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QUALITY PROGRESS | FEBRUARY 2013

LEAN SIX SIGMA CASE STUDIES

VOLUME 46/NUMBER 2

QP

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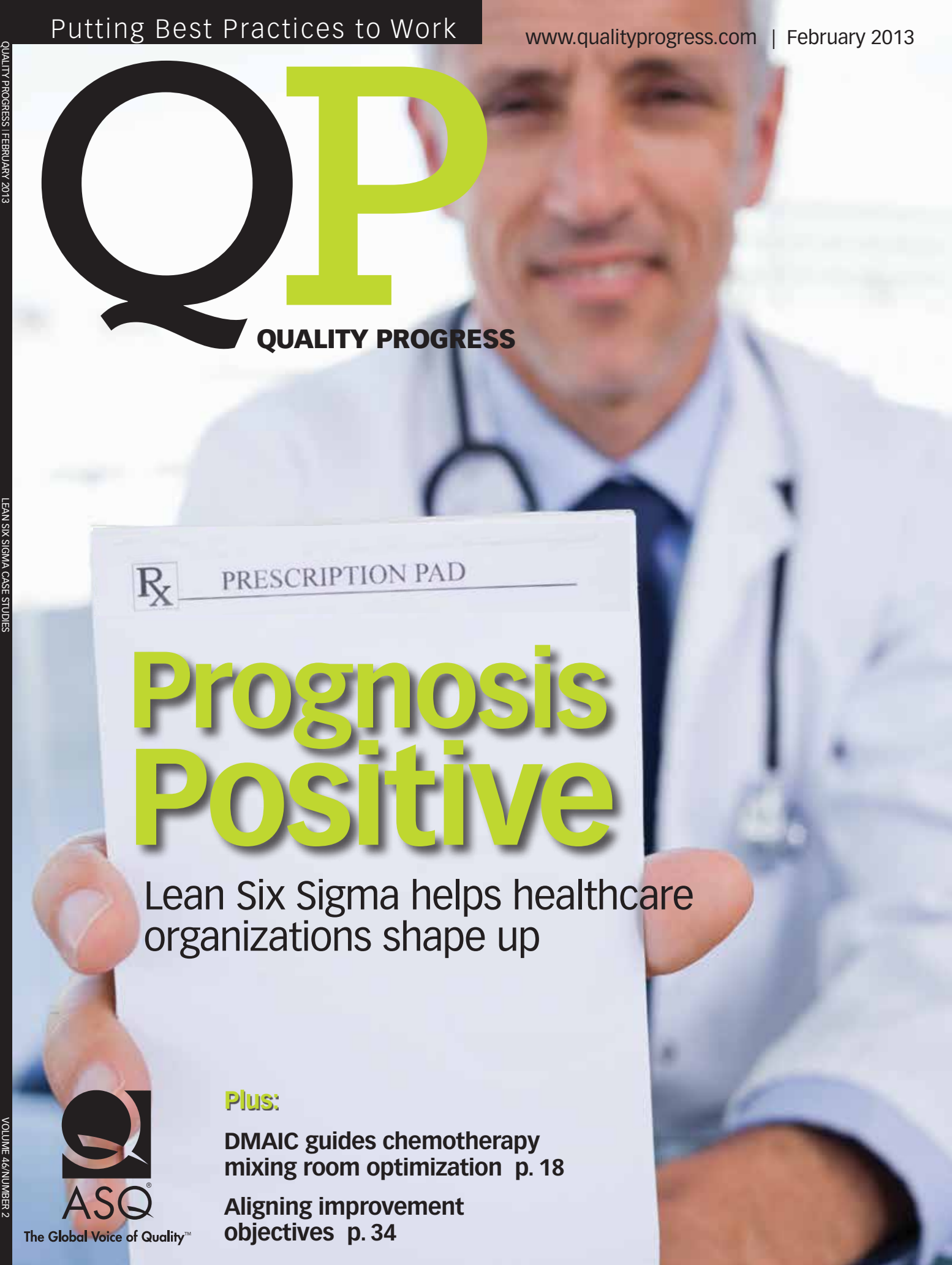

