Beyond Troubleshooting

BLACK BELT TRAINING SHOULD BLEND ANALYTICS AND CREATIVITY

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A new model for Black Belt (BB) training is emerging. Practitioners who were certified in BB programs in the past might be startled to see how curriculum and teaching methods have changed in programs being taught today.

These differences have resulted from the convergence of several different factors. They include the merging of the Six Sigma and lean methods, once viewed as competing disciplines but now recognized as a dynamic duo unparalleled in overall effectiveness among all other available management methods. Transaction-oriented companies in particular have embraced lean, recognizing that its tools are as productive for them as they have been for manufacturing businesses.

The change in BB training also has been fueled by the emergence of powerful new tools and the need to incorporate them into the practitioner's arsenal. Other factors behind the changes have been a better understanding of how adults learn and, equally as important, how they can be taught to apply their newly learned skills in the workplace.

Most important, however, is a new understanding of exactly what role BBs should play in today's economy. Gone are the days when businesses deployed BBs as troubleshooters. Today, BBs, together with other Six Sigma practitioners, are indispensable partners in organizationwide initiatives that are grounded strategically and implemented on a highly structured basis to meet critical organizational goals.

Included is the fostering of ongoing innovation, the use of business scorecards in ways that enhance rather than inhibit organizational improvement and the establishment of priorities that allow everyone in the organization to contribute to profit improvement.

In this environment, everything that matters is measured, the only measurements made are those that matter, and every metric has an owner. The organization is practicing the three Rs of business: Everyone is doing the right thing right at the right time.

What BBs need

Given these new challenges, BBs must return from training programs possessing business knowledge, leadership skills, team development capabilities, improved thought processes and enhanced technical expertise. They must learn to implement the define, measure, analyze, improve and control (DMAIC) system and its parallel enterprise-DMAIC process (E-DMAIC), and use DMAIC roadmaps to achieve critical organizational goals.

Guided by these roadmaps, BBs will pull high-yield projects for creation rather than push projects for completion irrespective of whether they contribute to the organization's overall goals or bottom line. This is one of

the guiding principles of an enterprise approach to DMAIC.

BBs trained in programs like this combine the principles of Six Sigma and lean to create a powerful improvement system. These new BBs are known as lean Six Sigma BBs. They do not simply identify the flaws in an operational process. Rather, they determine whether the process itself is flawed. They do not replicate projects. They design and replicate systems. They make the important distinction between two different types of variability—special cause and the far more prevalent common cause—and approach each one appropriately. Their focus on common-cause issues changes their role from firefighting to fire prevention.

Blending analytics and innovation

BBs also must help foster innovation in their companies by integrating analytics and innovation appropriately.

Each organization needs its own particular blend of analytics and innovation. Those in emerging-technology businesses clearly need ongoing innovation to direct new product development activities. For others, the wisest approach might be to give more attention to the blending of analytics with innovation through the use of tools such as design of experiments (DoE) in process improvement activities and the design plus verification phases of development.

Measurements must be taken at different levels that include corporate-level metrics, which deal with enterprise and financial factors such as operating income and profit margins, and operational metrics, which measure operation and production issues such as on-time delivery, work in progress (WIP), defective rates and warranty costs.

The organization must make certain the chosen metrics and their tracking encourage behaviors that benefit the organization as a whole, not just an arbitrarily chosen organizational silo's measurement goal. If this does not occur, organizations can fall into the trap of doing something that does not have a long-term benefit.

An organization must measure everything that's meaningful. But to avoid metrics overload, measure only what's meaningful. For example, to meet quarterly targeted objectives, Krispy Kreme shipped doughnuts that executives knew would be returned.

Successful organizations today need focused innovation—products and services that have a market and that the company is able to market. BBs support this process by capturing the voice of the customer (VOC) in the product-development cycle and breaking down creativity-usage barriers.

Some in the business community believe Six Sigma inhibits innovation. This view often is expressed by those who feel threatened by the need to establish and meet metrics. BBs must demonstrate that lean Six Sigma methods can provide the framework for orchestrating innovation stimulus to benefit the big picture. Without this framework, innovative work can become chaotic and detrimental to the organization as a whole.

Examples of successful applications

E-DMAIC combines analytics with innovation to produce impressive results at organizations in many different fields.

At one company, sales, manufacturing and internal customers are working on common goals aimed at improving the bottom line, not simply achieving a performance-metric goal that initially sounded good but led to producing something priced and sold at a loss.

