

Unit 27: Creating Charts

Introduction

There are many software packages that can create and update control charts for you. Some are specific to quality control, and most generalized statistical packages also have this capability. However, this course is not designed to train you in the use of any particular software program. Instead, the aim is to provide you with a solid understanding of the statistical basis for the construction and use of control charts. As such, you will be building and working with control charts from scratch, using Microsoft Excel or another similar spreadsheet program. It is assumed that students have basic capabilities for working in Excel – meaning you know how to copy/paste data, use functions, select and manipulate cells, format how cells display, use absolute references, etc.

Set It Up

The first step of course is to enter the data you have collected (or have been given) into the spreadsheet -- we use the data in Appendix A. Enter your data in rows, one row for each sample. Each sample observation will be entered as a separate cell in the sample's row. Headings should also be used to help you keep track of what everything is. Parameters/factors necessary for creating the control chart need also be entered somewhere. For every control chart, you will compute sample statistics to be plotted on the control. These statistics should be computed on the same row as the relevant sample, using standard Excel formulas. In our example, \bar{X} is computed using the average () function, and the sample range (R) is computed using the max() and min() functions. To save time and effort, you should enter the formulas only once, and then copy and paste them into the other cells for the remaining samples. Compute Control Limits and Center Line

The next step is to compute these key components of the control chart. We recommend computing them at the bottom of your sample data, again using standard Excel formulas. In computing these values, do not enter the values of any parameters/factors directly – rather, reference the cell that contains the value. For example (as can be seen in the formula bar in Figure 3), when computing the UCL for the \bar{X} -bar chart, the value of factor A2 is not entered, but the cell containing its value, C29, is. Likewise, the value of \bar{X} -double-bar is not entered, but rather cell F27 is, and so on. The reason for using cell references instead of direct values will become apparent when we look at modifying the control chart.

Format the Run Line (Data Points) If you have followed our example exactly, the run line of sample means will be medium blue, but will not have any markers to mark the data points. Whether or not it looks like our example, you may want to change how the run line appears. To do so, click the data line so that it is highlighted (each data point is now identified). Then, with the mouse cursor positioned on the line, right-click, and from the context menu that pops up, select Format Data Series (Figure 8). This will bring up the Task Pane titled Format Data Series on the right-hand side of your worksheet. From within this task pane you can make many formatting changes to your chart.

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You can change the color and style of the line by clicking on the Fill & Lines icon (looks like a paint can pouring paint) shown under Series Options (Figure 9). You have further options to alter the line itself, or the markers to identify data points on the line. We are happy with the blue color for the line, but want to add markers to indicate each sample mean. To do so we select the Marker sub-option in the task pane, and under that Marker Options. By default, none is selected. We choose Automatic to get around markers that match the color of the line. You can also choose the Built-in option to choose the shape and size of the marker if you prefer.

Change Title, Add Axis Labels You can change the title of your chart by simply clicking on it to set a cursor blinking in the title area. Delete the default and type in the title of your choice. We will need to add titles to the axes before we can edit them. Click anywhere in open space near the edge of your chart – you will see three icons appear to the upper right of the chart: a plus sign, a paintbrush, and a funnel. We want to add elements to the chart, so click on the plus sign icon. You will get a list of Chart Elements that you can add/delete from your chart. Currently included icons are shown by a checked box; missing elements have an empty box. To insert axis titles just check the box next to Axis Titles and you will see titles appear for both axes. Edit these just as you edited the chart title.

A chart is far more effective at communicating results, outcomes or trends than a table of figures displaying the same information. Different chart types have been created to communicate different types of information. Some charts show simple relationships between values, while others are designed for quite technical purposes. Here is a summary of the use of different chart types.

Chart Type	Use
Column, Bar, Cylinder, Cone, Pyramid	These chart types, either in 2D or 3D, are used to compare values across categories.

For example, they could compare the populations of different countries. Line, Area Lines in 2D or 3D are perfect for showing trends such as sales or employment figures. An area chart is basically a line chart with the area below the line filled in. Surface The surface chart plots trends in two dimensions. You could use this to plot departmental sales figures over time. The chart then shows you the trends between departments, as well as the sales trends over time. Pie, Doughnut If you want to show proportion, such as the sales figures from different departments that make up a total, then the pie and doughnut charts are for you. The doughnut chart varies only from the pie chart in that it can display more than one series of values.