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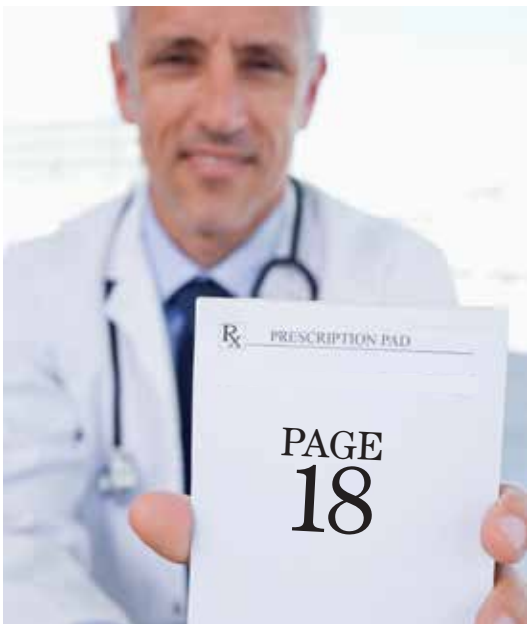

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- **Direct From the Source**
  Vera Vanicek, author of "The Right Blend," pp. 18-26, discusses the lean Six Sigma project that transformed the way workers prepared drugs for cancer patients.
- **Added Ingredients**
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- **Why Not More?**
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- A SHIFT IN MINDSET
Meet requirements for your organization, not just your auditor.

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Confidence Boost

Help others understand your contributions

A COMMON FRUSTRATION among quality professionals is that peers and superiors have a difficult time understanding the tangible and intangible benefits resulting from quality efforts. And it can be demotivating when you're constantly trying to reinforce and prove the value of your contributions when time would be much better spent on the next improvement project.

This month's issue of QP showcases three organizations' quality projects and the undeniably quantifiable impact they made. These organizations were able to effect significant and tangible improvements through lean Six Sigma projects that enhanced efficacy and efficiency, increased profitability and boosted customer satisfaction.

In "The Right Blend," p. 18, one organization's lean Six Sigma Black Belt completed a project that netted the organization—a provider of chemotherapy treatment—a 25% reduction in technician labor costs while meeting internal customer targets and handling a 9.5% increase in volume.

"Lessons in Labeling," p. 28, details how the Cancer Treatment Centers of America employed the design, measure, analyze, improve and control method at one of its locations to reduce errors in its specimen collection function. The result? Among other wins, the organization increased labeled laboratory specimen compliance by an impressive 287%.

Finally, in "Don't Lose Patients," p. 42, one hospital used lean Six Sigma combined with the theory of constraints to identify bottlenecks and implement solutions that reduced patient wait times by as much as 70%, thereby improving customer satisfaction and retention.

In all three case studies, you'll notice a pattern of many intangible results accompanying the tangible ones. Improvement seems to spur further improvement.

Did your New Year's resolution involve watching less TV? I hope not, because this month you won't want to miss the exciting premiere of ASQ TV. This brand new video series will provide a whole new perspective on quality's role in the world, and show what's new and what's working in an entertaining and novel new format. Watch for its premiere in *ASQ Weekly* and on www.asq.org. QP

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Increasing involvement

In "Get Them in the Game," (December 2012, pp. 52-56) Carlotta S. Walker mentions two primary ways to improve employee involvement and thereby engagement: involving employees in key decisions and empowering them to make decisions in handling complaints. Both are very effective indeed.

Regarding the first, though, I'd suggest it shouldn't be limited to strategic or other large changes, but rather can be expanded to include day-to-day continual improvement. We've empowered our team to edit the quality management system documentation, and it has worked wonders for engagement. Employees own their processes, and our continual improvement is faster than ever.

Francisco Castano
Cypress, TX

Make models actionable

In response to "Lasting Impression" (November 2012, pp. 24-29): With all the statistical expertise in organizations, why can't we finally put to bed the voodoo economics models? Models that use data rather than ideology are actionable. Instead of simply pushing "quality," get specific.

Mike Clayton
Mesa, AZ

Meeting requirements

In response to "Why Certify?" (January 2013, pp. 25-29): I am confused. How can Dana Korkuch obtain a quality engineer certification (CQE) only four years after school, when the requirement to test for the CQE is eight years of on-the-job experience in one or more of the areas of the CQE body of knowledge and a minimum of three years of this experience must be in a decision-making position?

