional Accountants, we are pleased to offer all our seminars and conference sessions as on-site training opportunities. On-site training provides companies of all sizes with numerous advantages, including the following.

- **Customization.** K2 can customize the content of all on-site training events to meet your organization's specific needs. For example, we can combine selected parts of existing courses into a focused learning experience to meet your team's needs. Likewise, we can develop custom content from the ground up and deliver it to your team members, ensuring we meet your training objectives.
- **Cost savings.** For organizations of all sizes, on-site training can provide significant cost savings compared to public training venues. In addition to potentially reduced registration fees, these cost savings materialize in the form of reduced travel costs and reducing the amount of time team members spend away from the office.
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**[caroline@k2e.ca](mailto:caroline@k2e.ca)**



## Web-Based Training

K2 offers web-based CPE and CPD to accounting and business professionals throughout the United States and Canada. K2's award-winning instructors deliver two-, four-, and eight-hour webinars on numerous technology-focused topics.

Additionally, K2 provides on-demand training. On-demand courses offer you the advantage of receiving top-quality training at a time and location that fits your busy schedule. You can start a class today and complete it in the future. For more information, please visit:

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K2 has two primary websites. You can view information regarding CPE and CPD opportunities, access a library of technology tips and articles, and link to K2-related websites.

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# Fundamentals Of Effective Visualizations

## Chapter

# 1

Accounting and financial professionals are generally familiar with rows and columns of data and can easily process large volumes. However, many more business professionals face the challenge of seemingly endless data ranges and struggle to identify meaningful trends and interpret the data. For these reasons, transforming raw data into meaningful and compelling visualizations is a near necessity in today's business climate. In this chapter, we begin the discussion of improving communication with effective visualizations by examining the fundamentals of visualizations, particularly those you can create in Excel.

## Learning Objectives

Upon completing this chapter, you should be able to:

- List the primary ways in which effective visualizations can enhance communications;
- Identify the major categories of visualizations offered in Excel and situations where each type can be helpful;
- List examples of specific techniques you can use to enhance your visualizations; and
- Cite examples of characteristics that can compromise the effectiveness of visualizations.

## How Should Visualizations Improve Communications?

First, let us be clear: not all visualizations improve communication. Unfortunately, some visualizations make it harder to understand the underlying data, thereby littering today's business environment. However, properly constructed charts and other visualizations can – and should – enhance communications, and they can do so in several ways, including the following.

- Visualizations can help to summarize and present massive volumes of numerical data. For example, consider a company with hundreds of thousands of sales transactions spread across multiple regions. With appropriate visualizations, we can quickly summarize the transactions and present a chart that helps readers understand the nature of the company's sales activities.
- Some visualizations – *line* and *area charts*, mainly – can highlight trends. For example, when plotting data over time, using the right chart type can help readers discover trends they might have missed in a tabular presentation of the same data. Moreover, trend lines in a chart can help us make future predictions and support budgeting and forecasting.

- In many cases, visualizations can be interactive, allowing readers to apply filters that show just the data the reader needs for their specific purpose. Furthermore, this filter does not permanently alter the chart, leaving it intact for other users.
- Often, charts can communicate a message that might take pages to convey in text. So, instead of readers having to invest an extended amount of time in consuming and digesting several pages of text, they could gain the same understanding from a chart in less time.

## What Types of Visualizations Are Available in Excel?

Excel offers several tools for creating compelling visualizations, including *charts*, *conditional formatting*, *PivotCharts*, *3-D Maps*, *Sparklines*, and several types of *illustrations*. This session focuses on *charts*, *conditional formatting*, and *Sparklines*.

Over 80 chart types are available in Excel, grouped into 18 categories.

1. Column
2. Pie
3. Line
4. Bar
5. Area
6. X Y (Scatter)
7. Map
8. Stock
9. Surface
10. Radar
11. Treemap
12. Sunburst
13. Histogram
14. Box & Whisker
15. Waterfall
16. Funnel
17. Combo
18. User-defined Templates

At this point, you should not let the many options overwhelm you, as you will likely use only a small percentage of them.

Conditional formatting does not involve using charts to communicate. Instead, it is a way to format your data so that its format changes when specific conditions are met. To illustrate, you can use conditional formatting to highlight unfavorable budget variances in red while formatting

favorable variances in blue. Once you create conditional formats, they update automatically in real time as the data changes.

Sparklines are simple, thumbnail-sized charts, bar charts, and win-loss charts. Perhaps the best way to think of Sparklines is as a hybrid between charts and conditional formatting. Once you establish a Sparkline, there are but a few options for changing its behavior or appearance, unlike charts, where the possibilities are seemingly endless.

## Five Simple Tips for More Effective Visualizations

Perhaps the best Excel-based charting tip for most business professionals is “keep it simple.” Avoid reaching beyond your grasp; otherwise, visualizations can detract from your message rather than communicate it effectively.

### Which Types of Visualizations Should I Use?

Before exploring the mechanics of creating visualizations, we first need to examine the types of visualizations you should consider to communicate your message effectively. This issue is paramount given the number of options available when working with Microsoft Office tools. With so many options, you can easily make a wrong decision!

A noted visualization expert, Stephen Few, advocates that no more than twelve visualizations are necessary to communicate your messages effectively in most business settings. Specifically, the twelve types of visualizations and their ideal applications are listed below.

#### Text Table

In many cases, a straightforward table is all that is necessary to communicate effectively. For example, the text table shown in **Figure 1** provides readers with all the information needed to help them understand the composition of Sales by Region.

| Region       | Sales               |
|--------------|---------------------|
| East         | \$ 1,318,415        |
| South        | \$ 910,641          |
| Midwest      | \$ 854,433          |
| Mountain     | \$ 849,836          |
| West         | \$ 1,386,040        |
| <b>Total</b> | <b>\$ 5,319,365</b> |

**Figure 1 - Sample Text Table**

### Bar Chart (horizontal)/Column Chart (vertical)

Bar and column charts are among the most used chart types; unfortunately, they are also the most misused. Use bar charts and column charts to compare values. Specifically, you should generally **not** use column charts to perform trend analysis.

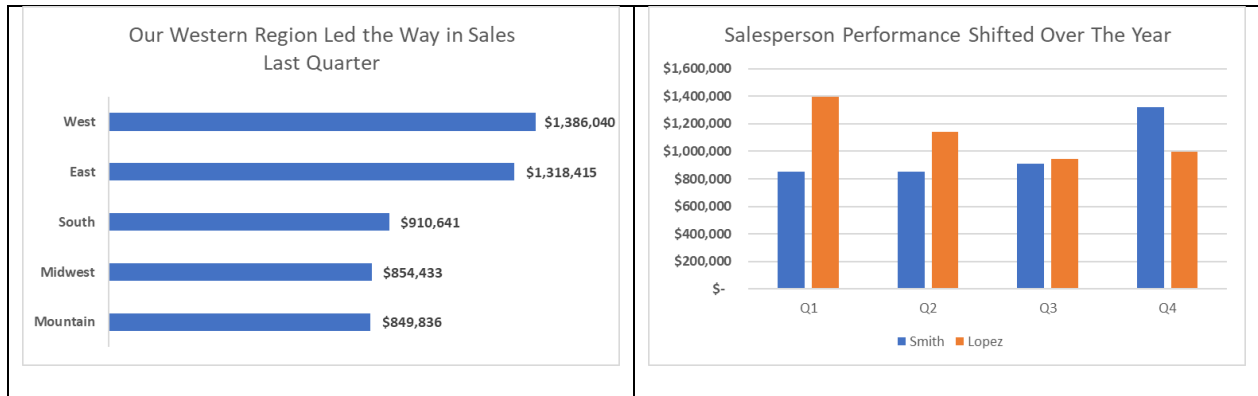


Figure 2 - Bar Charts and Column Charts

### Line Chart

The line chart is a commonly used chart type. The best use of a line chart is to depict data over time. Consequently, line charts are excellent choices for trend analysis.

### Area Chart

As shown in **Figure 3**, an area chart is simply a line chart that fills the area under the line with color. A challenge with area charts arises when the lines “cross,” as shown in Figure 3. In these cases, smaller values are obscured by larger ones. Therefore, consider using semi-transparent colors for area charts.

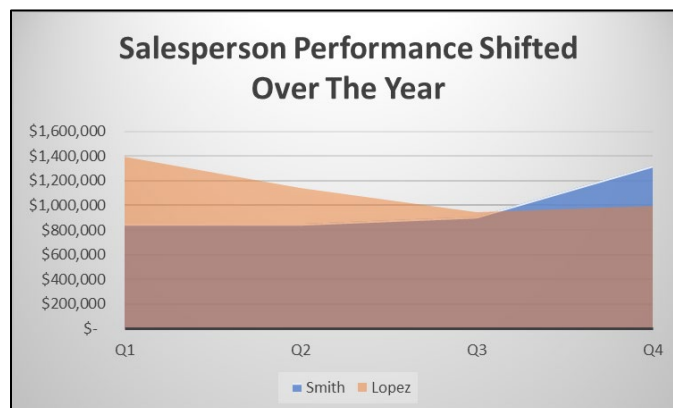
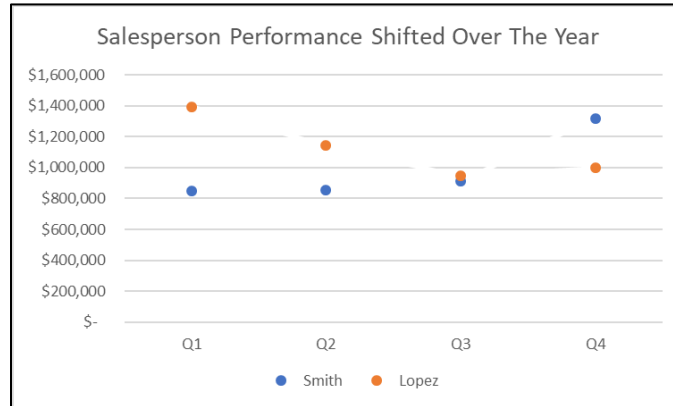


Figure 3 - Sample Area Chart

### Dot Plot

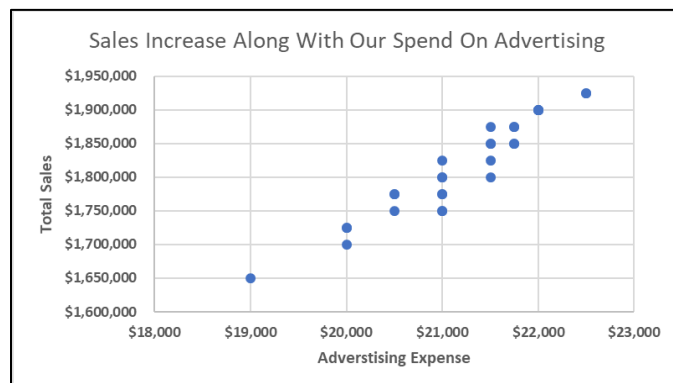
Dot plots use a single dot to represent a value. They represent a viable alternative to bar charts and column charts. Among the potential advantages of dot plots is that they can appear less “busy” than bar and column charts. Another possible advantage is that dot plots consume less ink/toner during printing. An easy way to create a dot chart in Microsoft Office applications is to create a line chart with markers. Then change the line color to match the background color, typically white. This process creates a chart like the one in **Figure 4**.



**Figure 4 - Dot Plot Chart Created from Line Chart with Markers**

### Scatter Plot

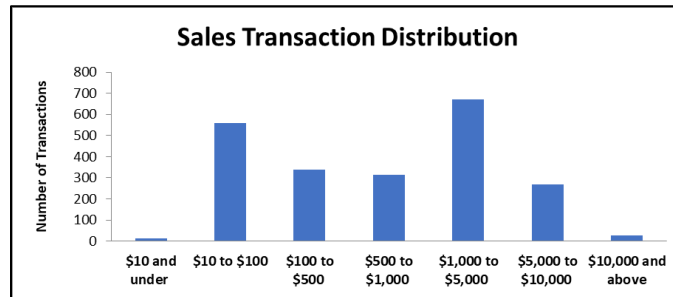
A scatter plot shows the relationship between two variables by plotting data points at the intersections of the horizontal and vertical axes. For example, the scatter plot graph in **Figure 5** plots total sales (the dependent variable in a cause-and-effect relationship) relative to total advertising expense (the independent variable). Although not shown in this visualization, a key element of scatter plots is adding trendlines to confirm cause-and-effect relationships.



**Figure 5 - Sample Scatter Plot Chart Showing the Relationship of Sales to Advertising Expense**

## Histogram

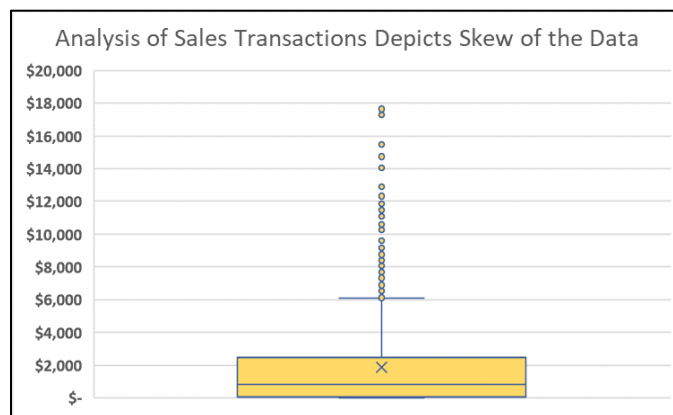
A histogram is a visualization that allows you to group data into various “bins” and then see the relationship between these bins. For example, the histogram in **Figure 6** displays the relative composition of transaction amounts in a retail store.



**Figure 6 - Sample Histogram Depicting Distribution of Sales Transactions**

## Box Plot

Box plots show the degree to which a data set is symmetric versus skewed. Box plots calculate and display the following five values in a data set: 1) minimum, 2) the first quartile, 3) median, 4) the third quartile, and 5) maximum. Also, box plots show outliers. For example, in the sample presented in **Figure 7**, the box plot shows a skew in the data with a moderately large number of outliers on the higher end of the distribution.

