30,000-foot-level Charting: Non-normal Data

By Forrest W. Breyfogle III

When non-normally distributed data are tracked over time at the 30,000-foot-level, process stability is to be assessed and a predictive statement provided, when appropriate. However, to make these assessments, a transformation that makes physical sense for this assessment may be needed.

The need for this transformation consideration is described in the article Transforming Individuals Control Chart Data and its Importance.

To illustrate the application of creating a 30,000-foot-level chart that has a transformation, 1000 data values were generated from a non-normal distribution. The process from which these dataset samples were to have been taken was to have an upper specification limit 0.035 inches for the flatness of the produced part. The same basic approach could be used for a transactional time-to-deliver assessment, where a response cannot physically be below 0 time.

Figure 1 shows a 30,000-foot-level chart of these data and their performance relative to a specification level of 0.035 that was not to exceed by more than 1% of the produced products.

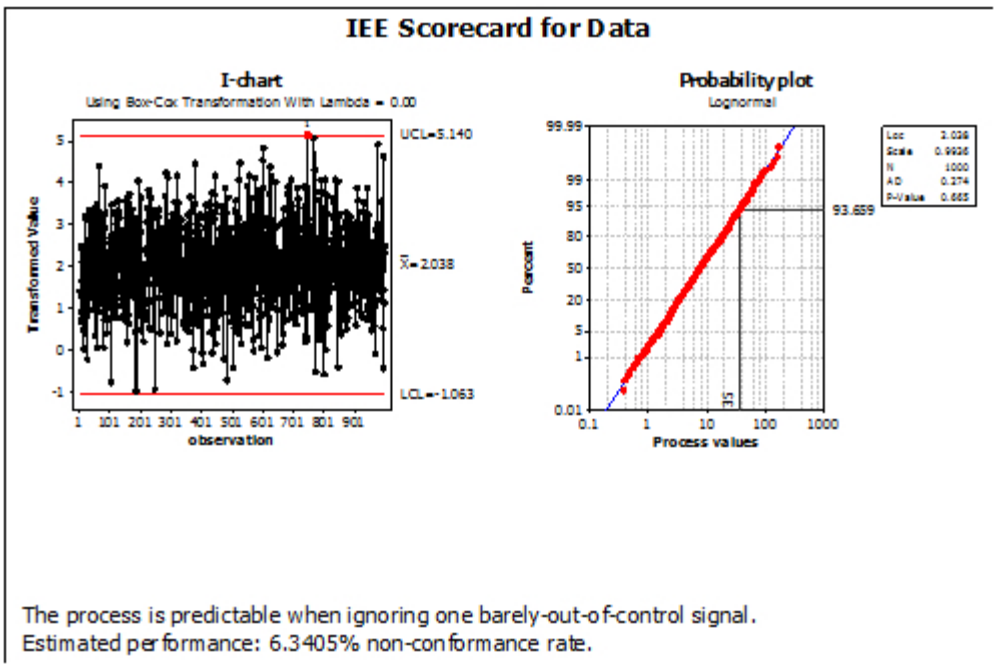

Figure 1: 30,000-foot-level Chart with an upper Specification of 0.035 inches[2]

With this 30,000-foot-level analysis approach, it was demonstrated from the individuals control chart in the left corner of the report-out that the process was currently stable; hence, a process prediction statement could be made. The probability plot on the right side of the graph describes the variability of the continuous-response process with its demonstrated predictability statement. With 30,000-foot-level reporting, a statement at the bottom of the plot nets out how the process is performing relative to the specification requirement of 0.035; i.e., a predictable process with an approximate nonconformance rate of 6.3 percent.

A Lean Six Sigma improvement project could be used to determine what should be done differently in the process so that the 0.035 inch upper specification requirement is met. Upon satisfactory completion of an improvement project, the 30,000-foot-level control chart would need to shift to a new level of stability that had a process capability/performance metric, which is satisfactory relative to a customer 1 percent maximum nonconformance criterion.

Summary

This article described the use of an appropriate transformation from a physical point of view when deciding which actions or non-actions are most appropriate:

1. Is the process unstable or did something out of the ordinary occur, which requires action or no action?
2. Is the process stable and meeting internal and external customer needs? If so, no action is required.
3. Is the process stable but does not meet internal and external customer needs? If so, process improvement efforts are needed.

The box at the bottom of Figure 1 describes the state of the examined process in terms that everyone can understand; i.e., the process is predictable with an estimate 6.3-percent nonconformance rate.

An organization gains much when this form of scorecard-value-chain reporting is used throughout its enterprise and is part of its decision-making process and improvement project selection.

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