Paul Smith
Warwick, RI

Author's response: Dana had a bachelor's degree, which allowed four years of the eight to be waived. The requirements to sit for the exam state:[1]

If you have completed a degree[2] from a college, university or technical school with accreditation accepted by ASQ, part of the eight-year experience requirement will be waived, as follows (only one of these waivers may be claimed):

- Diploma from a technical or trade school—one year will be waived.
- Associate degree—two years waived.
- Bachelor's degree—four years waived.
- Master's or doctorate—five years waived.

The four years of work experience that she did have were all in a decision-making position.

Scott Laman
Sinking Spring, PA

REFERENCE AND NOTE

1. ASQ, "Quality Engineer Certification—Is It Right for You?" http://prdweb.asq.org/certification/control/quality-engineer/right-for-you.
2. Degrees/diplomas from educational institutions outside the United States must be equivalent to degrees from U.S. educational institutions.

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(All URLs case sensitive)

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2. **Facing Tight Times:** The results from the 2012 Salary Survey and the keys to overcoming salary stagnation. (http://bit.ly/Xmgy0Q)
3. **Corrective vs. Preventive Action:** Keep the difference between corrective and preventive action straight.(http://bit.ly/Unwm2s)
4. **Outputs and Outcomes:** Defining, distinguishing and differentiating project deliverables. (http://bit.ly/UZ8N23)
5. **Learning to Fish:** Use a modified fishbone diagram to jumpstart your career. (http://bit.ly/V1UTvW)

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- **Optimizing operations**
  Hear more about how a chemotherapy mixing room team used the define, measure, analyze, improve and control method and lean tools to reduce costs and improve efficiency in this month's author audio featuring Vera Vanicek, author of "The Right Blend," pp. 18-26.

- **Do you know why?**
  Learn more about why it's important to know how an improvement project aligns with the organization's mission, goals and objectives by checking out additional tables and figures from the article, "Know the Why," pp. 34-41.

QUICK POLL RESULTS

Each month at www.qualityprogress.com, visitors can take an informal survey. Here are the numbers from a last month's Quick Poll:

"How has becoming certified affected your career?"

- I don't hold any certifications. 39.3%
- Hasn't made an impact. 31.4%
- Helped me get a new job. 23.5%
- Helped me get a raise. 5.6%

Visit www.qualityprogress.com for the latest question:

"What is the right way to ensure a lean Six Sigma project stays on track?"

- A project manager.
- Regular check-in meetings.
- Unified training.
- A Champion.

QualityNewsTODAY

Recent headlines from ASQ's global news service

(All URLs case sensitive)

Dreamliner Reliability in Doubt After Failures

A Boeing 787 Dreamliner destined for Tokyo last month had to return to the gate at Boston's Logan International Airport because of a fuel leak. The day before, a battery used to power another 787 when the engine was turned off on the ground caught on fire. (http://bit.ly/ZPJ7oH)

Disney's New Wristband May Eliminate Long Lines

The frustration of waiting in long lines at Walt Disney World in Florida could soon be a thing of the past, as the mega theme park announced it is launching a new program that will allow guests to customize their vacations with mobile phone apps and a futuristic wristband. (http://bit.ly/W3Qw26)

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EXPERTANSWE

Searching for answers

Q: My organization manufactures soft ferrite cores, which involves a typical process consisting of variables in many departments, such as pressing, sintering and grinding. The rejection rate is high—about 10%—and some of the variables are not in control. Then, if we control one, another is disturbed.

Because there are so many variables to control, it's difficult to analyze the root cause of the problem. We can correlate two or three variables, but not all. Please help me find a way to overcome this.

Vandana Rishi
New Delhi, India

A: Pardon the cliché, but this is a classic good news/bad news problem. First, the bad news: This is not a simple problem, so simple solutions may not work. But you already know that. The good news is the failure rate is 10%. How can that be good news? You have a significant opportunity, so it will be easier to make a significant difference.

Ferrites are ceramic compounds that include iron as the principal ingredient and other materials, such as zinc, nickel or manganese. The materials are milled into fine powders, mixed, pressed into a mold and sintered (baked).

The sintering oven usually has an atmosphere capable of controlling the chemical reaction and preventing unwanted contaminants. The sintered core may be ground to finalize the dimensions and perhaps adjust the electrical properties.

The finished product can be used in transformers, solenoids, power supplies and even loudspeakers. Ferrites have dozens of magnetic and electrical characteristics, but the critical performance measures depend on the application.

You mentioned that some of the variables are not in control, and as soon as you control one, another is disturbed. My guess is that you have multiple failure modes. If the failures are intermittent, it may seem as though you are chasing a moving target.