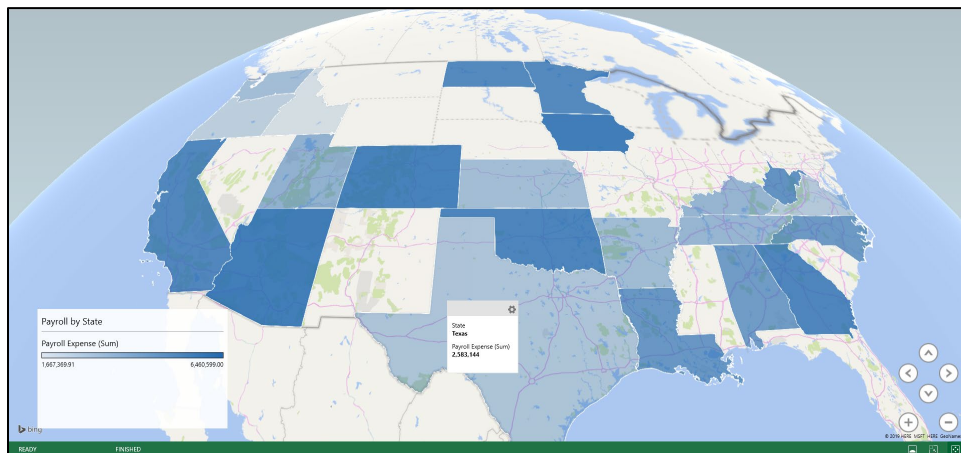


**Figure 7 - Sample Box Plot Showing Skew in the Data**

## Geographical Map

Plotting geospatial data is becoming increasingly popular. Thus, presenting data – total payroll expense, for example – on a map could effectively communicate payroll by state. Microsoft Office began offering map charts with the 2019 update to the suite. However, the **3D Maps** add-in for Excel has offered this capability since 2010. **Figure 8** shows a sample map chart created with the

3D Maps add-in. In addition to 3D Maps and map charts in Excel, Microsoft’s Power BI tools and many other business intelligence platforms provide map charts.



**Figure 8 - Using Excel’s 3D Maps Add-in to Present Payroll Expense by State**

### Heat Map

Through color and symbols, a heat map highlights the values the reader should focus on. Heat maps are not a specific chart type; instead, they are visual effects added to a report. For example, the heat map shown in **Figure 9** uses **Conditional Formatting** in Excel to help users interpret the data.

|                                       | Jan     | Feb     | Mar     | Apr     | May     | Jun     |
|---------------------------------------|---------|---------|---------|---------|---------|---------|
| Creme, Aloe Vera Hand, 9 oz           | 8,388   | 9,087   | 8,039   | 8,388   | 10,485  | 12,582  |
| Creme, Extra Moisturizing Hand, 9 oz  | 8,988   | 9,737   | 8,614   | 8,988   | 11,235  | 13,482  |
| Creme, Hand and Body, 16 oz           | 15,588  | 16,887  | 14,939  | 15,588  | 19,485  | 23,382  |
| Lotion, Organic Body, 9 oz            | 9,588   | 10,387  | 9,189   | 9,588   | 11,985  | 14,382  |
| Lotion, Organic Body, 16 oz           | 17,988  | 19,487  | 17,239  | 17,988  | 22,485  | 26,982  |
| Lotion, Organic Body, 24 oz           | 26,388  | 28,587  | 25,289  | 26,388  | 32,985  | 39,582  |
| Lotion, Extra Moisturizing Body, 9 oz | 8,388   | 9,087   | 8,039   | 8,388   | 10,485  | 12,582  |
| Lotion, Organic Hand and Body, 9 oz   | 10,188  | 11,037  | 9,764   | 10,188  | 12,735  | 15,282  |
| Lotion, Organic Hand and Body, 16 oz  | 19,188  | 20,787  | 18,389  | 19,188  | 23,985  | 28,782  |
| Mask, Organic Facial, 9 oz            | 16,788  | 18,187  | 16,089  | 16,788  | 20,985  | 25,182  |
| Mask, Wrinkle Reducing Facial, 9 oz   | 22,788  | 24,687  | 21,839  | 22,788  | 28,485  | 34,182  |
| Mask, Wrinkle Reducing Facial, 16 oz  | 5,399   | 4,679   | 4,139   | 4,319   | 5,399   | 6,478   |
| Mask, Wrinkle Reducing Facial, 24 oz  | 8,099   | 7,019   | 6,209   | 6,479   | 8,099   | 9,718   |
|                                       | 177,766 | 189,655 | 167,777 | 175,066 | 218,833 | 262,598 |

**Figure 9 - Sample Heat Map Created Using Conditional Formatting in Excel**

### Treemap

Treemaps are a relatively new type of chart that helps users make relative comparisons of the data. Treemaps are excellent alternatives to pie charts, donut charts, and similar charts used for the same purpose. Treemaps offer an advantage over many other charts: they compare multiple data series.

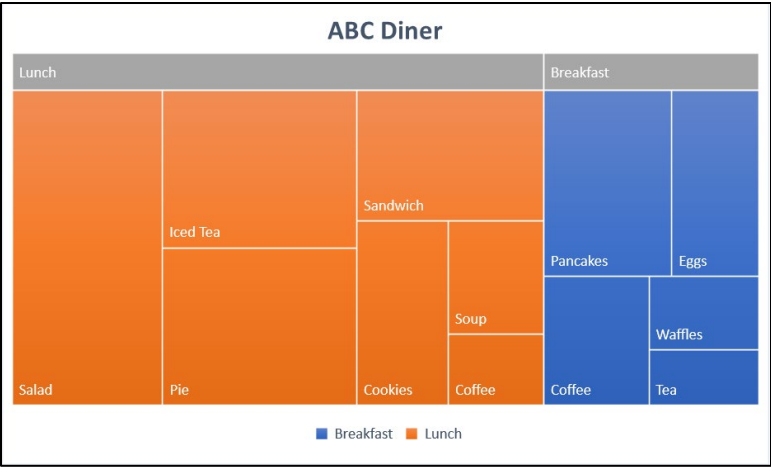


Figure 10 - Sample Treemap Chart Comparing Two Data Series

Gantt chart

Gantt charts illustrate schedules and progress toward milestones. Most commercially available project management applications provide Gantt charts to help managers move projects from start to finish. Unfortunately, Microsoft Office applications do not offer Gantt charts as a default chart type. However, you can create Gantt charts in Excel using Conditional Formatting and Stacked Bar Charts to indicate the completion status of project tasks. Alternatively, you can download a template and use that as the foundation of your Gantt chart. Microsoft makes this template available at <https://templates.office.com/en-us/Gantt-project-planner-TM02887601>. Figure 11 provides sample output from that template.

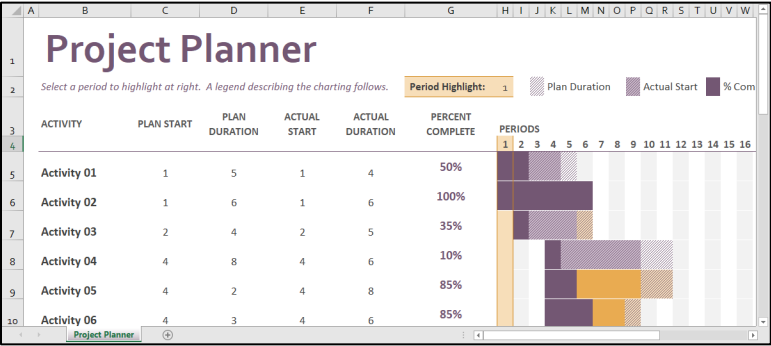


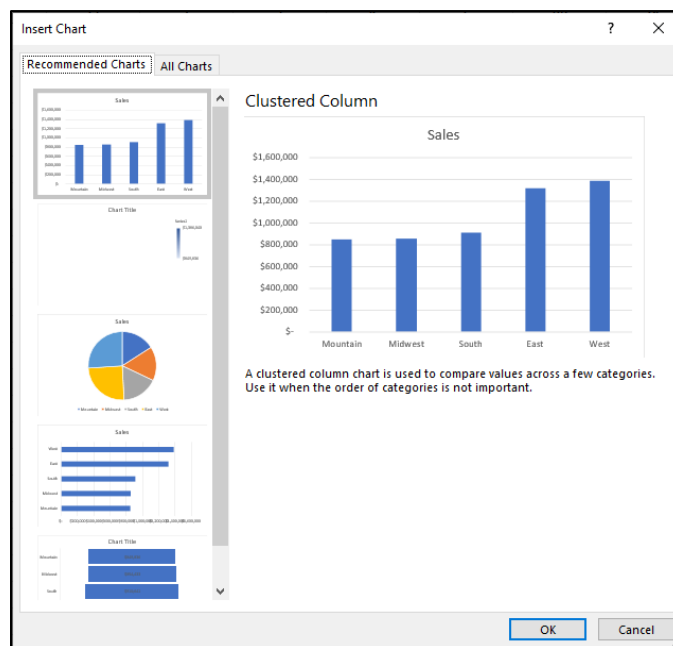
Figure 11 - Sample Gantt Chart Created from Excel Template

The purpose of focusing on the twelve visualizations described above is to point out that you do not need to be an expert in all types of visualizations to use visualizations effectively. Instead, one of the world's leading authorities on this subject indicates that, above all else, the twelve types of visualizations outlined above are what we should master to maximize our chances of success. You will likely use variants of the visualizations discussed above and may also incorporate additional visualizations into your reports and presentations. However, you should focus on these twelve types of visualization outlined above to be most successful.

## Using Recommended Charts for Better Results

If you create charts in Excel, consider using Excel's **Recommended Charts** feature. Found on the Ribbon's **Insert** tab, Recommended Charts analyzes your data and provides a "shortlist" of recommended chart types. If you agree with one of the recommendations, Excel will even create your chart.

To utilize Recommended Charts, click the data range from which you want to create your chart. Next, click the Ribbon's **Insert** tab, followed by **Recommended Charts**. Recommended Charts then analyzes your data and provides recommendations based on that analysis, as shown in **Figure 12**. If you want to create a chart based on one of the recommendations, select the chart type from the dialog box's left side and click **OK**. At that point, Recommended Charts creates the chart for you. Once created, you can edit the chart as if you created it manually. If you choose not to accept any of the recommendations, click the **All Charts** tab to select a specific chart type; alternatively, click **Cancel** to terminate the process.



**Figure 12 - Using Recommended Charts in Excel**

When using **Recommended Charts**, most users benefit from their ability to automatically analyze data and provide recommendations that generally align with the data type. Further, the suggestions typically align with Few's twelve recommended chart types discussed previously. Thus, you can have a high degree of confidence that the chart type selected will genuinely serve as a tool to enhance your message and make it more readily understood by your audience.



Were you previously using Recommended Charts in Excel? If not, do you see the advantages of changing your workflows to include Recommended Charts? Do you plan to begin working with Recommended Charts?

## Presenting Your Data in Context

Regardless of the visualizations you create, you should always present your data in context. Add boundaries, targets, and indicators to your visualizations to help your readers understand the message you are attempting to communicate. For example, suppose you are presenting summarized transactional data. You could contextualize the summarized data by comparing it with a prior period, target/budget results, industry standards, or similar metrics. Any of these comparisons would help the reader better understand the data.

## Remove All Unnecessary Elements

When creating an Excel chart, the application often adds unnecessary elements that detract from your message. For example, unnecessary tick marks on the vertical and horizontal axes contribute to the chart's overall feel being too "busy," and, in most cases, you should remove them. Likewise, remove horizontal gridlines and other unnecessary elements from the chart. By removing these distracting elements, you set the stage for readers to focus on what matters most: the chart data.

This tenet aligns with noted visualization pioneer Edward Tufte's theories about the "*data to ink ratio*." According to Tufte, most of your ink should be spent on the data, not on gridlines, tick marks, unnecessary borders, too many data labels, legends (unless essential), or axes that do not add value.

## Create Your Visualizations with the Right Amount of Data

Following the mantra of "keep it simple," you should avoid trying to put too many data points into specific types of charts. For example, if you are using a pie chart, you should limit the number of slices to no more than six; otherwise, each piece of the pie becomes insignificant. Additionally, line graphs should generally have no more than four lines. The chart can become too "busy" and challenging to understand when you exceed that number. Likewise, we should be prudent with the number of columns in a column chart (no more than six) and the number of bars in a bar chart (no more than fifteen and preferably sorted in ascending or descending order). Adhering to these guidelines will help readers understand the message you are trying to convey with the visualization.

## What Should You Avoid?

Just as there are things you should do to enhance your chances for success when charting, there are also things you should avoid doing. Among these are the following items.

## Avoid Unnecessary Formatting

While virtually all visualizations will require at least minimal formatting, too much will detract from your message. Therefore, avoid unnecessary formatting, including the following.

- Background colors to the chart area or the plot area
- Three-dimensional effects
- Gradients, pattern fills, shadows, and other “frivolous” formats
- Clip art and pictures

## Avoid Small Fonts

Remember that your readers may have challenges reading large numbers printed in small fonts. Therefore, consider using Excel’s custom number formats to reduce trailing zeros in large numbers. For example, if you plot \$27,346,879 in a chart, would it not be as effective to format the number to display as \$27.3M? Of course, you can use Excel’s Custom Format codes to change the data’s appearance without changing the data itself.

## Avoid Generic Chart Titles

Chart titles that present *Acme Widget Company's 2026 Sales* are not useful in most business environments. Instead, replace stale titles with more active text, such as "*We Exceeded Our Sales Goals in All Regions.*" Doing so will remove all doubt about the message you are trying to communicate through your chart.

## Avoid Manipulating Aspect Ratios

An *aspect ratio* is simply the chart’s ratio of height to width. If we make a chart wider without increasing its height proportionately, we alter the aspect ratio and distort the story the chart tells. For example, if the chart is a line chart, we would flatten the trend line. Alternatively, if we increase the chart’s height without a corresponding increase in its width, we will exaggerate the trend. As a rule, the aspect ratio on most charts should be one unit tall by two units wide, up to three units tall by five units wide.



Which items in the "avoids" list have you failed to comply with? Do you think they may have hampered your effectiveness at communicating with visualizations?



# Creating Visualizations In Excel

## Chapter

# 2

Charts assist communication by transforming large volumes of numerical data into easily understandable visualizations. Because charts assist in the communication process – to help people understand data that they might not otherwise comprehend – take great care to select and format charts to ensure they deliver the intended message. Charts of the wrong type, including too much detail or inappropriate color schemes, will not enhance reader understanding. Our review of Excel charting concentrates on identifying the correct choices for effective communication.

## Learning Objectives

Upon completing this chapter, you should be able to:

- Create charts and modify chart elements to customize and improve charts;
- Add analytic elements such as trendlines to charts to improve their usefulness;
- Create PivotCharts to assist in reporting and analyzing potentially large volumes of data; and
- List various dashboard-specific charting techniques and use these techniques in concert with other Excel features discussed in this course to build dashboards.

