30,000-foot-level Chart Quantifies Process Improvement

By Forrest W. Breyfogle III

Enhancements from process improvement efforts (e.g., Lean Six Sigma project or Kaizen event) should be accompanied by statistical validation and quantification of the benefits. This can be accomplished by tracking a process over time at the 30,000-foot-level[1], as described in 30,000-foot-level Reports with its Predictive Measurements.

With a high-level process-output tracking at the 30,000-foot-level, there will be an infrequent subgrouping/sampling plan such that the typical variability from input variables that could affect the response will occur between these subgroupings. An infrequent subgrouping/sampling interval could be day, week, or month, where responses from differing people, departments, machines, and so forth would be captured within each subgroup.

This mixture of input variability within subgroups for 30,000-foot-level charting is different from traditional statistical control charting, which has a primary focus of controlling a process through the identification of special- cause events that can be resolved in a timely fashion. 30,000-foot-level charting does not offer timely identification of process changes but instead provides a high-level view of how the process is performing from a customer-of-the-process point of view.

From a high-level, 30,000-foot-level point of view, specific differences between inputs that could affect a response are not a primary concern. Instead focus is given to whether the process is stable (consistently performing over time) and how well the process is performing relative to objectives or desires for process performance. An individuals control chart is needed to assess process stability from a 30,000-foot-level point of view. Traditional x-bar and R charts, *p*-charts, and *c*-charts cannot provide a 30,000-foot-level stability assessment, since between-subgroup variability for these control charting techniques has no impact on the control chartôs upper and lower control chart limit calculations.

For a detailed discussion of traditional control charting shortcomings, see:

- X-bar and R Control Chart: Issues and Resolution
- P-chart: Issues and Resolution
- C-chart: Issues and Resolution

30,000-foot-level charting consists of two steps. The first step is to determine if the process has a recent region of stability, where this stability region could be six days, six weeks, six months, or six years. If the process does have a recent region of stability, the second step is to describe how the process is performing.

Processes will inherently have variability. Some processes have a great deal of variability, while other processes do not experience much variation. Decisions relative to what action or non-action should be taken in a process should consider this variability and the statistics or probability that accompanies this variability. However, often decisions are made using only a table of numbers, a pie chart, stacked bar chart, red-yellow-green scorecards, or variances to goals, which do not include variability in their reporting process. (For a more detailed discussion and illustration of the shortcomings from these performance-reporting methods see: Performance Reporting (KPI Reports): Issues and Resolution).

Assessing Process Stability and Quantifying Process Predictability

Time-series data can be continuous or pass/fail attribute proportion. An individuals control chart is used in general for 30,000-foot-level reporting to assess process stability. When a process is considered stable at the 30,000-foot-level, the next steps are to determine how the process is performing and to provide a prediction statement.

If a specification exists or the response is a pass/fail attribute proportion, a 30,000-foot-level predictability statement would be made about percentage or proportion non-conformance. If the response is continuous and there is no specification, a statement is made about its median response and 80% frequency of occurrence values. When the response is pass/fail attribute, a statement can be made relative to non-conformance directly from the chart or data calculations from the most recent region of stability. When a response is continuous, a probability plot is used to estimate process performance relative to a specification or to provide a median and 80% frequency of occurrence rate.

To some, a probability plot can initially appear intimidating; however, interpretation of this chart is not complex. With the probability plot, the x-axis is the response, while the y-axis is percent less than the value on the x-axis. Other articles referenced below provide a more detailed explanation.

With 30,000-foot-level reporting, a statement is provided at the bottom of the graph stating whether the process is predictable or not. If the process is predictable, a prediction statement is made. This prediction statement provides a chart reviewer a quick assessment of how the process is performing. The accompanying charts also give a visual representation of the variability that accompanies the process, which can be examined in further detail, if so desired.

Demonstrating Process Change

This section of this article illustrates an example 30,000-foot-level report-out with its tracking over time and quantification of process performance, while later referenced articles provide a more detailed explanation of the mechanics to create the charts.

Figure 1 illustrates a 30,000-foot-level response change (e.g., from completing a Lean Six Sigma project) for a continuous response when there are no specifications, while Figure 2 illustrates a 30,000-foot-level response change for an attribute response.