Sometimes, "intermittent" failures are quite predictable. I used to work on a spot-welding process with intermittent "cold" welds. Most of the time, all of the welds were good. But every so often, a high percentage of welds would fail. It turned out there were too many machines drawing from the same power source, and on the rare occasion when all of the equipment demanded power at the same time, the voltage would drop, and cold welds would result.

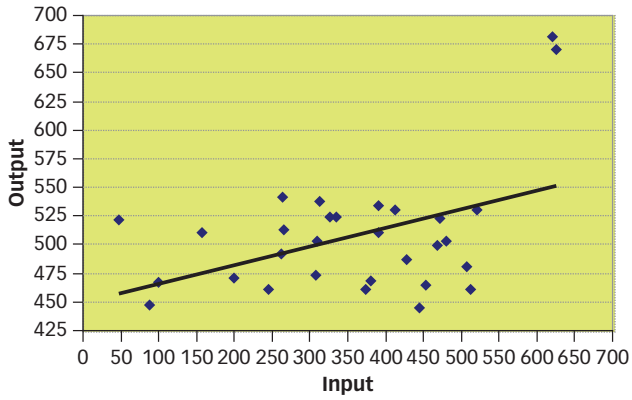
I suggest you start by collecting as much historical data as you can. Analyze the data, and look for patterns between inputs and failures. There is no guarantee this method will work, but you might get lucky and find some opportunities. The key is to use the right tools for this analysis.

Correlation can be helpful, but it only works well if both metrics have variable data. For example, if parts are rejected for insufficient flux density, try correlating the flux density to the raw material particle size, mixing time, oven temperature and other variable inputs.

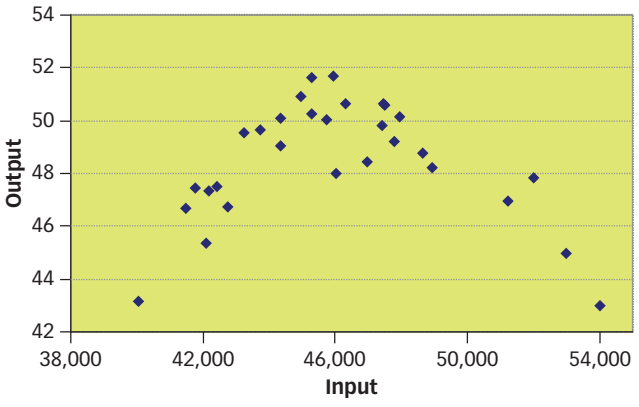
Correlation is subject to pitfalls, and correlation coefficients can be inflated by outliers (see Figure 1). In addition, you may miss important relationships if you rely solely on correlation coefficients to identify problems (see Figure 2). For these reasons, correlation analysis always should be supplemented by scatter plots.

Another limitation of correlation is it cannot detect interactions. The process

Misleading correlation due to outliers / FIGURE 1



Special correlation / FIGURE 2



RS

Be persistent and get other people involved. **You will find answers soon enough.**

output may be fine if any single process variable drifts to the specification limit, as long as the other process factors stay at the nominal setting.

But processes can be complex. Imagine a two-by-two matrix with two key process variables. If your process has an interaction, then three of the four quadrants in the matrix will have low failure rates, but one of the quadrants will generate the majority of the failures. With a little manipulation of the historical process data, you could create categories for each variable (either low or high) and then compare the failure rates for each combination of factor settings (low-low, low-high, high-low and high-high).

To minimize the failures, you will need to restrict the operating range of at least one of the process variables. If all four quadrants have a similar failure rate, try some other process factors.

Charts and tools

For failures related to attributes such as cracks, voids and burrs, correlation may not work. In this case, try bar charts. Compare the failure rates by shift (day vs. night), mold number or position in the oven (top, middle or bottom). Large differences in the failure rate will help you isolate the problem. Try this technique with variables you have not yet considered, such as lot changes in the raw materials or the number of production runs since the most recent mold refurbishment.

Also consider trend charts. Some people limit investigations to the specific lot that failed. But a trend chart may show that a critical process average shifted a week before the failure. The failure was more likely to occur after the process shift, but you may need a combination of factors to occur simultaneously before the failure happens.

Don't forget standard tools such as fishbone diagrams. Structured brainstorming also can generate new insights into potential root causes. A process failure mode and effects analysis can identify the system's potential weaknesses, such as poor detection.