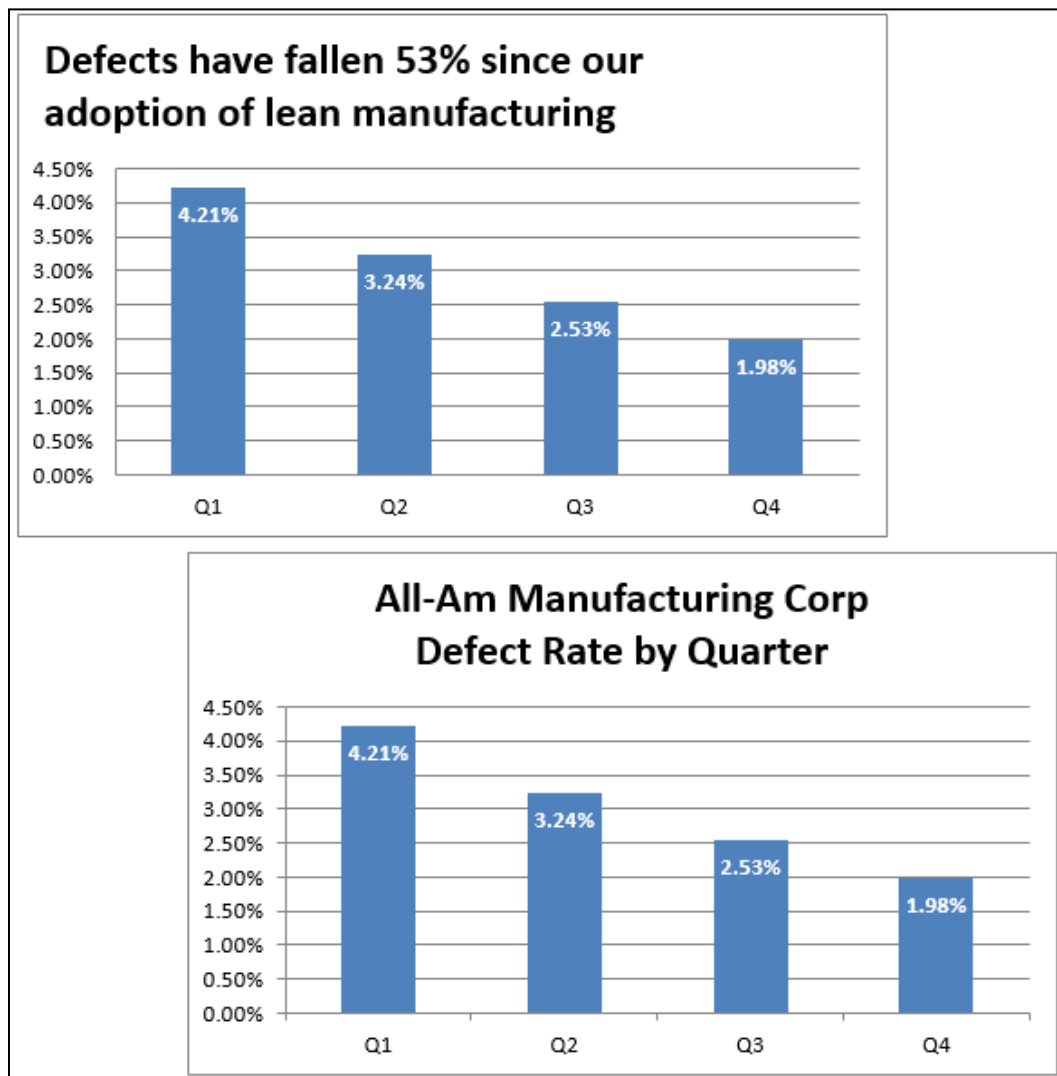
## Choosing a Chart Type

With so many choices, the most challenging part of creating a chart is selecting the type that best fits the situation. However, a few guidelines may be helpful.

- Column charts, bar charts, cylinder, cone, and pyramid charts are the best choices when comparing items to other items.
- Line and area charts are usually superior to other options when comparing data over time.
- *Pie* and *doughnut charts* help compare one data point to another. Also, *stacked bar charts*, *stacked column charts*, *100% stacked bar charts*, and *100% stacked column charts* are good choices.
- Causal relationships in data are often best depicted with *XY charts*. However, in this case, if you need to plot three data values, use a *bubble chart* instead of an XY chart.

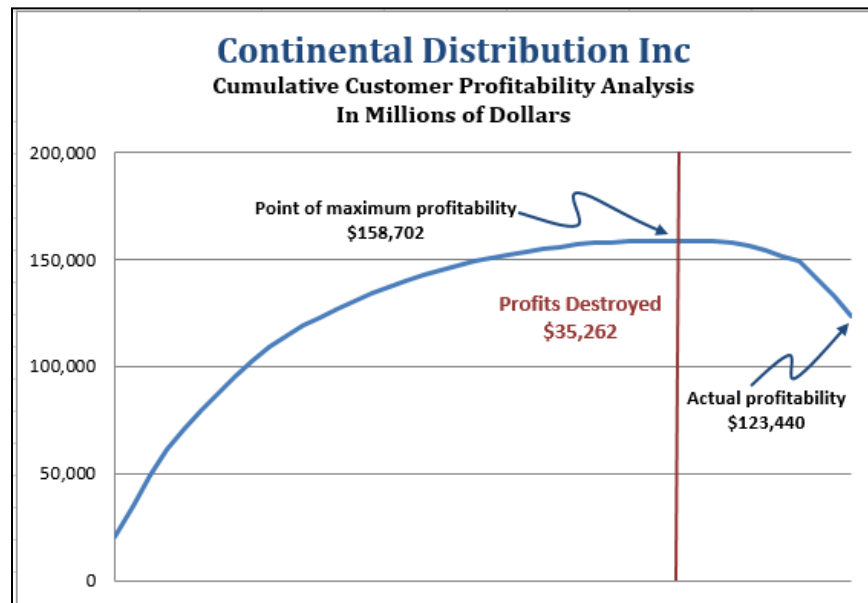
## Communicating More Effectively with Charts

Communicating effectively with charts requires a strategy. Before creating a chart, take time to determine what the chart should communicate and which type of chart will most effectively convey that message. If possible, include the message in the chart's title. For example, compare the two charts in **Figure 13**. Note that the top chart is more effective at communicating its message because the message is stated explicitly in the title.



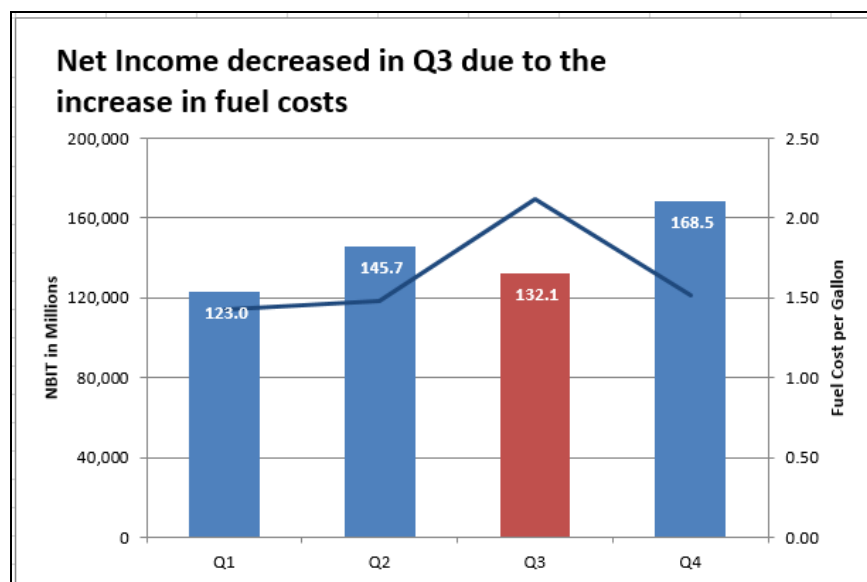
**Figure 13 - Putting the Message in the Title of the Chart**

Alternatively, annotate the chart with text boxes and arrows to clearly communicate the message, as shown in **Figure 14**. When charts communicate intended messages clearly, productivity and decision quality improve. Productivity improves because staff members do not waste time preparing or delivering explanations of charts. Decision quality improves because the intended message is communicated effectively, reducing user misunderstandings and the poor decisions they lead to.



**Figure 14 - Using Text Boxes and Arrows to Create Self-explanatory Charts**

Another technique for communicating information effectively with charts is to highlight key points with contrasting colors. For example, net income may have declined sharply in the third quarter, as fuel costs had risen for several months. To draw attention to this anomaly, use a contrasting color to present net income results for the third quarter, as shown in **Figure 15**.



**Figure 15 - Using Contrasting Colors to Highlight Data of Interest**

### Elements in an Excel Chart

Each Excel chart contains some or all of the elements listed below. More importantly, you can format *each component* independently of the others. If an element needs modification to display correctly, click it, then modify it using the Ribbon or a contextual menu. Alternatively, you can select specific chart elements for alteration from the drop-down box in the **Current Selection** group on the **Chart Tools, Format** contextual tab of the Ribbon.

Adjust the formatting, scaling, appearance, and other characteristics as needed, then move on to the next element. While Excel does an excellent job automating the entire charting process, advanced users can still fine-tune charts by modifying individual components.

- **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** – identify data points
- **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

- **Gridlines** – used to extend labels from an axis visually
- **Chart Area** – background area of a chart
- **Error Bars** – display potential error amounts relative to each data marker in a data series
- **Chart Title** – identifies the chart

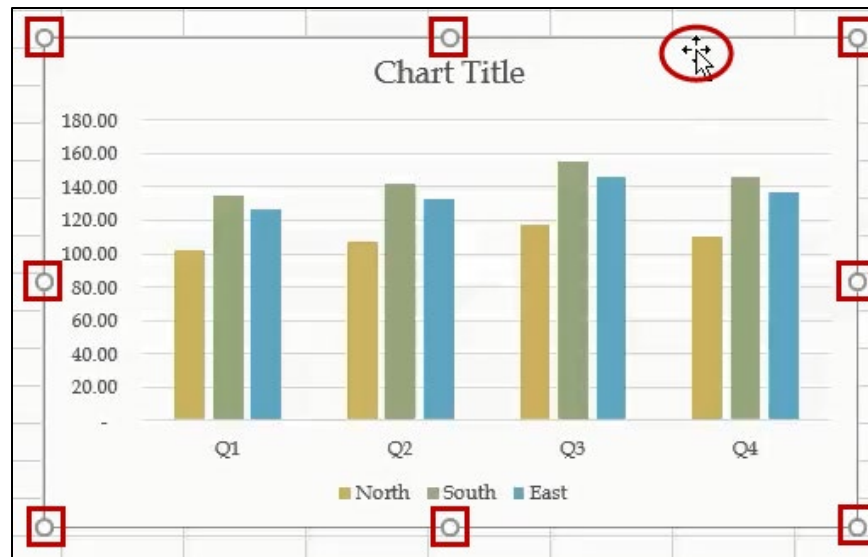
## Creating a Chart

Creating a chart in Excel requires four basic 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, Design** contextual tab of the Ribbon, and
4. Fine-tuning the chart's look and feel on the **Chart Tools, Design**, or **Format** contextual tabs of the Ribbon or by right-clicking and using a context-sensitive menu.

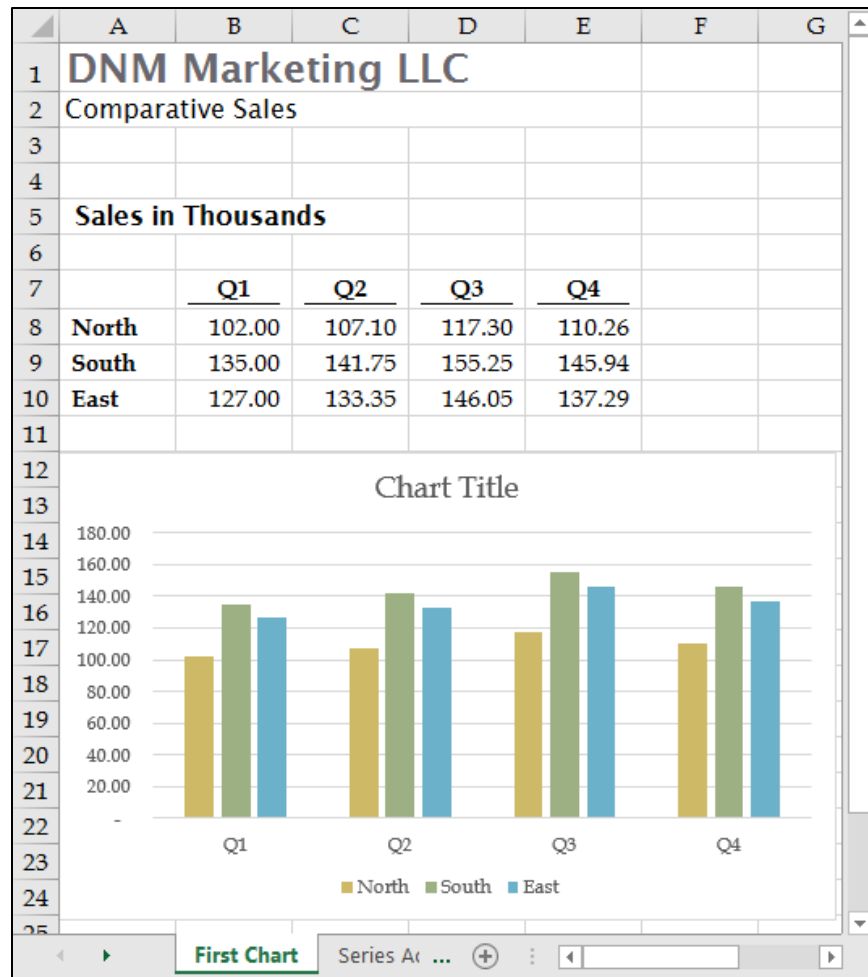
Generally, arranging the data with the X-axis categories in columns and the data series in rows produces the best charts by default. If the data series is in columns, you can switch the axes with a single click by clicking **Switch Row/Column** on the Ribbon's **Chart Design** tab. While most Excel users 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 cells.

To create the first example chart, position the cursor within the data. Next, press **ALT + F1** to create a chart as an object on the worksheet containing the data, then reposition and resize the chart as desired. To resize a chart, select the chart and then click on one or more of the eight resizing handles on its border, indicated by the rectangles in **Figure 16** and drag them to resize the visualization.



