

## Golf Scores and Six Sigma Metrics: Confusion and Resolution, Part 2

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### Background

In *Golf Scores and Six Sigma*<sup>1</sup> there was discussion on how someone might track and report their golfing performance using a sigma quality level metric. This article also showed problems with this metric and described an alternative. Discussed also was the process capability/performance indices  $C_p$ ,  $C_{pk}$ ,  $P_p$ , and  $P_{pk}$ . This article will elaborate more on these indices and how the results from these metrics can also deceive.

### Example

Consider the data shown in Table 1, which shows the number of strokes above par, where a minus value is a score below par. Figure 1 shows a process capability/performance analysis someone might conduct for this data, where there is a one-sided upper specification of 0. From this output we note a  $C_{pk}$  and  $P_{pk}$  values of -0.46. However, an underlying assumption for this analysis to be valid is that the data are continuous, which is not valid because of the incremental units of the score.

Even if we ignored this analytical problem for this situation, how well do these indices describe your golf game? If you reported a  $C_{pk}$  value of -0.46 metric to a friend, would it be clear to him how well you are doing in golf? Do you understand how your golf game is progressing over time? Do you have a strategy that naturally leads you to quantify the source of variability within your golf game? Do you have a measurement strategy that will ask you questions on what you might do differently to improve? Think that most of us would answer “no” to these questions. Similar confusion results for a sigma quality level metric<sup>2,3,4</sup>.

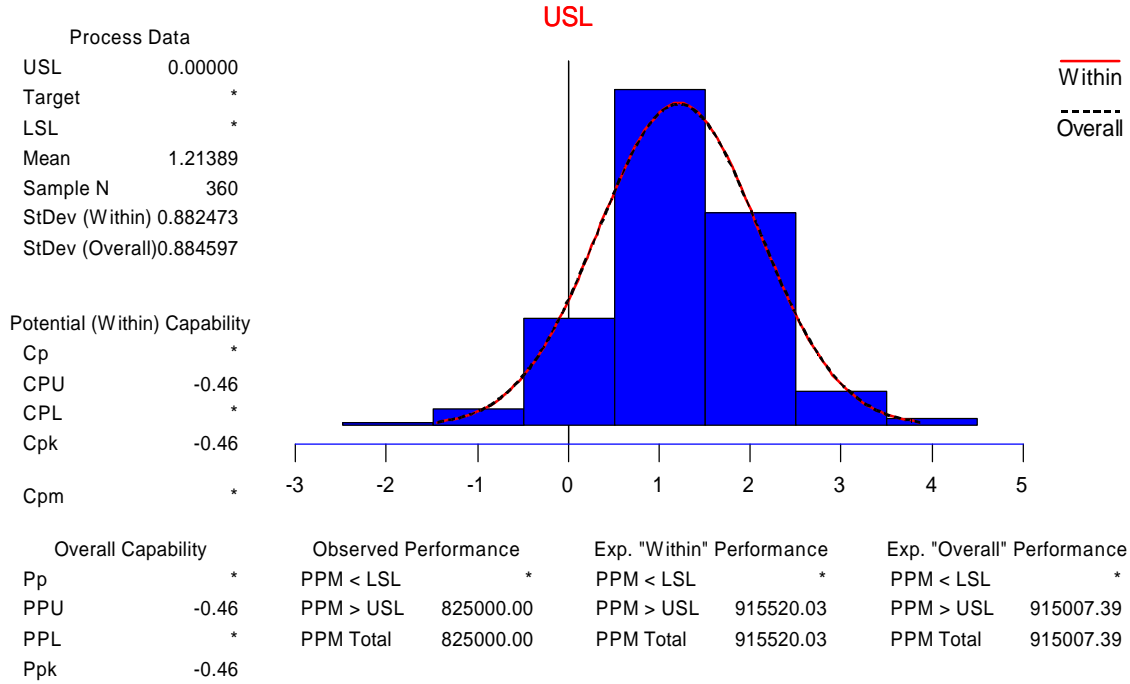
## Summary

The problems with this golf illustration relative to the understanding of someone's golf score performance are not unlike the reporting of the *Y* output or key process output variable of many Six Sigma projects and other metrics within an organization. Also, the implication of sample size and of how samples are taken is often not addressed in these metrics. For alternative approaches to tracking and quantifying a capability/performance metric see *Golf Scores and Six Sigma*<sup>1</sup> or *Golf Scores and Six Sigma Metrics: Confusion and Resolution*<sup>5</sup>.

	Hole																	
Round	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1	2	1	1	2	0	2	1	0	3	2	1	1	2	0	0	1	0
2	1	2	0	0	0	1	1	1	2	2	1	-1	1	1	0	1	1	0
3	2	1	1	0	1	2	1	2	1	0	0	1	1	1	1	1	3	1
4	2	2	1	0	0	2	1	2	0	2	0	2	3	3	2	2	0	2
5	0	2	1	2	3	2	1	2	1	2	1	2	1	2	1	1	1	2
6	1	2	1	0	2	1	0	3	1	1	-1	1	2	1	1	2	2	1
7	2	1	0	3	1	2	2	1	1	2	1	1	1	2	2	1	2	1
8	2	2	2	0	2	1	1	0	1	0	2	3	0	1	1	0	3	0
9	1	-1	1	1	2	0	0	2	1	1	1	0	1	3	1	1	0	1
10	1	2	1	1	2	1	0	1	1	1	1	1	1	2	1	1	1	1
11	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	2	2	0
12	1	2	3	2	3	1	0	1	2	1	1	2	0	3	1	0	1	2
13	1	1	2	2	1	0	1	1	-1	2	0	1	1	1	2	2	2	2
14	2	4	2	2	2	1	1	0	1	1	2	2	1	1	1	0	-1	2
15	0	0	2	0	4	1	0	2	2	2	0	1	2	1	2	1	2	1
16	2	2	1	2	2	1	1	1	2	2	4	0	1	1	2	0	1	1
17	0	2	1	3	-1	0	3	1	2	2	1	1	1	2	1	2	1	0
18	2	2	0	1	1	2	1	-1	0	1	-2	1	1	-1	1	3	1	1
19	2	1	1	2	1	1	2	2	1	1	1	1	2	1	1	1	1	1
20	1	1	1	2	3	2	1	1	1	2	2	2	2	2	1	1	0	1

Figure 1. Process capability/performance indices.

### Process Capability Analysis for Hole 1 - Hole 18



### References

1. Forrest W. Breyfogle III, Golf and Six Sigma, *Quality Progress*, ASQ November 2002.
2. Forrest W. Breyfogle III, *Implementing Six Sigma*, John Wiley and Sons, 1999.
3. Forrest W. Breyfogle III, James M. Cupello and Becki Meadows, *Managing Six Sigma*, John Wiley and Sons, 2000.
4. Forrest W. Breyfogle III, David Enck, Phil Flories and Tom Pearson, *Wisdom on the Green: Smarter Six Sigma Business Solutions*, Smarter Solutions Inc., 2001.
5. Forrest W. Breyfogle III, Golf Scores and Six Sigma Metrics: Confusion and Resolution, (<http://www.smartersolutions.com/html/golfandsixsigma.htm>).