It is always better to prevent failures, but if you can detect them at an intermediate process step, you can react faster and prevent defects from progressing to the next step of production. If you already tried these tools, simply review the historical failure data and make sure you have not missed any failure modes.

You also could try a tracking study. For the purpose of this study, measure everything you can think of at every step of the process, including things you don't normally measure. Track the material and try to maintain the production sequence as the material moves through subsequent operations. This will allow you to look for trends within the lot instead of just looking at variation between lots.

If the failure rate changes from the beginning to the end of the run, start digging deeper. Some mixers have a tendency to sort by particle size, so if the mixer runs too long, all the large particles end up on the top. This may cause problems either at the beginning or the end of the batch, depending on how the mixer is unloaded.

When you think you have found the root cause, prove it. If possible, conduct a series of runs, alternating between the "before" and "after" conditions. If the failure appears and disappears as expected every time you change the process, you can be confident you found the root cause.

It's also possible to show the worst-case scenario is a 50/50 probability you found the root cause. When the fix is implemented, you expect the failure rate to go down, and when the fix is removed, you expect the failure rate to go back up. If you do this change four times (on, off, on, off) and the process behaves as expected every time, you can be confident you have the root cause.

The probability of being wrong is $(0.5)^4 = 0.0625$. If you do this six times (on, off, on, off, on, off) and the process behaves as expected for all six runs, the probability of being wrong is reduced to $(0.5)^6 = 0.015625$. If any of the runs deviate from your expectation, you probably do not have the root cause, so keep looking.

Be persistent and get other people involved. You will find answers soon enough. If all else fails, get a Six Sigma Black Belt or statistician to help you, and try factorial experiments.

Andy Barnett
Consultant and Master Black Belt
Houston

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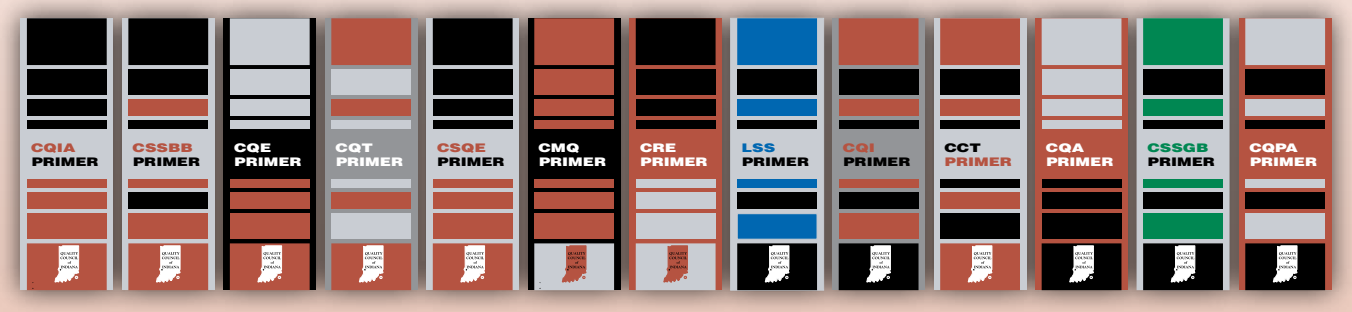

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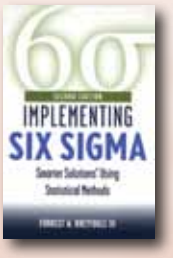

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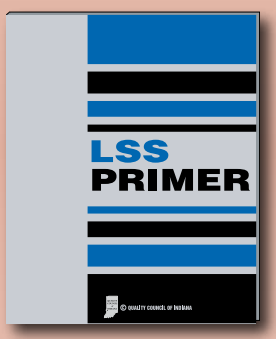

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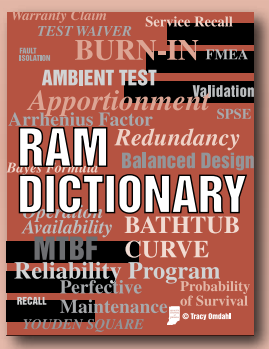

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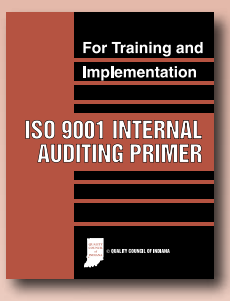

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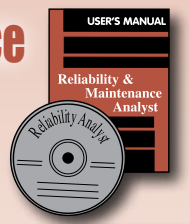

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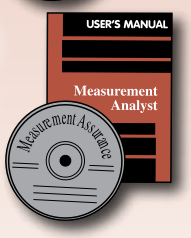

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Quality System Handbook

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Details the selection, organization, and writing of quality documents. The disk contains procedures and work instructions.