**Figure 16 - Using the Chart Border to Resize and Reposition a Chart**

Select a chart and click on its border to reposition it, avoiding the resizing handles. The cursor will change to a compass rose, as shown in the circle in Figure 16. At this point, you may drag the chart to its desired position. After repositioning the chart, the worksheet should resemble the one in **Figure 17**.



**Figure 17 - Simple Column Chart Created with a Single Keystroke**



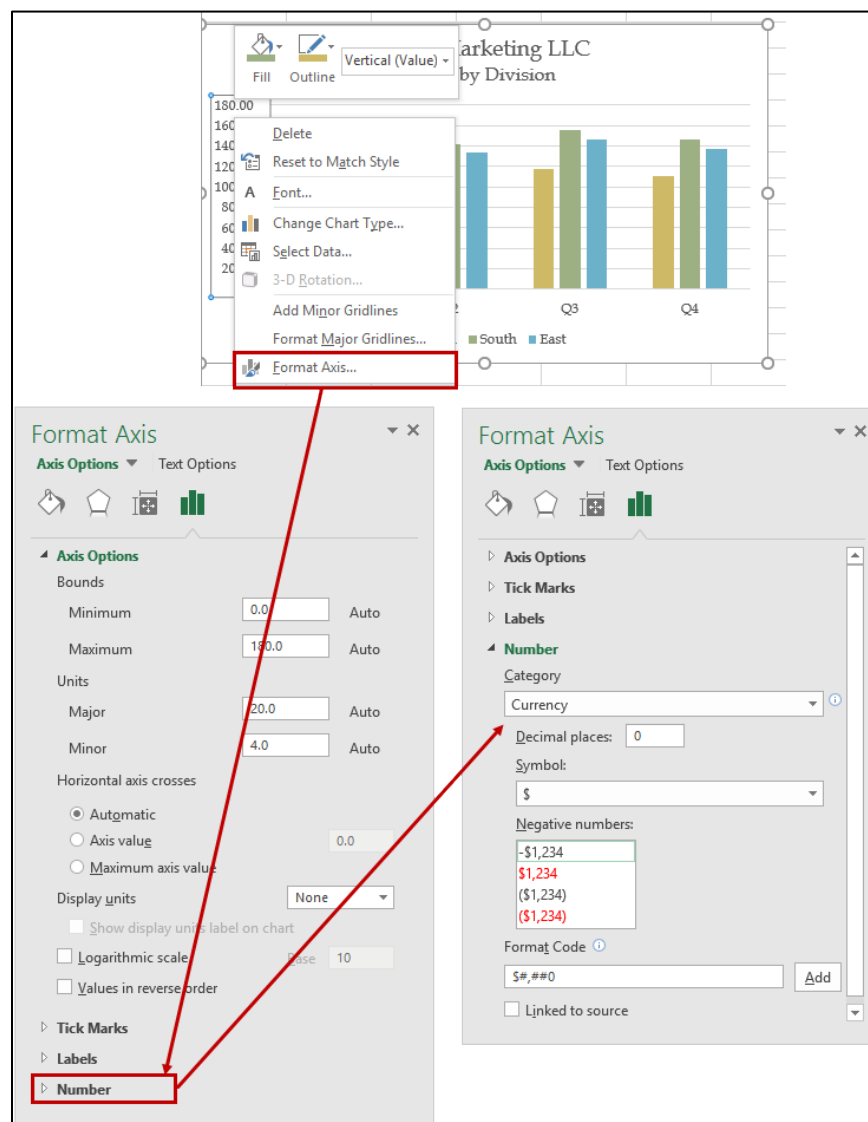
To create a chart on a separate Chart Sheet, position the cursor within the data to be charted and press **F11**. Both one-click methods generate a chart using the default chart type. To change the default chart type, click on a chart to display the **Chart Tools** tab. Next, select the **Chart Tools,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

In our example, a simple column chart is appropriate for our needs, but you can change a chart's type at any stage of creation or use. Our chart needs a title and the Y-axis formatted to display dollar signs and zero decimal places.

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

Now, let us change the number format of the quarterly sales amounts. First, right-click anywhere on the numbers in the Y-axis area to activate the axis. A gray box will surround the area. Next, select **Format Axis** from the contextual menu to open the **Format Axis** dialog box. Click **Number** to expand the formatting options. Then, choose **Currency** in the **Category** box, enter **0** decimals, and select **\$** as the symbol. Formatting is applied to the chart as you make selections. The process described appears in **Figure 18**.

You can shorten the formatting process by using the context-sensitive menu. For example, to format a chart's vertical axis, right-click on the vertical axis and select **Format Axis**. You can format any chart element using this shortcut process.



**Figure 18 - Changing the Number Format of the Y-Axis**

Suppose 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**)

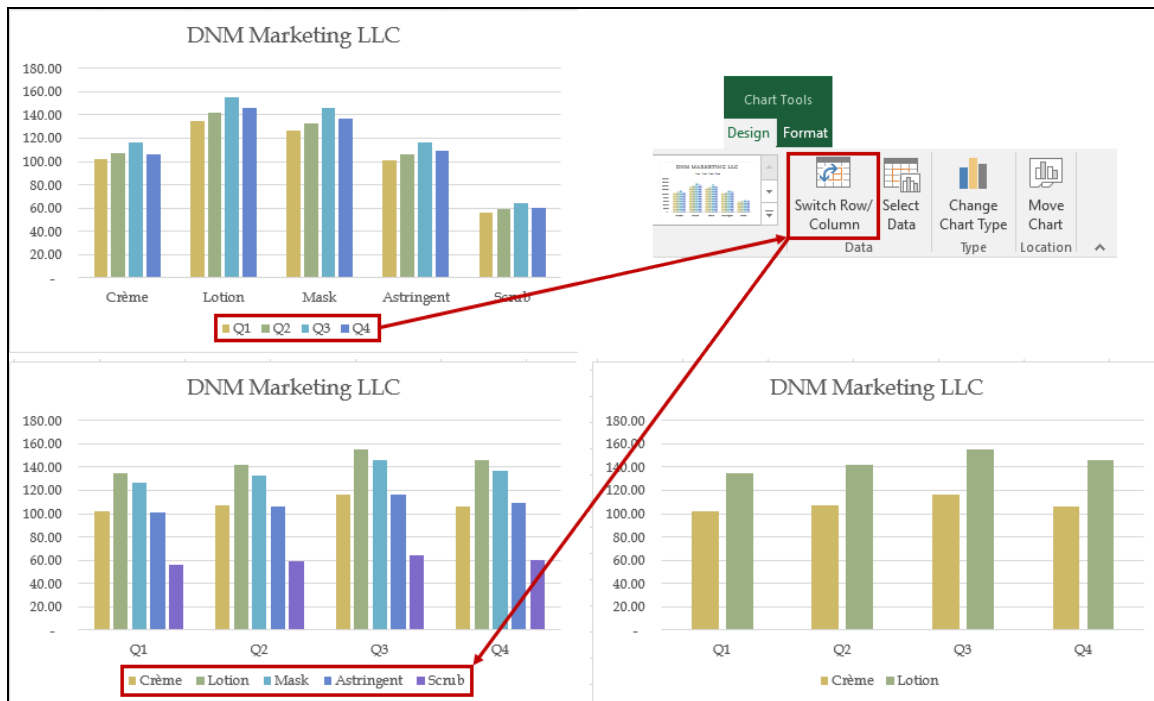
and data in the column immediately to the right and adjacent to the current data. Next, enter **112.2**, **148.4**, and **139.7** for the North, South, and East divisions. Now, click on the chart. A green box surrounds the legends in the source data, a magenta box surrounds the X-axis labels, and a blue box surrounds the data series. Click and drag the blue box in the lower-right corner of the data series area one cell to the right so the new quarter is 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 no longer resides in the data series box. Notice how the chart immediately changes to reflect the new data range.



You could build your chart from a table rather than using the method mentioned above. Then, add the data for the additional quarter to the table. Upon doing so, the chart based on the table data will automatically update to include the new data. Furthermore, you can apply filters to the table, and as you filter the data, the chart updates in real time to reflect the filters.

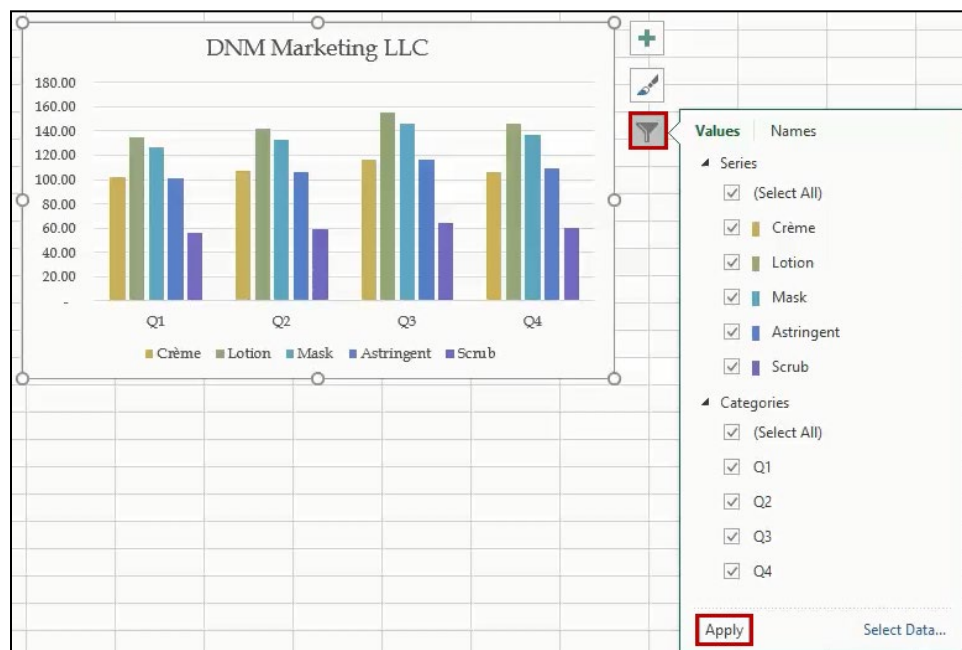
## Manipulating Axes

The following example demonstrates how you can quickly 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 to include a chart title and a legend on the right. Note that the chart displays quarters in the legend and product groups on the X-axis. Switch the axes so the product groups become the legend and the quarters become the X-axis. 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 on the X-axis. Debbie, the owner of DNM Marketing, wants a chart to help her understand whether the new lotion line cannibalizes the old crème line. Click on the chart columns for *Mask*, *Astringent*, and *Scrub*, and press **DELETE** to remove these three data series from the chart. **Figure 19** illustrates this process.



**Figure 19 - Switching Axes and Deleting Data Series**

You can filter a chart on-screen without manually deleting data. To initiate this process, click on the chart. Next, click the **Filter** button next to the chart. In the resulting dialog, uncheck the boxes next to the items you want to filter from the chart, or check the boxes next to the items you want to add. Finally, click **Apply** to confirm your selection, as shown in **Figure 20**.



**Figure 20 - Filtering a Chart in Excel**

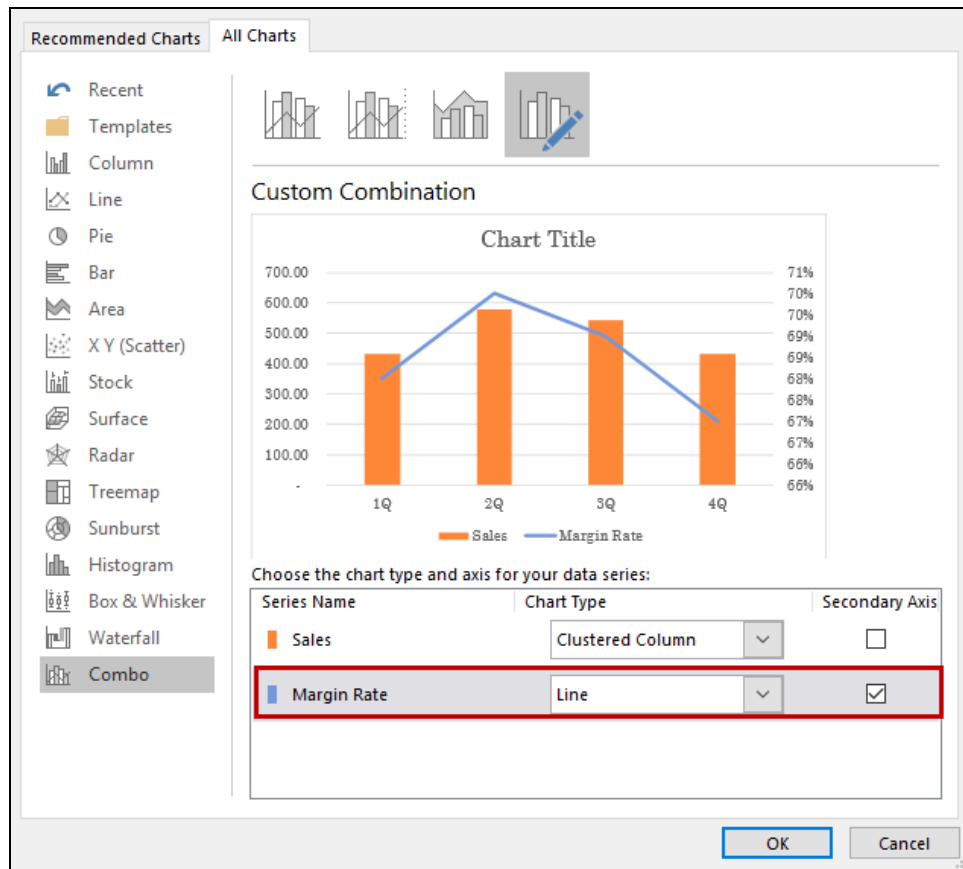
Let's improve the chart's presentation style. First, click the chart and select the **Chart Design** tab. Next, expand the **Chart Styles** gallery and choose **Style 4**. **Figure 21** illustrates the completed and formatted chart.



