30,000-foot-level Charting: One Sample per Subgroup

By Forrest W. Breyfogle III

Described is a methodology for tracking a single-process output response over time to determine process stability and then, if the process is stable, provide a prediction statement.

The data in Table 1 were collected using an infrequently subgrouping/sampling plan that is consistent with application of a 30,000-foot-level charting methodology[1]. Specification limits for the process are 72 and 78. (For more information about 30,000-foot-level reporting and its benefits see Performance Metric Reporting Issues: 30,000-foot-level Charting Resolution.)

Time Sequence	Response		Time Sequence	Response
1	70.10		11	72.90
2	75.20		12	72.50
3	74.40		13	74.60
4	72.07		14	75.43
5	74.70		15	75.30
6	73.80		16	78.17
7	72.77		17	76.00
8	78.17		18	73.50
9	70.77		19	74.27
10	74.30		20	75.05

Modified from Table 10.2, *Integrated Enterprise Excellence Volume III -Improvement Project Execution: A Management and Black Belt Guide for Going Beyond Lean Six Sigma and the Balanced Scorecard*, Forrest W. Breyfogle III, Bridgeway Books/Citius Publishing, Austin, TX, 2008.

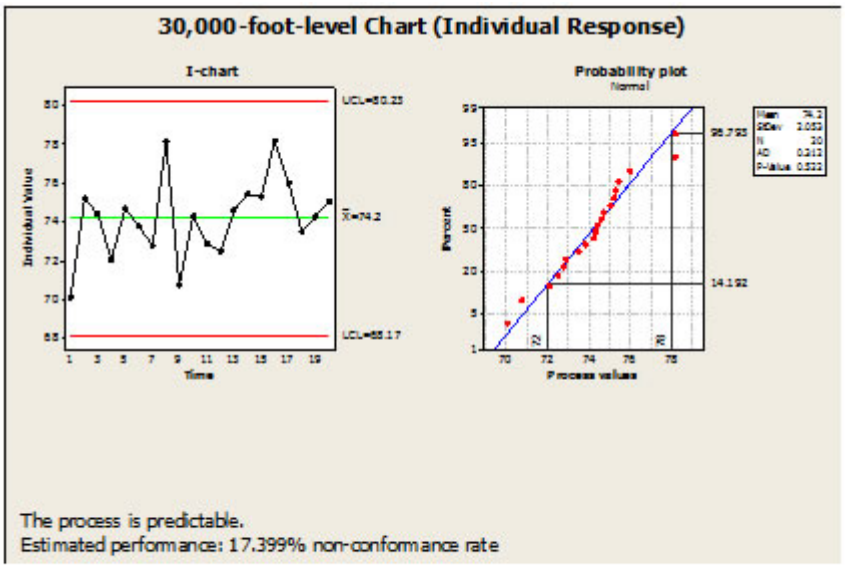
Table 1: Time series Data

Figure 1 provides a 30,000-foot-level chart of the response. From the individuals control chart on the left side of the graphs, the process is concluded to have a recent region of stability. This conclusion is made since there are no trends or data points outside the statistically-determined upper and lower control limits (UCL and LCL).

Since the process has a recent region of stability, one can conclude that the process is predictable. The up-and-down variability shown over time is from common-cause variability. Organizations should not react to individual common-cause values, which can lead to much firefighting; i.e., reacting to special-cause variability as though it were common cause.

The probability plot on the right side of the pair of charts was created from the data during the recent region of stability and provides a process performance statement relative to the specification limits of 72 and 78. From this plot, a process capability/performance metric estimate is 17.4% non-conformance [(100-96.793)+14.192 = 17.399].

Conclusions about this process and its performance relative to predictability and a prediction statement are described at the bottom of the 30,000-foot-level chart, as shown in this figure.



Modified from Figure 12.5, *Integrated Enterprise Excellence Volume III - Improvement Project Execution: A Management and Black Belt Guide for Going Beyond Lean Six Sigma and the Balanced Scorecard*, Forrest W. Breyfogle III, Bridgeway Books/Citius Publishing, Austin, TX, 2008.