The Unending Search

Transformation in quality as a 'thing in the making'

RECENTLY, STEPHEN K. Hacker wrote that "many of our organizations remain mired in their current states, frozen in old mindsets."[1] To free our organizations and ourselves from such paralysis, Hacker exhorted the reader to contemplate how we and our organizations answer questions such as, "Who am I?" and "What constitutes truth?"

For Hacker and me—I agree with his comments—the possibility of transformation begins with an introspective review of the assumptions upon which our mindset depends. Is the notion of transformation itself, however, a reflection of an old mindset?

Consider Hacker's definition of transformation: "The marked change in the nature or function of organizational systems creating discontinuous, step-function improvement in sought-after result areas."[2]

Note that "marked change" is a noun that refers to a complete state. In short, Hacker defined transformation as a noun. But is transformation better expressed as a noun or a verb? While this question may seem like a superficial grammatical distinction better left to high school and undergraduate English courses, what is at stake is grammar at the most discrete level.

That is, the rules and metaphilosophical assumptions supporting how you understand transformation—or the grammar informing the very discourse concerning transformation and, by extension, quality itself—govern quietly whether you understand transformation as a noun or a verb.

What follows is a contrast of the current grammar and its tacit assumptions concerning knowing, being and meaning to a different grammar born in the experiential-based philosophy of William James. The difference between grammars and the importance of the difference in the reconstruction of transformation and quality is explored.

Transformation as a thing made

According to the current grammar, truth may be considered as the highest good or the very point of quality. Truth might be expressed as the reduction of waste, the minimization of variance, the adherence to a specific standard, or even in terms of the voice of the customer. In all instances, however, quality is an expression of some sort of established truth.

Within the current state mindset, truth is a thing that's made. By necessity, then, this mindset must orient itself to that which comes before. In short, the mindset is rear-facing.

The universe, within such a mindset, is rational, knowable and safe. The eternal and unchanging truth is always lurking. Meaning exists and is a fixed and knowable point. Within such a mindset, not only is finding the correct answer possible, but the response, once found, may apply to all knowers across all contexts.

The worth of quality, according to this grammar, is centered in definitional clarity. The clearer the definition, the more value quality offers. Such a framing assumes a clear distinction between knower and thing known. The individual is the knower (or subject), and the thing known is the object; both are things made.

The clear and distinct separation between knower and thing known is usually referred to as the subject or object split within philosophy. The self or knower within such a vision is always distinct and apart from the world.

The essential rationality and immutability of knowing and being within the traditional mindset lends itself to quantitative methods and statistical tools. You can progress safely through the define, measure, analyze, improve and control cycle—or choose not to—because the universe as defined through the traditional grammar is inherently knowable and predictable. You can differentiate between common cause and special-cause variation, and, by extension, processes that are in control and out of control because of the assumed stability within knowing, being and meaning.

Language and meaning within these horizons also are based in antecedent truths. If you have the correct name of a thing, you have insight into the very essence of a thing because the name corresponds to the unchanging truth of a thing. If the correspondence is errant, you must identify the appropriate noun or adjective, and realign your knowledge.

Within this vision, substantives are primary; verbs are important only when they somehow reflect the unchanging essence of the thing in question. Nouns reflect the static quality of truth as they themselves are inert. Such a view cannot help but stress the disjunction of things in terms of being and knowing.

Accordingly, transformation is not understood as doing and as a verb, but as a noun and as an accomplished state. For example, transformation in quality is reached after the goal of the project charter is attained. While the goal may be lost if a control plan is inadequate, transformation

is said to have occurred but was not maintained.

Similarly, improving a process to meet critical-to-quality requirements or to meet any of the external standards is typically framed as transformation within the field of quality. As Hacker noted, transformation is a "marked change."[5]

In one of his later works, James wrote, "What really exists is not things made, but things in the making. Once made, they are dead, and an infinite number of alternative conceptual decompositions can be used in defining them."[3]

James, like American writers Ralph Waldo Emerson and Henry David Thoreau before him, rejected the mindset that reality is static and fixed. Things, such as organizations and the humans within them, are wonderfully diverse and marvelously inconsistent.