**Figure 21 - A Professional Chart Created with a Few Clicks**

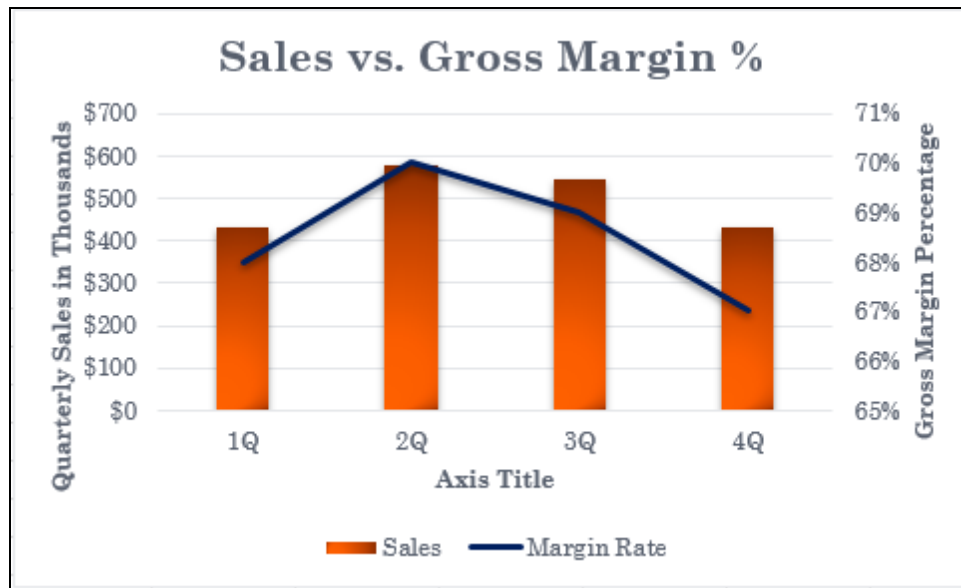
#### Combination Chart on Two Axes

The following example uses a combination line-and-column chart on two axes to display quarterly sales dollars and the gross margin percentage. Begin by clicking in or selecting the data range you wish to plot in a combination chart. Next, press **ALT + F1** to create the default chart and then choose **Change Chart Type** from the Ribbon's **Chart Design** tab. In the resulting dialog box, indicate which of the data series – in this example, *Margin Rate* – you want to plot on the secondary axis, as shown in **Figure 22**.



**Figure 22 - Plotting Second Data Series on the Secondary Axis**

Finally, adjust the formatting as desired to produce your combination chart, an example of which **Figure 23** presents.



**Figure 23 - Completed Combo Chart in Excel**

## Adding Analytic Elements

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

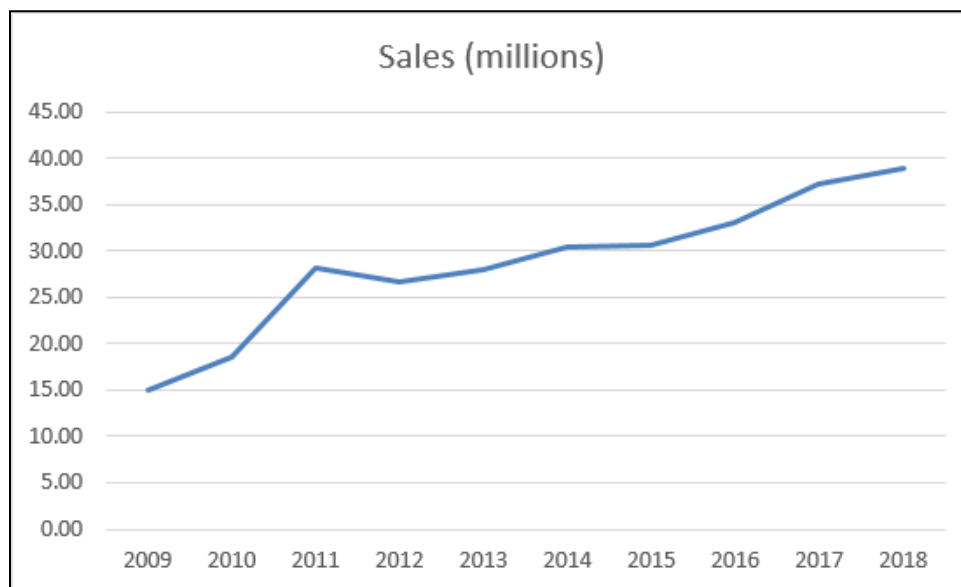
- **Trendlines** – Statistical trends fitted to data using least squares regression
- **Error bars** – Used to show the standard error of an estimate
- **Drop lines** – Vertical lines from data points to the x-axis so that you can ascertain the exact location of the data point on the x-axis
- **Up/down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

In the following example, Jill Harris, the CFO of GTM Manufacturing, is trying to determine whether current-year sales revenues are reasonable relative to those from prior years. **Figure 24** presents a summary of the company's sales data. Jill believes a chart with a trendline will be the best way to confirm that sales are reasonable and in line with company trends. She also likes the visual impact of the chart at tomorrow's Board of Directors meeting, where Jill will brief the Board on GTM's financial performance.

|    | A    | B                   |
|----|------|---------------------|
| 1  | Year | Sales<br>(millions) |
| 2  | 2009 | 15.00               |
| 3  | 2010 | 18.60               |
| 4  | 2011 | 28.20               |
| 5  | 2012 | 26.64               |
| 6  | 2013 | 28.08               |
| 7  | 2014 | 30.48               |
| 8  | 2015 | 30.60               |
| 9  | 2016 | 33.00               |
| 10 | 2017 | 37.32               |
| 11 | 2018 | 38.88               |

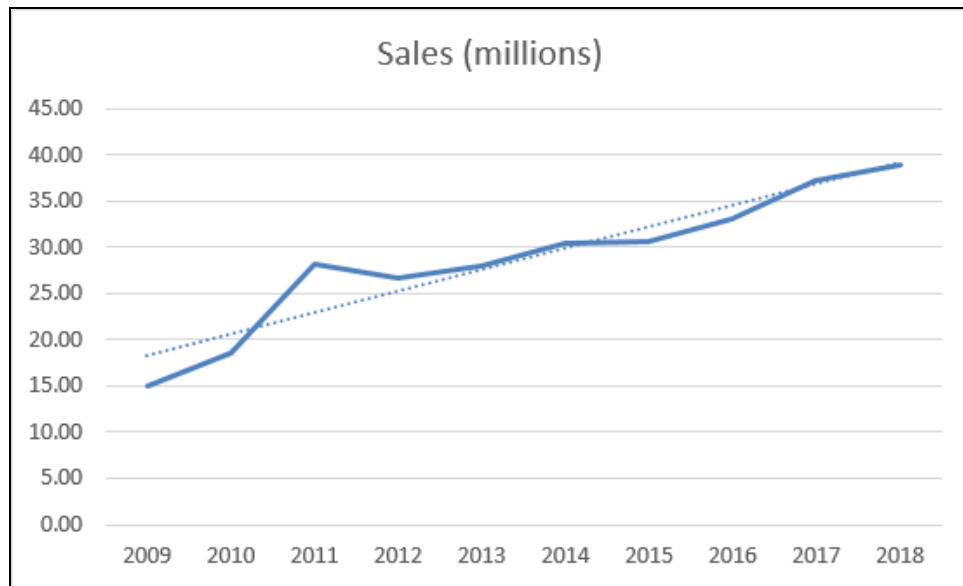
**Figure 24 – Summarized Sales Data**

To create the chart with a trendline, Jill begins by clicking the data and choosing **Line** chart from the Ribbon's **Insert** tab, followed by **2-D Line chart**. Next, she edits the data so that **Year** becomes the horizontal axis, and she deletes the **Legend** to create the graph shown in **Figure 25**.



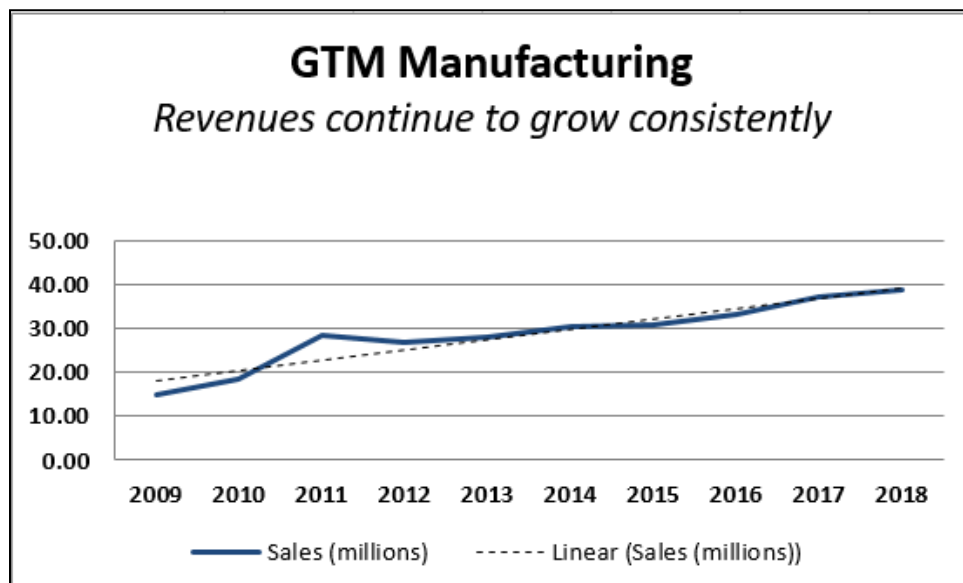
**Figure 25 - Initial Draft of Chart for GTM Manufacturing Sales Performance**

Next, Jill adds the trendline by right-clicking on the chart's Sales line and choosing **Add Trendline...** from the pop-up menu. Finally, she accepts the default of a linear trendline and clicks **OK** to produce the visualization shown in **Figure 26**.



**Figure 26 - Sales Chart with Trendline**

Based on the trendlines on this chart and its proximity to the line for actual Sales revenue, Jill is comfortable with the reasonableness of the recorded income for 2018. She changes some of the chart's formats to create the final product, shown in **Figure 27**.



**Figure 27 - Completed Sales Chart with Trendline**

## Introducing PivotCharts

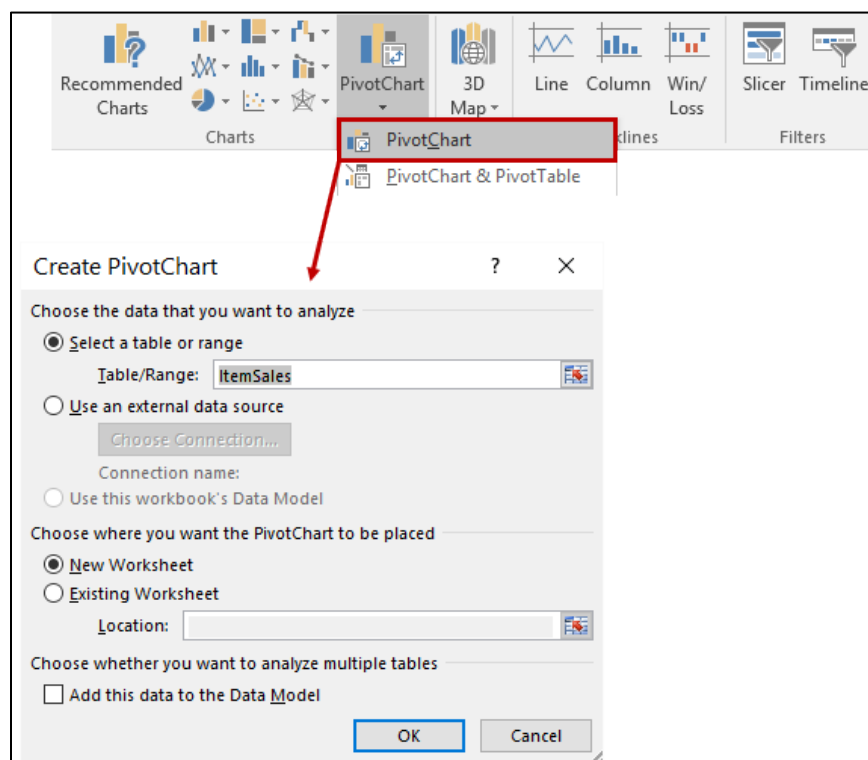
Business professionals often face the prospect of summarizing large quantities of data to produce a chart. Excel can automate data summarization and charting with PivotTables. If the source data

is a table, the PivotChart automatically updates when you add new records. Of course, tables can serve as dynamic data ranges for virtually any object in Excel.

In this example, the **Sales by Item Detail** report exported from QuickBooks will serve as the data for the PivotChart. First, convert the data to a table. Position the cursor in the data and choose **Format as Table** from the Ribbon's **Home** tab. Next, select a *Table Style* to convert the data to a table.

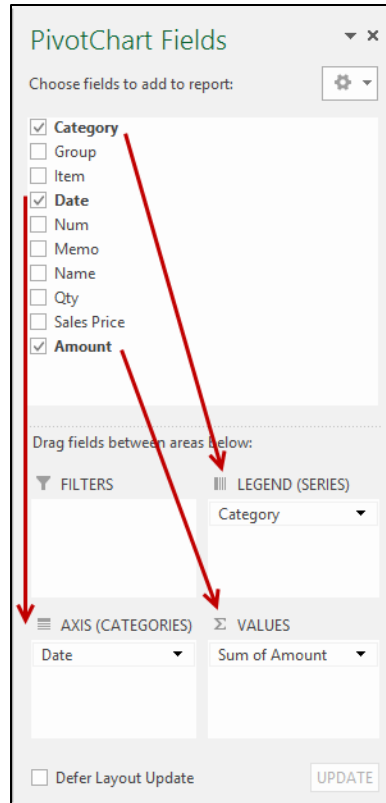
To create a PivotChart, follow the six steps outlined below.

1. Position the cursor in the table and select **PivotChart** from the Ribbon's **Insert** tab, as shown in **Figure 28**. Click **OK** to accept the defaults in the **Create PivotChart** dialog box.