Figure 1: 30,000-foot-level Chart Individual Response[2]

Interpretation of 30,000-foot-level Level Charts

A 30,000-foot-level chart's predicted value provides an estimate for future performance, given that nothing changes within the process; i.e., the results of a process' current level of common-cause variability. If the predicted value is not satisfactory, the process needs improvement. A statistical hypothesis testing of causal theories from the recent region of stability can be helpful to gain insight as to what could be done differently to improve the process' performance. For example, an analysis may show the impact from the use of differing operating procedures when executing a process; i.e., how procedural differences impact the current process' common-cause variability magnitude. The result of this analysis could lead to a selection and execution of the best procedure, which would transition the 30,000-foot-level control chart to a new level of stability that has an improved level of performance. Chapters 22 - 28 of Integrated Enterprise Excellence, Volume III: Improvement Project Execution[1] provide the tools for making the described statistical assessments. Application of the book's detailed process-improvement roadmap is provided through Lean Six Sigma training, which references this book in its blended on-line or stand-up education.

30,000-foot-level Charting Applications

The described 30,000-foot-level charting technique has many applications, as described in 30,000-foot-level Performance Reporting Applications.

References

1. Forrest W. Breyfogle III, *Integrated Enterprise Excellence Volume III - Improvement Project Execution: A Management and Black Belt Guide for Going Beyond Lean Six Sigma and the Balanced Scorecard*, Bridgeway Books/Citius Publishing, 2008
2. Figure created using Enterprise Performance Reporting System (EPRS) Software

About the Author
Forrest Breyfogle, III
Integrated Enterprise Excellence

In a professional career spanning over a quarter century, Forrest Breyfogle has established himself as a leading edge thinker, a prolific author, an innovative consultant, a world-class educator, and a successful business executive. His work is documented in eleven books and over ninety articles on the topic of quality improvement.

A professional engineer, Forrest is also a member of the board of advisors for the University of Texas Center for Performance Excellence. He is the founder and CEO of Smarter Solutions, Inc., an Austin, Texas based consulting firm offering business measurement and improvement consultation and education to a distinguished list of clients worldwide, including BAMA, CIGNA, Dell, HP, IBM, Oracle Packaging, Sherwin Williams, Cameron, TIMET, and TATA. He served his country on active duty in the US Army for 2 years, and has played an active leadership role in professional and educational organizations. Forrest received the prestigious Crosby Medal from the American Society for Quality (ASQ) in 2004 for his book, *Implementing Six Sigma* (second edition). This award is presented annually by the American Society for Quality to the individual who has authored a distinguished book contributing significantly to the extension of the philosophy and application of the principles, methods, or techniques of quality management. Mr. Breyfogle was named Quality Professional of the Year for 2011 by Quality Magazine and in 2012 was awarded alumni of the year by Missouri University of Science and Technology.

He is a widely recognized authority in the field of management improvement and is a frequent speaker before professional associations and businesses. His earlier work in the field of management science has been widely acclaimed. A previous book, *Implementing Six Sigma*, sold over 40,000 copies and still ranks among the top Amazon books in Applied Mathematics/Engineering Statistics and Industrial Engineering /Quality Control.

He founded Smarter Solutions in 1992 after a 24-year career at IBM. The associates of Smarter Solutions specialize in helping companies throughout the world improve their bottom line and customer satisfaction through the implementation of techniques that are beyond traditional Lean Six Sigma and the balanced scorecard methodologies. His latest and most extensive work has been in the documentation of a new system of enterprise management, the Integrated Enterprise Excellence (IEE) system, in a series of four books. IEE provides a detailed roadmap that builds on and integrates the best practices of earlier disciplines like Six Sigma, Lean, TQM , PDCA, DOE, and TPS combined with innovative analytical tools to produce improvements at the highest level of an enterprise.

In addition to assisting hundreds of major clients in the wise implementation of improvement systems worldwide, Forrest has also developed over 300 hours of classroom instruction used to train executives, managers, and Black Belt practitioners to plan for, implement, and manage IEE systems. He also leads formal seminars and workshops worldwide.

Forrest Breyfogle
forrest@smartersolutions.com
512-918-0280 x401
www.smartersolutions.com