With an improved operational-level measurement tracking system, the company's production scheduling achieved a 25% increase in throughput while reducing lead time and WIP working capital by $232,000—a 50% drop. Manufacturing lead time is now half the industry average, there has been a 5% reduction in raw material ordered for internal production, and the company has identified the potential to reduce scrap by more than 50%.

The merging of analytics and innovation also is helping make ongoing improvements at another company, an international service organization that manages employee relocation for its clients. The process began when the company's executive leadership identified five organizational improvement goals, developed a strategy for meeting each and identified the metrics needed to chart progress. Every metric the company uses has an owner. "There is zero ambiguity regarding internal and customer requirements," reported the president and CEO, who asked that his company not be identified.

One group of metrics used in this relocation company deals with the satisfaction of the relocated employees served. Surveys of these employees identified where there were service shortcomings, and the tools of lean Six Sigma showed where to focus

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improvement efforts. Ongoing projects are aimed at improving two aspects of relocations: temporary living facilities for the employees and transportation coordination. The CEO credits this system for helping increase the company's performance and marketplace position.

The merging of analytics and innovation also is helping a nonprofit organization improve its results. This organization is using an enterprise excellence model to increase the effectiveness of fund-raising and control costs while also improving the quality of services.

Providing needed training

The new role of lean Six Sigma BBs requires a training program that helps participants understand the dynamics of organizational culture, people and infrastructure.

The BBs must learn communication tools not only to secure executive management buy-in for projects, but also to help management understand that lean Six Sigma should be implemented in the enterprise-level business system so projects are analytically selected.

Overall, businesses need operational-level metric reporting of functional performance without calendar boundaries. These metrics can provide a predictive assessment of the processes. The collective analysis of metrics for corporate-level financial goal achievement (for example, profit margins and revenue growth) can create improvements for metrics that have the most benefit to the business as a whole.

This metric improvement need creates a "pull" for project creation. This is in contrast to the historical push for project creation in which leaders listed potential projects and assigned them to those who, for example, were to attend a training class.

Background knowledge that is essential for BBs to understand in meeting today's competitive expectations includes the following integrated enterprise management tools:

- The project-based process improvement systems of Six Sigma and lean Six Sigma, with enterprisewide analysis focus on items such as avoidance of silo projects that have sub-optimized benefits.
- Avoidance of performance metrics that stimulate the wrong behavior.
- Understanding how traditional scorecards, dashboards and performance-metric reporting can have serious shortcomings. These measurement tools include tabular, pie chart, line chart and stacked bar chart reporting; the balanced scorecard and its tracking of organizational objectives, measures, targets and initiatives to strategies; and red-yellow-green scorecards
- Enterprise-level business system alternatives that structurally use lean and Six Sigma tools as part of the measurement, analysis, improvement and control system.

In creating an enterprise-level business system, BBs use an E-DMAIC system, which overcomes problems encountered with traditional scorecard, business management and enterprise-improvement systems. E-DMAIC describes how organizations can overcome these issues by using a systematic roadmap system of DMAIC at the enterprise level.

An improvement project DMAIC (P-DMAIC) describes a detailed step-by-step project execution roadmap with true integration of Six Sigma and lean tools. BBs must understand and use the following in the define and measure phases of the P-DMAIC roadmap:

- How to define and scope projects.
- How to plan VOC and in-process Six Sigma metrics.
- Response statistics, graphical representations and data analyses.
- Attribute response statistics.
- Project tracking at operational levels (project baselining), including traditional control charting and its shortcomings; traditional process capability and process performance metrics and their shortcomings; baseline project process predictability with capability; and performance

metric assessments for continuous and attribute response data.

- Lean assessment in the measure phase, including waste identification and prevention, principles of lean, takt time (rate of customer demand), observation worksheets, standardized work charts, combination work tables, spaghetti diagrams, five why's (finding the root cause of a problem), time value diagrams and value stream mapping.
- Measurement systems analysis and wisdom of the organization tools, including flowcharting, cause and effect diagrams, cause and effect matrixes and failure mode effects analysis.

Training in the P-DMAIC analyze phase should include the following:

- Data collection plan and experimentation traps.
- Visualization of data tools, such as box plots, marginal plots and multivariate charts.
- Confidence intervals and hypothesis tests.
- Inferences, including continuous response and attribute (pass/fail) response.
- Hypothesis testing for simple comparisons such as two inputs, including continuous response and attribute pass/fail response.
- Hypothesis testing for more than two inputs, including variance components; correlation and simple linear regression; single-factor (one-way) analysis of variance and analysis of means; two-factor (two-way) analysis of variance; and multiple regression, logistic regression and indicator variables.