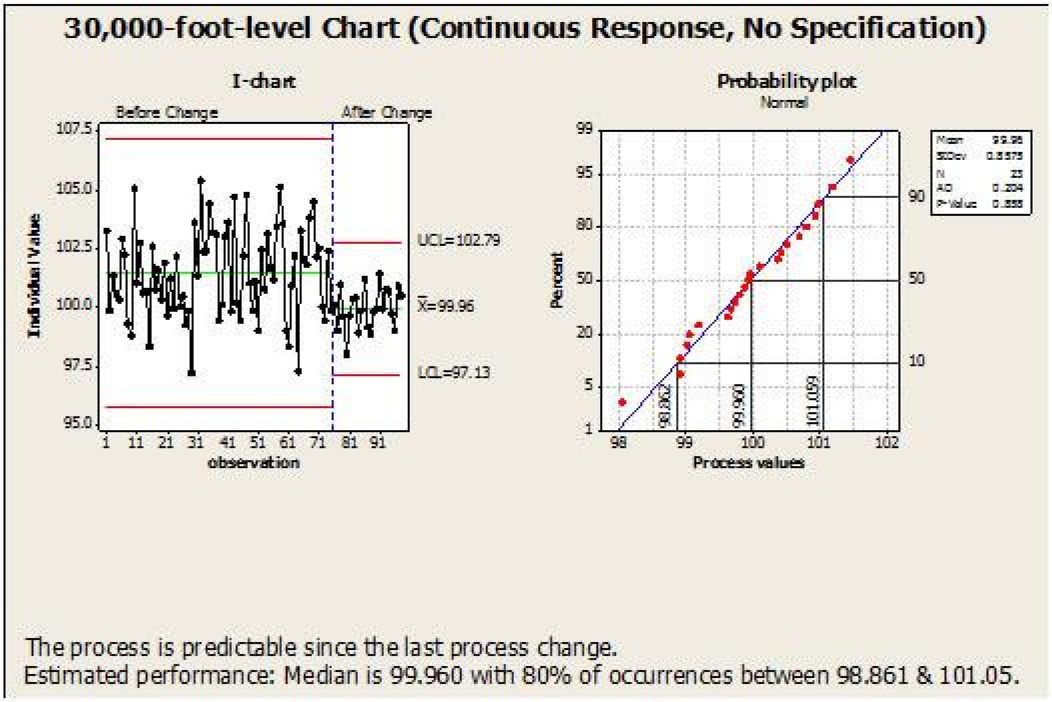

Figure 1: 30,000-foot-level Chart (Continuous Response, No Specification)[2]

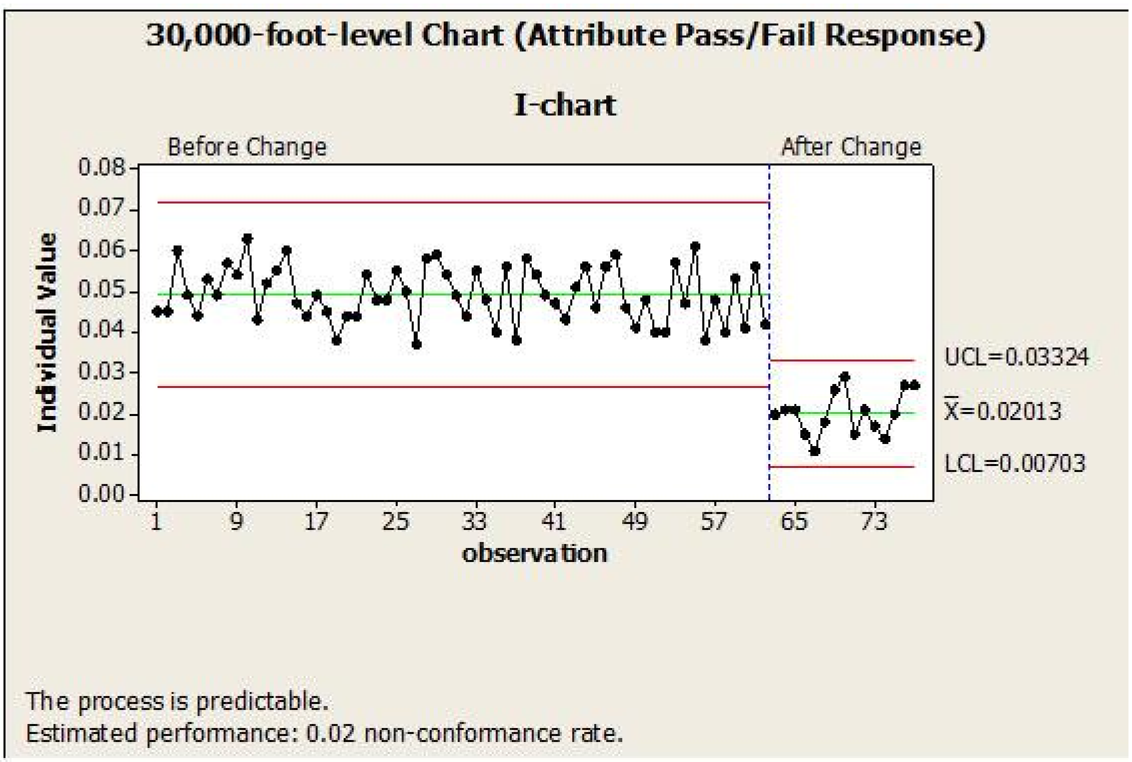

Figure 2: 30,000-foot-level Chart (Pass/Fail Attribute Response)[2]

Providing Predictive Measurements using 30,000-foot-level Charting

For more information about 30,000-foot-level reporting see:

- 30,000-foot-level Performance Reporting Applications
- 30,000-foot-level Charting: One Sample per Subgroup
- 30,000-foot-level Charting: Multiple Samples in Subgroups
- 30,000-foot-level Charting: Attribute Pass/Fail Data
- 30,000-foot-level Charting: Infrequent Failures
- 30,000-foot-level Charting: Non-normal Data

Conclusions

Traditional organizational performance measurement reporting systems can utilize a table of numbers, stacked bar charts, pie charts, and red-yellow-green-goal-based scorecards. For a given situation, one person may choose one reporting scheme, while another uses a completely different approach. These differences can lead to a different conclusion about what is happening and what should be done. In addition, described traditional reporting methods provide only an assessment of historical data and make no predictive statements or statistical assessment of whether a process has changed or not. These charting and metric performance-reporting shortcomings are overcome with 30,000-foot-level reporting.

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