TMGT 361

Assignment VII A Instructions

Lecture/Essay

Control Charts

In addition to the text book, make sure you peruse the *Various Essays, Explanations, and Q&A About Quality* folder at the documents button. At least look to see what sort of information is in that folder (and all folders) under the documents button. Make sure you read the *Why We Use Control Chart Factors* and *Control Chart Notation and Formulas* documents because they are part of this lecture/essay. You will also have to use other files in this folder to complete this assignment.

I have already introduced that separating random error (common cause) from non-random error (special cause) is central to quality. Why is that so? We can’t do anything about common cause error *for a given situation*; therefore it is a waste of time and other resources to try. Trying to control common cause error actually leads to more error! We potentially can eliminate or reduce special cause error (which can save money and other resources, improve efficiency and quality, and do other good things). Is it worthwhile to get rid of the special cause error? Overall, yes (otherwise we would care about quality, or accuracy, or precision). However, it is possible to spend more money fixing a problem that the money lost due to the problem (just take a look at a lot of government funded programs!). Therefore, some sort of cost-benefit analysis is necessary to decide which special cause errors to tackle.

Essentially, quality is about hitting the target as consistently as possible. Both common and special cause error cause us to miss the target (be less accurate) and to be less consistent (less precise or reliable). When accuracy or precision is reduced, quality goes down, safety goes down, efficiency goes down, customer satisfaction goes down, profit goes down, and employee satisfaction goes down (and all the unwanted opposites, e.g., costs, complaints, accidents, etc. go up).

Control charts track the accuracy and/or precision of a process (or part dimension or other quality characteristic). By itself, plotting the accuracy and precision is a valuable thing. But humans are not good at eyeballing data and gleaning all the meaning that can be gleaned from that data (this is why we use summary/descriptive statistics, to help us make sense of the data). Specifically, humans are not good at separating common and special cause error. A control chart helps us decide if error is random or not because it has *control limits* based on probabilities. If a control limit is reached or exceeded (or there are distinguishable non-random patterns or trends) the conclusion is reached that the error is due to a special cause.

What a control chart actually does is plot a statistic, e.g., the average diameter of a part, over time. You will learn more about this in future lectures, e.g., an X-bar (average/mean) chart plots a t-test over time. But you do not have to know much statistics to layout, fill in, or interpret a control chart because there are relatively easy to use by-hand tables and formulas. There is also a lot of software packages. Note that you need to know certain things to create or interpret a control chart. By-hand or software—garbage in, garbage out.



From <https://www.clearpointstrategy.com/control-charts-everything-you-need-to-know/>

Software vs By-Hand

You will learn the most if you do all the math and create the chart by-hand. I prefer you do most of the math and the entire chart by hand. If you use SPSS, Minitab, or some other software to do all the math and create the chart for you (the software will even identify out of control points, patterns, and trends), I cannot tell if you have learned anything. I am not primarily looking for correct answer as much as I am looking for evidence that you learned something. You should also primarily be interested in learning as compared to merely getting correct output. I want to see your work. There is no evidence of learning when I get 40 identical software printouts.

A TI-84 type calculator (required in many AETM department majors) or most models with statistics functions will do all the calculations and statistics required for this course. I want you to use such a calculator to crunch all the numbers for the formulas. Most calculators will not draw the control chart; I want you to do that by-hand.

Note that merely showing a result (the math answer, the output of the calculator or software) is never the *answer*. To completely address the general and specific instructions and evaluation criteria, you have to interpret and discuss—grammar is required. For example, even if I ask you *what is 2x2*? You will get zero points if all I see on the page is *4*. I would want to see your work, e.g., 2x2=4. and the grammar, 2 times 2 equals 4. Of course, I am not going to ask you anything this simple. If you merely post software output, you might get 1 out of 5 points.

Initial Post

See the general assignment instructions for information about the quality and quantity expectations and evaluation criteria.

1. SPC & statistics. Note that there are 4 assignments based on unit VII but only one quiz.

VII A. Using data set VIIA, construct and analyze the following control charts. Show your work (by hand or software output). With prior permission of the instructor, you can use data from work instead of the data set (but you cannot use internet or book data).

* 1. X-bar and range (or s). Calculate the Cp and Cpk and analyze process capability.
	2. p
	3. u
	4. c