BB training in the P-DMAIC roadmap improve phase should include the following:

- DoE, including understanding how to create full and fractional factorials, planning 2^k DoEs (factors that are each at two levels), design and analysis of 2^k DoEs, robust DoEs (for example addressing variability reduction) and response surface methods.
- Innovation and creativity.
- Lean tools.
- Plan-do-check-act.
- Selecting, implementing and demonstrating project improvements, including process modeling and simulation, solution selection, Pugh matrices, walking the process and value chain documentation, pilot testing, process change implementation training and project validation.

Finally, for the control phase in the P-DMAIC roadmap, BBs should learn the following tools:

- Active process control tools, such as control process and input variables, realistic tolerances and precontrol charts.
- Control plan and project completion.

Selecting a training provider

Many training options are available for BBs wanting to learn to blend analytics and creativity. They range from intensive classroom instruction to quick online courses.

Although online courses are generally cheaper, they are burdened with several significant disadvantages. Chief among them is a higher noncompletion rate caused by a systemic weakness of online training: its impersonal nature.

Other weaknesses can include:

- The implication that the participant's organization is saying, in effect, that training is important but not important enough to warrant live instruction. This results in lowered motivation.
- The possibility that when a visitor interrupts the lesson, the student may lose concentration and continuity—and perhaps never get back to the training.
- The lack of interaction among students, when much of the learning takes place.
- Little opportunity for course customization for the organization's particular strategy or the widely varying backgrounds of individual participants.

Real-time exchange among students and instructors in a formal classroom setting represents the most effective way to learn—and retain the learning. An effective program also must be led by an instructor with real-world experience.

The instructor should enliven the teaching through the use of case studies, hands-on exercises, video demonstrations, homework assignments, designated projects and personal encouragement. The instructor should understand the personality characteristics of each individual student and adapt the one-on-one coaching accordingly.

Here are some questions to ask a prospective training provider:

- Does the curriculum provide all the skills—tech-

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nical and nontechnical—needed for success as a BB today and in the hypercompetitive international arena of the future?

- Does the training provider have experience in successful implementation of lean Six Sigma on an enterprisewide basis, or is the program taught by instructors whose actual experience in lean Six Sigma may be limited?
- Does the training organization view lean Six Sigma as an enterprise issue, or is it still focused on yesterday's vision—project execution that often is determined in silos and does not impact the big picture?
- Is the curriculum suitable for transactional and manufacturing organizations, or only for manufacturing?
- Is the company recognized for providing content-rich certification?
- Is the training rigorous? Does it require a true understanding of the topics?
- Are the training materials and reference books designed for use on the job? Are the BBs provided with detail-rich reference materials that can be used later?
- Are participants provided with P-DMAIC and E-DMAIC roadmaps?
- Does the program provide individual attention to participants who may have widely varying levels of knowledge and experience?
- Does the training provide what is needed for the organization to meet its financial growth and profit goals, now and in the future?

Selecting a BB training provider requires thoughtful analysis. Like any other strategic decision, it can be made more effective by applying the principles of lean Six Sigma to the task.

The road ahead

Organizations today face unprecedented challenges, including:

- Rapid-fire technology developments that can quickly make an established product obsolete.
- Increasingly sophisticated foreign resources in manufacturing and services that create pricing pressures.
- An employee workforce that has different work-styles than those of previous generations.
- A host of problems, including the current economic climate.

The blending of analytics with innovation by BBs who have superior capabilities is needed more than ever before.

NOTE

Three monthly magazines provide thoughtful commentary on employee training issues: *Chief Learning Officer*, www.clomedia.com; *Training Magazine*, www.trainingmag.com; and *T+D*, published by the American Society for Training and Development, www.tdmagazine.astd.org.

BIBLIOGRAPHY

ASQ Quality Glossary, www.asq.org/glossary.
Breyfogle, Forrest W. III, *The Integrated Enterprise Excellence System: An Enhanced, Unified Approach to Balanced Scorecards, Strategic Planning and Business Improvement*, Bridgeway Books, 2008.
Breyfogle, Forrest W. III, *Integrated Enterprise Excellence: Going Beyond Lean Six Sigma and the Balanced Scorecard* (three-volume series), Bridgeway Books, 2008.
Collins, Jim, *Good to Great: Why Some Companies Make the Leap … and Others Don't*, HarperCollins Publishers Inc., 2001.
Deming, W. Edwards, *Out of the Crisis*, Massachusetts Institute of Technology, 1986.

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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

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.

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