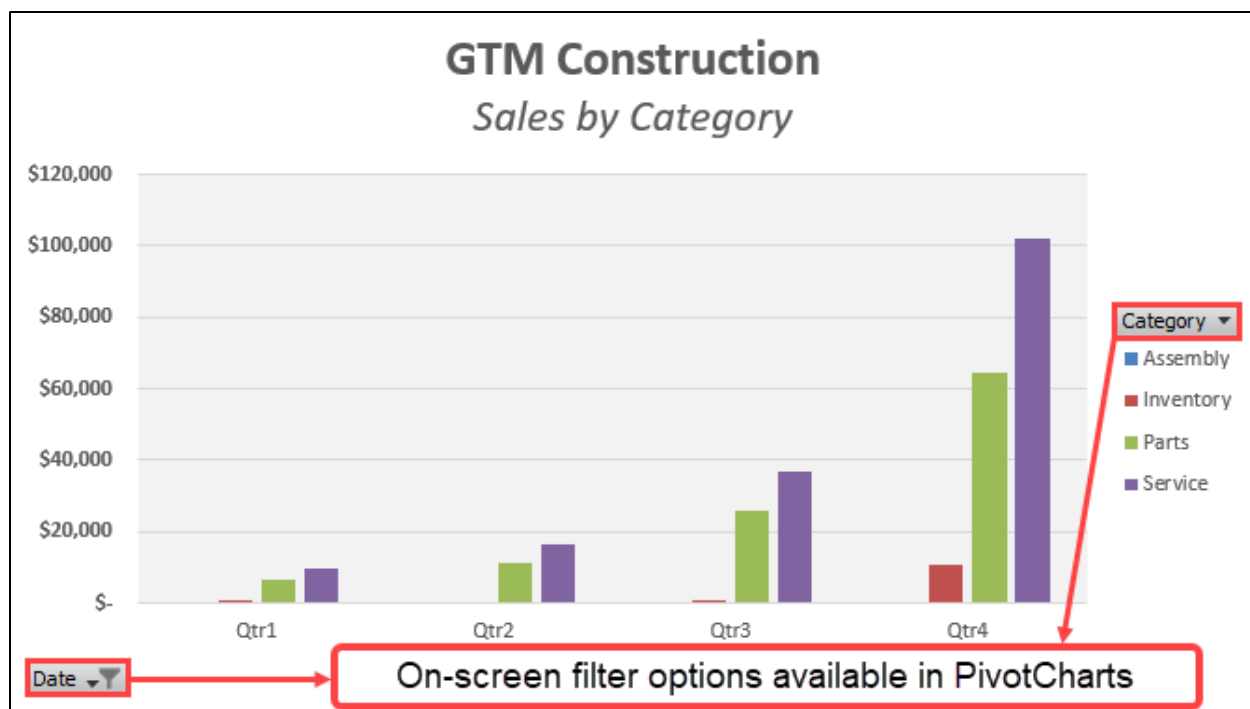
**Figure 28 - PivotCharts Created from the Insert Tab**

2. Excel inserts a new worksheet and a blank chart into the workbook. A task pane opens on the right, including the **PivotTable Fields** at the top and the four **PivotChart Layout** quadrants at the bottom.
3. To create the initial PivotChart, drag each field from the list to the appropriate quadrants. Drag **Date** to **Axis**, **Category** to **Legend**, and **Amount** to **Values**. The label for **Amount** changes to **Sum of Amount**, indicating that the PivotChart will sum the field, as shown in **Figure 29**.



**Figure 29 - Dragging Data Fields to the Appropriate Quadrant**

4. Select **Date** in the **Field List** and click the drop-down arrow on the right. Next, choose **Date Filter** and apply a filter to show only the desired results in the PivotChart.
5. Next, group the dates by quarters. Right-click on any date in the **Rows** area of the PivotTable and choose **Group**. In the **By** box, select **Quarters** and unselect **Months**. The PivotChart now displays four quarterly columns.
6. Choose a combination of chart layouts, styles, and themes to format the PivotChart using the same processes as when working with a standard chart. When complete, your chart should resemble the one in **Figure 30**.



**Figure 30 - 3-D PivotChart Created from Detail Data**

As shown in Figure 30, a PivotChart allows users to filter the chart on-screen. By clicking either the Category or Date filter shown above, users can control the data displayed in the PivotChart. Furthermore, because a PivotChart is inextricably linked to the underlying PivotTable, filtering the chart will apply the same filters to the PivotTable. From a practical perspective, these on-screen filters facilitate interactive charting. This feature would otherwise require significant development effort, often involving the creation of dynamic defined names and linking them to form controls. One potential disadvantage of the on-screen filters is that they are visible on printed output. If this is problematic, turn off the filters by right-clicking on any on-screen filter and selecting **Hide All Field Buttons on Chart** from the pop-up menu.

## Other Charting Techniques

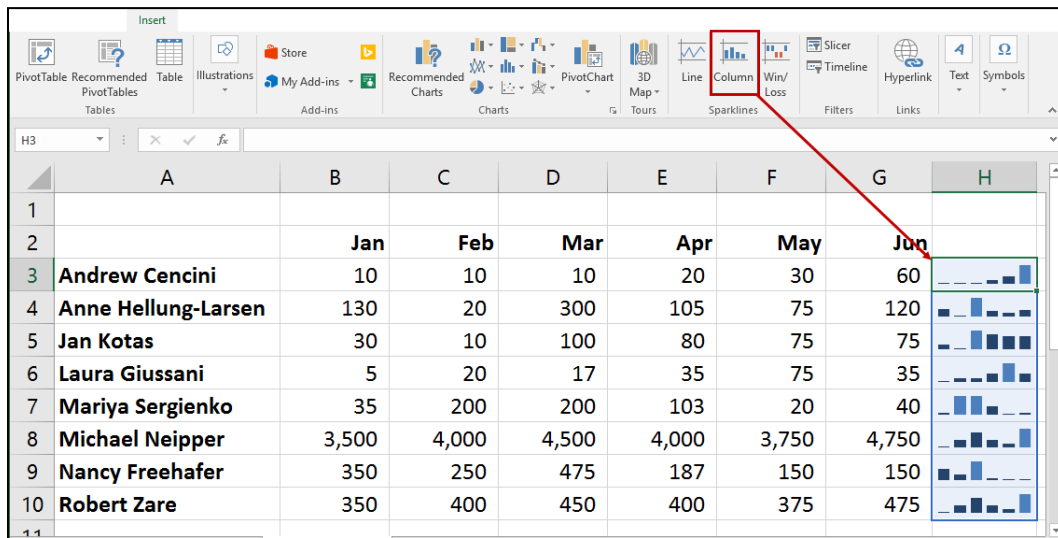
### Sparklines

Microsoft added **Sparklines** to Excel over 15 years ago to help readers visualize trends in a spreadsheet's data rows. As shown in **Figure 31** and **Figure 32**, Sparklines generate miniature graphs for each data row. You can present Sparklines in an adjacent column or a summary report, much like a dashboard-style report.

To insert Sparklines, go to the Ribbon's **Insert** tab and select one of three options in the **Sparklines** group, as shown in Figure 31.

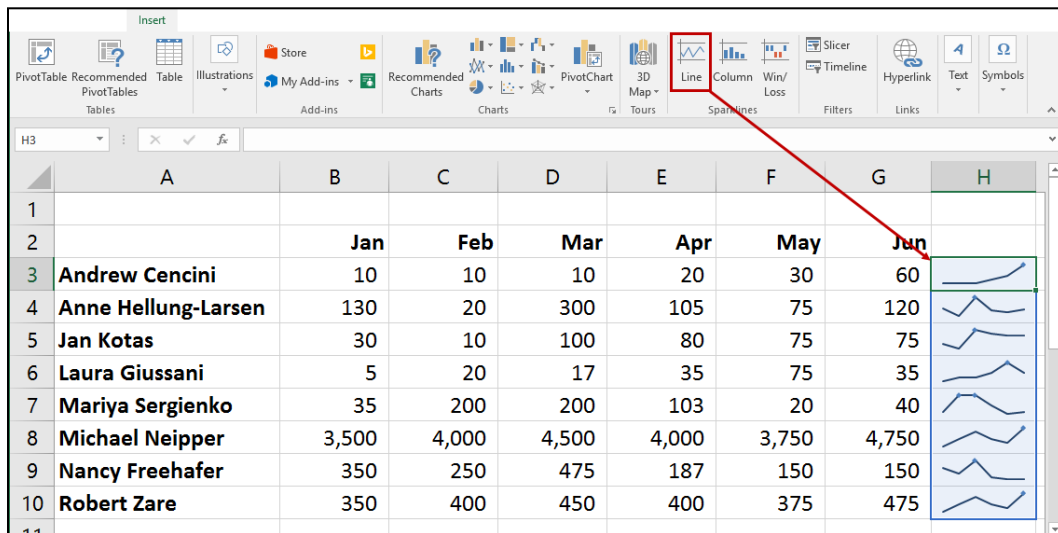
There are three basic kinds of Sparklines.

1. **Column Sparklines**, shown in **Figure 31**, approximate a Column chart.



**Figure 31 - Column Sparklines Providing Data Visualization for Records in Data Sets**

2. **Line Sparklines**, shown in **Figure 32**, resemble a Line chart.

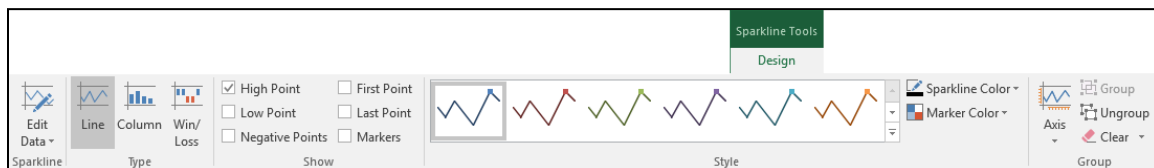


**Figure 32 – Line Sparklines Provide a Different View to Data Sets**

3. **Win/Loss Sparklines** show the change from column to column as a bar chart instead of the values.

Once created, clicking on a Sparkline activates the **Sparkline Tools** contextual tab on the Ribbon, pictured in **Figure 33**. You can edit and format a Sparkline or series of Sparklines from this tab. 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 all;
- The color of the Sparkline; and
- Axis options.



**Figure 33 - Sparkline Tools Contextual Tab**



Which visualization techniques discussed in Chapter 2 will likely be most beneficial to you and why?

# Beyond The Basics For More Effective Visualizations And Communication

## Chapter

# 3

Charts and graphs are nothing new. However, many professionals struggle to build compelling visualizations that enhance communication and understanding of the presented data. This chapter teaches you how to create advanced interactive, dynamic, and animated charts. If you want to improve your communication skills, the information in this chapter will prove invaluable.

## Learning Objectives

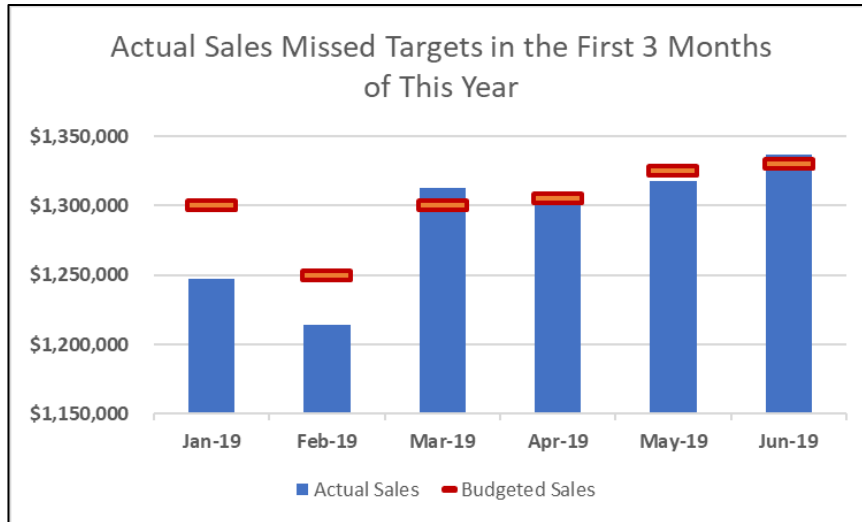
Upon completing this chapter, you should be able to:

- List processes necessary to customize standard visualizations in Excel;
- Identify key objectives and techniques associated with interactive visualizations;
- List steps necessary to integrate Excel-based visualizations into other documents; and
- Distinguish between Sparklines and Conditional Formats and identify how to create these visualizations in Excel.

## Presenting Your Data in Context

As mentioned previously, regardless of the visualizations you create, you should always present your data with appropriate context. This technique will help your readers understand the real meaning of the numbers – we are ahead of schedule, we are over budget, our competitors are closing the gap, among others. Additionally, you can add items such as performance bands, budgeted values, and other indicators to your visualizations to help your readers understand the message you are trying to communicate. For example, if your visualization presents summarized transactional data, the following three techniques can add necessary context.

1. Display the actual results for the current period and the prior period.
2. Display the actual results for the current period and budgeted/forecasted data. **Figure 34** displays a combination line chart with markers and a column chart to compare actual versus budgeted results. We modified the chart to remove the line, leaving only the budgeted data markers.

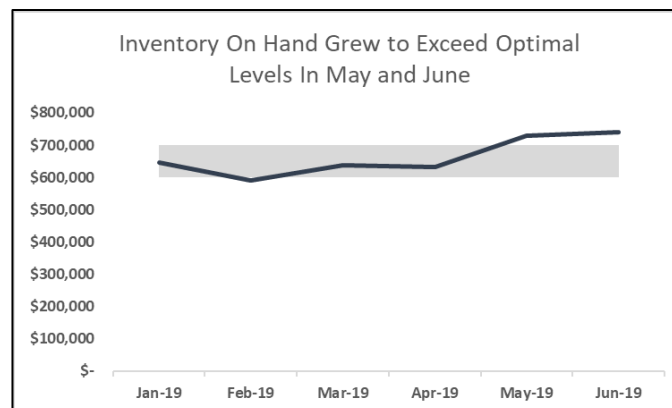


**Figure 34 - Using a Combination Chart to Display Actual Results Compared to Budget**

- In addition to displaying actual data for a range of dates, show acceptable boundaries for the results. The example in **Figure 35** compares actual results to satisfactory results. This chart summarizes the following data.

|             | 1/31/2019 | 2/28/2019 | 3/31/2019 | 4/30/2019 | 5/31/2019 | 6/30/2019 |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Lower Limit | 600,000   | 600,000   | 600,000   | 600,000   | 600,000   | 600,000   |
| Upper Limit | 100,000   | 100,000   | 100,000   | 100,000   | 100,000   | 100,000   |
| Actuals     | 647,291   | 589,311   | 637,400   | 630,898   | 727,661   | 741,331   |

With the data in place, create a **Stacked Area Chart**. Right-click the **Actuals** series and change the **Chart Type** to a **Line Chart without Markers**. Next, right-click the **Lower Limit** data series and choose **Format Data Series**. Next, click **Fill** and select **No Fill**. Finally, adjust the formatting options to suit your needs and complete the chart.



**Figure 35 - Displaying Actual Results Compared to a Range of Desired Performance**

With the performance band in place, readers of your chart can understand the message you convey with this chart. This customized chart is more effective than a simple line chart that shows inventory levels only for the first six months of the year.

## How Can I Make My Visualizations Interactive?

You should anticipate that each report reader will want to see the visualizations “sliced” or filtered differently. For example, suppose you present a visualization that shows financial and operational results for each region where your company operates. Different readers will likely want to see the graphic present only the results for the jurisdictions they are responsible for. You can easily accommodate this using one or both of the following techniques: 1) PivotCharts and 2) Tables and Slicers.

### PivotCharts

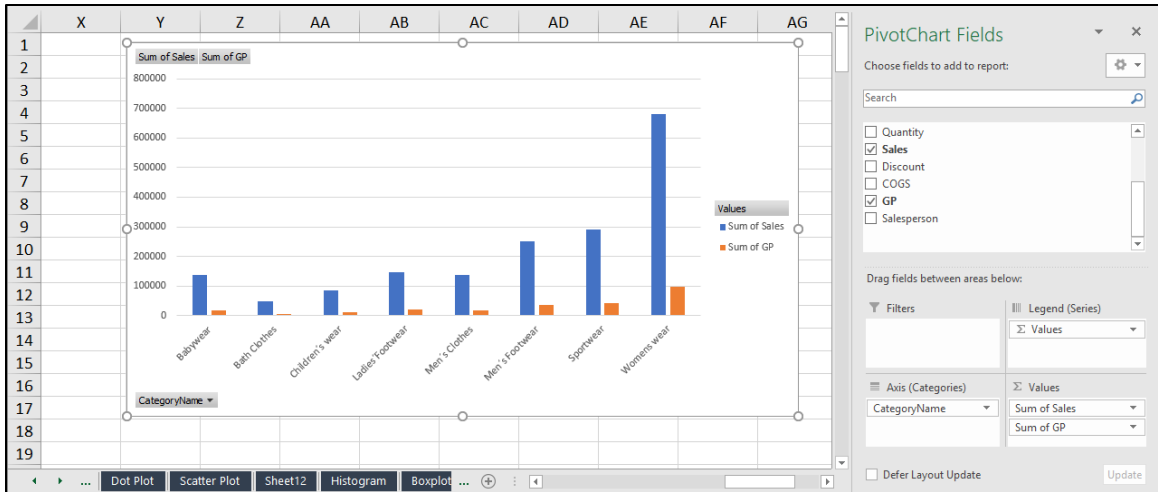
Many Excel users work with PivotTables daily to summarize data into tabular reports. PivotTables are renowned for data “crunching” capabilities and the capacity to handle large volumes of data efficiently, especially if you use the Power Pivot add-in for Excel. However, few PivotTable users leverage PivotCharts to extend their reporting capabilities. This condition is unfortunate because PivotCharts provide built-in filtering capabilities and, as such, should be the first option we explore when building interactive virtualizations.

To create your PivotChart in Excel, perform the following steps.

1. Begin by clicking on the contiguous data range you want to use for your PivotChart.
2. Next, on the **Insert** tab of the Ribbon, click either **Recommended Charts** or **PivotChart**. If you click **Recommended Charts**, then select PivotChart.<sup>1</sup>
3. Finally, drag the desired fields from the Field List into the various quadrants (*Filters, Legend, Axis, Values*) in the PivotChart Fields task pane. Doing so will create a PivotChart like that pictured in **Figure 36**.

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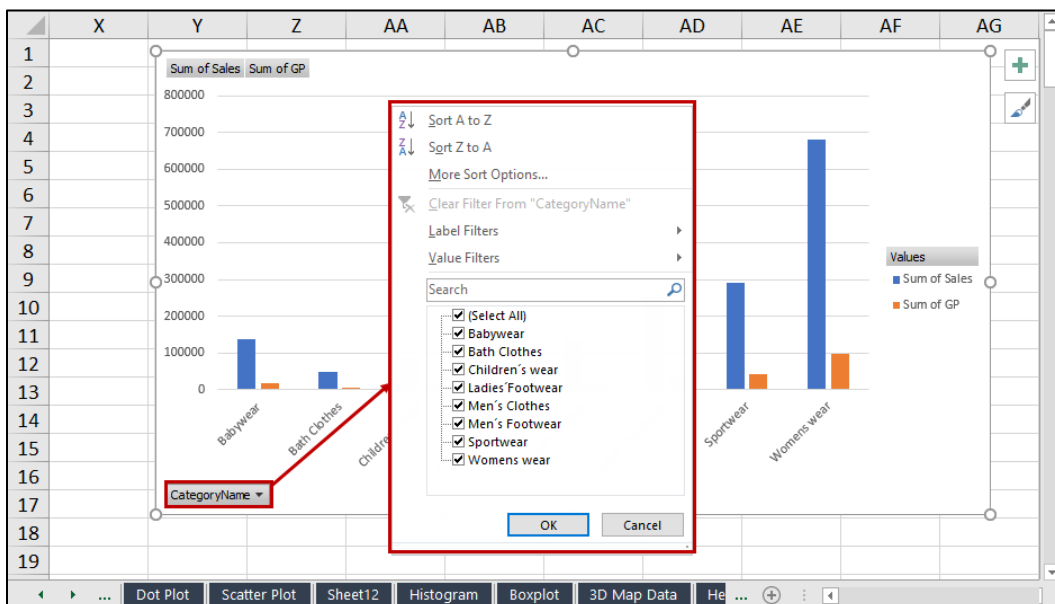
<sup>1</sup> Depending on the data set with which you are working, **Recommended Charts** may not show a **PivotChart** option. If so, click **PivotChart** from the **Insert** tab of the Ribbon instead.



**Figure 36 - Sample PivotChart**

Once you create your PivotChart, you can manipulate it like any other. First, click the PivotChart to select it, and then choose any of the three tabs – *Analyze*, *Design*, *Format* – available from the Ribbon's **PivotChart Tools** tab.

From an interactivity standpoint, note the presence of drop-down filters on the PivotChart face. For example, in the lower-left corner of the chart pictured in **Figure 36**, a filter for *CategoryName* exists. Clicking on that filter allows you to filter the PivotChart to just the *Categories* you desire, as shown in **Figure 37**.



**Figure 37 - Applying a Filter to a PivotChart**

Notably, you can remove the on-screen filters from a PivotChart by clicking the **PivotChart Tools**, **Analyze** tab of the Ribbon, followed by **Field Buttons**. There, you can choose which button you

want to add or remove from the face of your PivotChart. Notwithstanding your selections there, you can still filter your PivotChart by other means, including applying filters in the PivotChart Fields task pane, adding filters to a related PivotTable, or using Slicers to filter your PivotChart and related PivotTable.

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Depending on the data with which you are working, when creating your PivotChart, you may occasionally see an error message indicating, “The maximum number of data series per chart is 255.” This message often appears when you add dates to your PivotChart because the number of items you add (e.g., 365) exceeds the limit. However, you can quickly work around this issue by grouping your items – for instance, individual dates into months, quarters, or years. |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Tables and Slicers

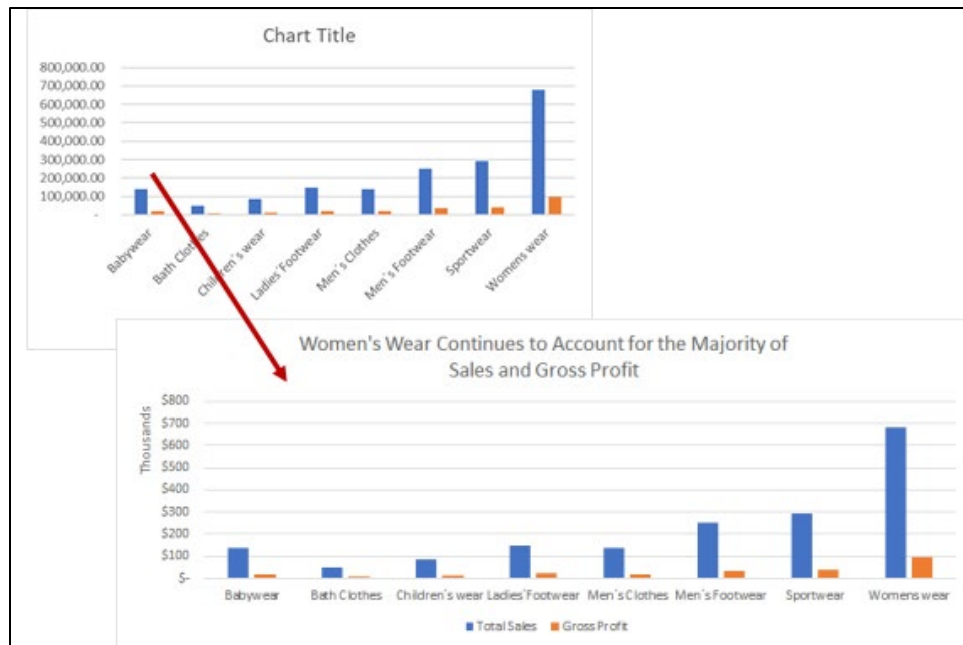
In addition to using PivotCharts to facilitate interactivity, you can also take advantage of Excel’s **Tables** and **Slicers** features. A table serves as a “container” for your data in Excel. One of the many benefits of using Tables is that they automatically expand (and contract) as your data volume changes. Further, all objects – including charts – that use a Table as a data source automatically adjust as the size of the Table changes. Thus, if you create a chart from a Table that contains 100 rows of data and subsequently add 30 more rows of data to the Table, your chart will automatically expand to accommodate the 30 new records.

A **Slicer** is a filter that lets you quickly and easily filter a Table.<sup>2</sup> When you filter your Table with one or more Slicers, all objects that use the Table as the data source will automatically filter to the same criteria. Furthermore, the Slicer’s visual nature will make the current filters visible to all users.

With that background of Tables and Slicers in place, let us now see how to use these tools to facilitate interactivity with charts. Creating a chart from a Table can begin by clicking anywhere in the Table; note that it is unnecessary to select the Table – merely clicking it will suffice. Next, click on **Recommended Charts** or the chart type you specifically desire from the Ribbon’s **Insert** tab. Then, you can modify this chart just like any other visualization. Your results may resemble those shown in **Figure 38**.

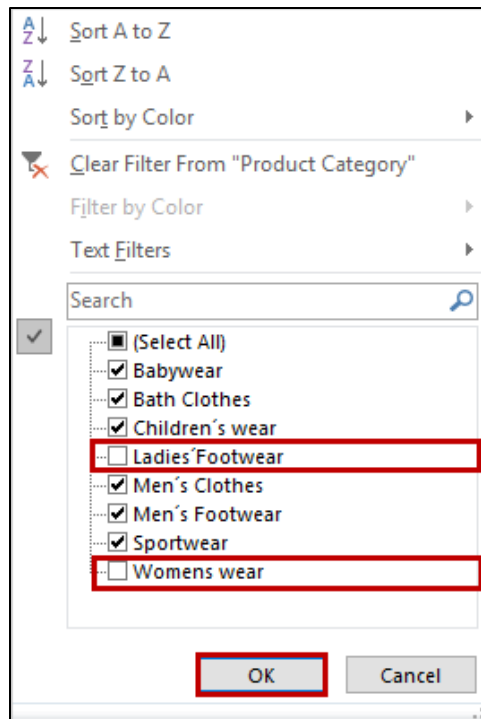
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<sup>2</sup> Microsoft added Slicers to Excel 2010, but, in that version of Excel, you could only use Slicers to filter PivotTables and PivotCharts.



**Figure 38 - Initial and Edited Chart Created from a Table**

Now, return to the Table and click on the *Product Category* drop-down filter. Upon doing so, uncheck the boxes next to *Women's Wear* and *Ladies Footwear* and click **OK**, as shown in **Figure 39**. Immediately after clicking OK, you will notice that the chart created from the filtered Table excludes *Women's Wear* and *Ladies' Footwear* from the results.



**Figure 39 - Applying Filters to Tables**

To demonstrate a Table's auto-expansion capabilities, enter one or more records in the row(s) directly below the Table. You will notice that all charts that use the Table as their data source incorporate the newly added data without any manual intervention.

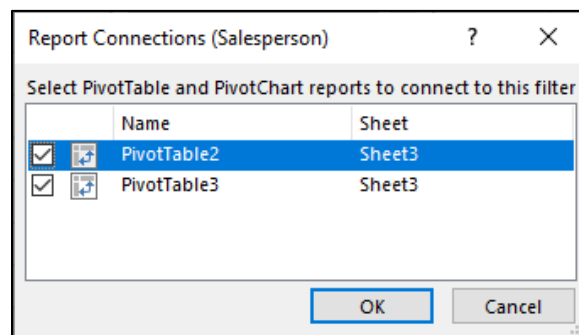
To filter the table and chart more easily, return to the worksheet that contains the Table and click on it. Then, click **Insert Slicer** from the Ribbon's **Table Tools Design** tab. In the resulting **Insert Slicers** dialog box, select the Product Category checkbox, then click **OK**. Upon doing so, Excel inserts a Slicer onto the worksheet that contains the Table. With that Slicer in place, you can filter the Table – and, by extension, the chart built from the Table. To do so, click on any of the Slicer buttons. Next, hold down your **CTRL** key while clicking on items in the Slicer filter to select multiple items.

An additional benefit of Slicers is that, once created, a Slicer does not have to reside on the same worksheet as the Table it controls. Thus, you can copy the chart(s) you create from a Table, paste it (them) onto another worksheet, and copy any related Slicers to that worksheet. Of course, this action would streamline the user environment, so users would only see the chart(s) and Slicer(s). The underlying data would be on another worksheet. If you choose this option, you may consider hiding the worksheet containing the data to avoid end-user issues, including potential security and privacy concerns.

## Slicers and PivotCharts

Previously, we considered and demonstrated PivotCharts. Now that we have discussed Slicers, let us return to PivotCharts to explore how to incorporate them. Once you create a PivotChart, you can add one or more Slicers to help filter the visualization. The process for adding a Slicer to a PivotChart is virtually the same as adding a Slicer to a Table – select the PivotChart and, from the **PivotChart Tools, Analyze** tab of the Ribbon, choose **Insert Slicer**. Then select the fields you want to use to filter your PivotChart, and Excel will create a separate Slicer for each. You can resize and reposition your Slicers as needed to improve usability and appearance.

One little-known feature associated with Slicers and PivotCharts is that you can connect a single Slicer to multiple PivotCharts, provided the PivotCharts are all created from the same data source. To do so, after you generate a Slicer, right-click on it and choose **Report Connections**. Then, check the box next to each PivotChart you want to apply your Slicer, as shown in **Figure 40**. Finally, click **OK** to complete the process. Henceforth, any action you take on that Slicer will apply to all PivotCharts connected to it.



**Figure 40 - Adding a Slicer to Multiple PivotCharts**

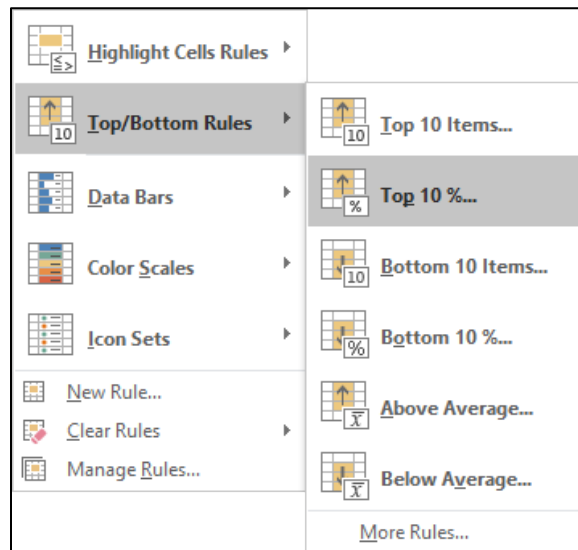
## Beyond Charts, What Types of Visualizations Should I Consider?

For many, “visualization” is synonymous with “chart.” However, there are numerous other options for communicating more effectively with your audience. These include 1) Conditional Formatting, 2) Sparklines, and 3) SmartArt.

### Conditional Formatting

Conditional Formats are formats that you can apply to Excel data that change as the data changes. Earlier in this session, you learned about Conditional Formatting in the form of the heat map pictured in Figure 9. Business professionals can use Conditional Formatting for a range of purposes. These include automatically highlighting the top or bottom x items in a range, Table, or PivotTable, identifying positive or negative variances that exceed a specified amount or percentage, and stratifying data into various groups such as quartiles.

To apply Conditional Formats in Excel, select the data to which you want to add your Conditional Formats. Then, click **Conditional Formatting** from the Ribbon's **Home** tab and choose the type of Conditional Format you would like to apply. **Figure 41** illustrates using a Conditional Format to highlight the top 10% of all the selected data items.



**Figure 41 - Creating and Applying a Conditional Format in Excel**

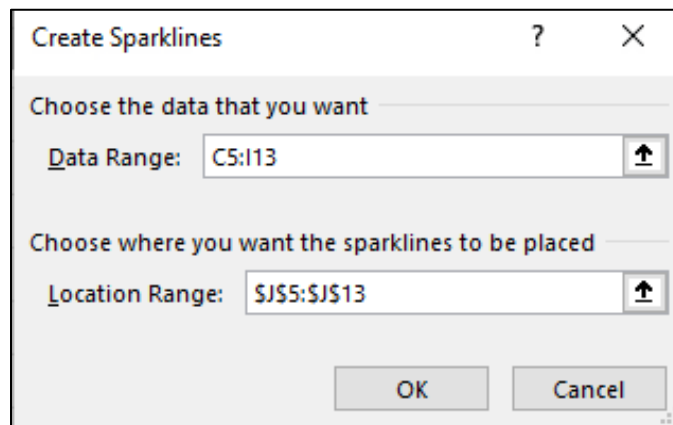
There are several essential points to keep in mind regarding Conditional Formatting.

1. Conditional Formats are not available in Word or PowerPoint.
2. You can “stack” or “layer” multiple Conditional Formats on the same data. For example, you can apply a Conditional Format that highlights the Top 10% of the data points in blue and another that highlights the Bottom 10% in red.
3. You can create Conditional Formats based on a user-defined formula; in other words, Excel does not limit you to its predefined Conditional Formats.
4. Any user-defined Conditional Format you create can refer to cells in the workbook as part of the formula. This functionality enables end-user interaction, allowing a user to apply Conditional Formatting to highlight all budget variances exceeding 10%. In contrast, another user could highlight all differences exceeding 20%.
5. Conditional Formats as Icon Sets make it easy to stratify your data into various groupings, including top-third, middle-third, and bottom-third.

## Sparklines

In Excel, a Sparkline is a hybrid of conditional formatting and charts. You can use Sparklines to create simple but highly effective visualizations via line charts, columns, and win-loss indicators.

To create a Sparkline, click the desired type of Sparkline you want to create – *Line*, *Column*, *Win/Loss* – from the Ribbon’s **Insert** tab. Next, in the resulting **Create Sparklines** dialog box, indicate the range of data you want to use as the basis for your Sparklines and where you want your Sparklines to reside. **Figure 42** illustrates this process. After entering the data, click **OK** to generate your Sparklines. **Figure 43** provides an example of how your Sparkline may appear.



**Figure 42 - Creating a Sparkline**

|    | B           | C         | D          | E         | F         | G         | H         | I         | J                                                                                     |
|----|-------------|-----------|------------|-----------|-----------|-----------|-----------|-----------|---------------------------------------------------------------------------------------|
| 4  | Country     | Jan-19    | Feb-19     | Mar-19    | Apr-19    | May-19    | Jun-19    | Jul-19    | Trend                                                                                 |
| 5  | Austria     | -         | 4,040.02   | 2,564.30  | 1,137.07  | -         | -         | -         |  |
| 6  | Belgium     | 719.57    | 3,991.61   | -         | -         | -         | 1,669.17  | -         |  |
| 7  | Canada      | 623.34    | 8,868.02   | 1,084.51  | -         | 1,913.34  | -         | -         |  |
| 8  | Germany     | 12,445.17 | 71,204.99  | 16,613.68 | 8,087.25  | 31,651.53 | 12,581.39 | 28,755.71 |  |
| 9  | Ireland     | -         | 2,807.70   | 6,089.10  | 2,579.66  | -         | 11,597.72 | 11,276.10 |  |
| 10 | Mexico      | 2,282.13  | 11,661.71  | 2,327.66  | 4,766.47  | 1,544.70  | 471.46    | 5,780.50  |  |
| 11 | UK          | 5,807.24  | 9,309.32   | 1,412.68  | 1,315.65  | 5,778.70  | 819.18    | 33.12     |  |
| 12 | USA         | 4,628.32  | 5,085.65   | 17,944.75 | 6,862.28  | 10,673.30 | 7,037.98  | -         |  |
| 13 | Grand Total | 26,505.77 | 116,969.02 | 48,036.68 | 24,748.38 | 51,561.57 | 34,176.90 | 45,845.43 |  |

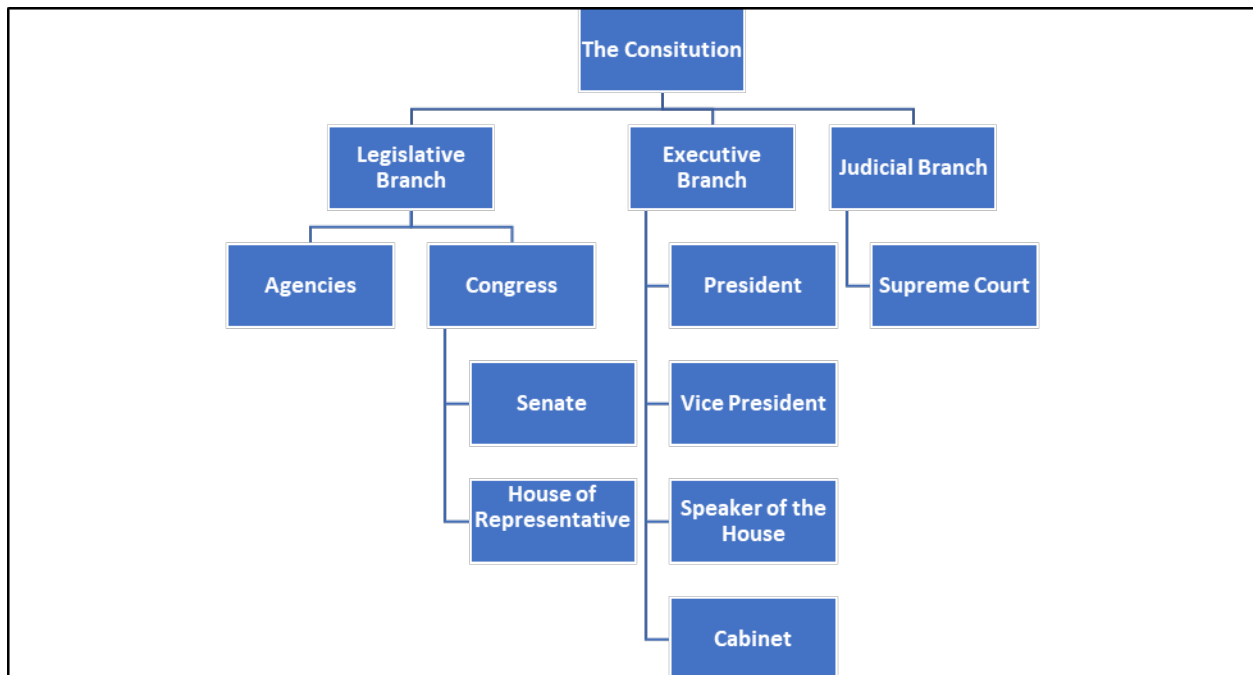
**Figure 43 - Completed Sparkline Providing Trend Analysis**

As shown in Figure 43, the Sparklines help a reader “see” the trends emanating from the worksheet’s data – trends a reader might otherwise overlook.

## SmartArt

Microsoft added **SmartArt** to Office about two decades ago, and today you can find it in Excel, PowerPoint, and Word. SmartArt can be a valuable tool for presenting information more clearly and concisely than text. For example, you can use SmartArt to create visualizations that display data lists, express relationships between data, illustrate business processes and cycles, and even

show your company's organizational chart. **Figure 44** provides a sample organizational chart created using SmartArt. Notably, once you create a SmartArt visualization, you can easily update it to reflect changes as they occur.

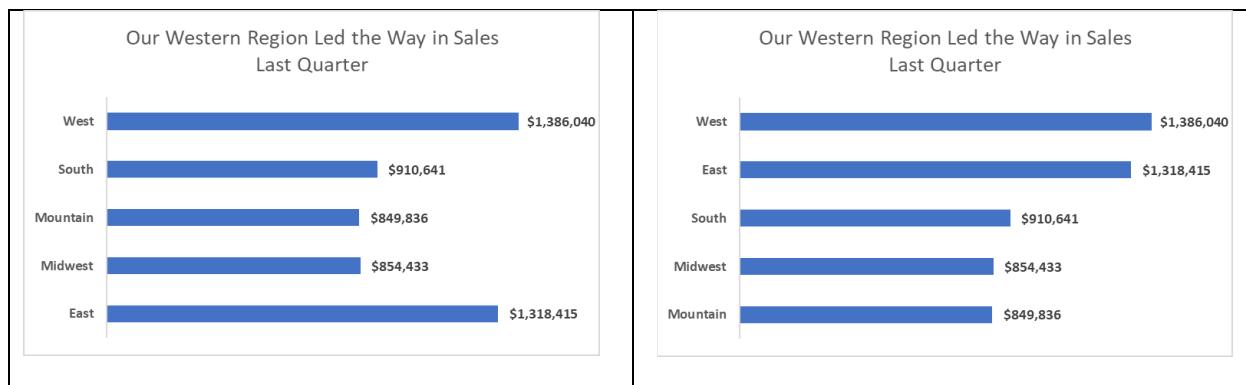


**Figure 44 - Simple Organizational Chart Created with SmartArt**

## A Six-Pack of Tips for Improving Your Visualizations

1. Modify your visualization's title to state the conclusion explicitly that you want your reader to draw from the chart. Assume that, despite your best efforts, some readers will misinterpret the visualization and take the wrong message from it. Therefore, explicitly state your message in the title to remove any uncertainty or ambiguity. For instance, replace a title like *"Sales by Quarter"* with *"Sales Grew as We Invested in Our Marketing Program."*
2. Do not automatically assume you should copy and paste a chart from an Excel workbook when adding a chart to a Word document or PowerPoint presentation. Instead, recognize that the charting engine in Word and PowerPoint is the same as in Excel. Therefore, you can create a chart in Word or PowerPoint, and you will have all the same options for your chart as you otherwise have in Excel, except for PivotCharts. Alternatively, create the chart in Excel and copy and paste it into Word or PowerPoint, including a link to the underlying data. With linked data, if users make changes in Excel, the linked chart updates to reflect the new data. Additionally, this methodology will allow you to apply animation to the chart in PowerPoint if you desire.

3. Remove **EVERYTHING** from the visualization that is not necessary. Often, Microsoft Office applications add unnecessary objects to charts created in them. Examples include gridlines in the chart body and tick marks on the axes. Carefully consider the value each object adds to your visualization; if you determine it adds little or no value, delete it. Keep your visualizations as simple as possible to avoid distracting your readers with unnecessary items.
4. Strategically locate the legend for a chart. Tools used to create charts often place the data legend in a location that unnecessarily consumes a large space. For example, Microsoft Office applications typically place a pie chart legend to the right of the chart. A better location for the legend is at the top or bottom of the chart. By relocating the legend, you will give the chart a much cleaner look, making it easier for your audience to understand the message you are conveying.
5. Change the chart's type so readers do not have to tilt their heads to consume it. For example, when creating a column chart with many items on the horizontal axis, many applications rotate the items by 45 degrees or even 90 degrees to avoid truncation. Unfortunately, this causes readers to tilt their heads to read the chart data. A better approach is to change the chart type from a column chart to a bar chart in such instances. Bar charts display data labels on the left side, making them easier to read.
6. Sort your data in an order that makes it easy for your readers to understand the meaning of your chart. For example, sort your data in ascending or descending order when creating column or bar charts. Sorting allows readers to compare data points without wasting time analyzing them. To illustrate, consider the two charts pictured in **Figure 45**. Most readers can interpret the message from the chart on the right more quickly than the chart on the left because of the data's sorting.



**Figure 45 – Comparing a Chart with Unsorted Data to One with Sorted Data**

?

Of the six items listed above, which are likely to be most helpful to you for improving visualizations? Why?

## Summary

We are often told, “A picture is worth a thousand words.” However, we should rephrase the adage to “An ***effective*** picture is worth a thousand words,” because in many business settings, we see too many visualizations that fail to communicate the intended message. Reasons include selecting the wrong type of visualization for the task, poor formatting, failing to account for interactivity, failing to present data in context, and a lack of attention to detail. Fortunately, as you have learned, it does not take tremendous effort to create compelling and meaningful visualizations – tools that help you communicate more effectively. By adhering to the principles discussed in this session, you are well on your way to improving your communications with effective visualizations.