Growth and change—and the transformations sought through quality—are seldom linear, rarely static and tend to ride us more than we ride them. The plurality suggested by James' phrase of "thing in the making" seems a better description of being than the singularity suggested by "thing made."

According to James, how you know also is colored by the incessant plurality that you are and that you experience. What is real for James is more aptly described as a "fringe."[4]

A "fact" is similarly reconstructed from a fixed objective and singular incontestable piece of information to a "conscious field plus its object as felt or thought of plus an attitude towards the object plus the sense of the self to whom the attitude belongs."[5]

Thus, for James, a knower is never separate from the thing known. Within concrete reality, you color that which you know with your purpose and intent, and, in turn, are joined through experience with that which is experienced.

Knowing and being are, therefore, reconstructed as creative engagement, or better yet, as procreative engagements with the world. Knowing is an action that comes to life within the tissue of experience.[6] As noted by James in *Pragmatism*, the function of a living philosophy (and of a living quality) is to discover the concrete differences to "somebody, somehow, somewhere, and somewhen."[7]

Transformation reconstructed

Within the Jamesian mindset, transformation is troped; it is moved from a static centering in the past to an indeterminate sliding and future-tensed focalization within the stream of experience. Evaluating transformation within the flow and ebb of experience reaps some profound insights:

- Transformation is never completed; it is a thing always in the making; the golden carrot as promised in future-state transformation is an illusion based on abstraction.
- The end-state is also illusory; what is to follow only can be intimated and can never be fixed according to some antecedent understanding.
- There is no objective scale upon which or against which to evaluate transformation; transformation will possess positive and negative characteristics, but appreciating the mix is whimsical and dependent upon numerous and changing factors, mood and context.
- The lived experience takes precedence over the cognitive within the flow of transformation.
- The experiences born from transformation can and should be shared; sharing these vivid sorts of experiences are profoundly human and deeply rewarding—even if not always joyous.
- In the end, transformation cannot be defined in terms of what rewards it will reap, but by the openness of the person to the concreteness of a given moment.

What's the difference?

While disparaging abstraction and the philosophical assumptions upon which the current mindset rests, the allure is obvious. Stability, definitional clarity and predictability are all extremely valuable.

What sense of improvement or transformation, and of quality, can survive in a mindset turned from these attributes toward plurality, the vague and unbounded contingency?

Desired outcomes, goals and best practices: All of these often touted entities are better understood as verbs and not as nouns. They are moving targets, and as fluid as human moods and organizational context.

Quality, when glimpsed from within the Jamesian mindset, is a fleeting and constantly moving nexus among these forces. The seductive promise of control and command is not offered from such a temporary stay. In its place, a prescription for more work—to search constantly for the "lived" meaning—is offered.

While such arduous and relentless work comes at the price of theoretical clarity, in its place is the genuine possibility to make a concrete difference to "somebody, somehow, somewhere and somewhen."[8] QP

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FOOD SAFETY

Eating Expense

Proposed FDA food regulations will come at a price

Two new regulations proposed by the U.S. Food and Drug Administration (FDA) to prevent the contamination of produce and processed foods could cost businesses nearly half a billion dollars a year to implement, but the rules are expected to reduce the Centers for Disease Control's estimated 3,000 U.S. deaths a year caused by foodborne illness.

The new rules—part of the Food Safety Act passed by Congress in 2011—could cost large farms $30,000 a year, according to the FDA. The agency did not break out costs for individual processing plants, but said the rules could cost manufacturers up to $475 million annually. It was unclear how consumers will bear some of the expense of the proposed new rules.

Shelly Burgess, an FDA spokesperson, said the FDA will "pursue a variety of mechanisms" to find resources, including shifting money from other programs, partnering with states and charging fees for activities such as repeat inspections.

"While user fees will help, the lion's share of the cost of implementing strong regulations will come from congressional appropriations," said Caroline Smith DeWaal, food safety director at the Center for Science in the Public Interest, a consumer group based in Washington, D.C.

"These are challenging times in terms of congressional appropriations, but over the long run, this is the basic function of the government to have adequate inspections and to have safe food," she said.

The first rule would require manufacturers of processed foods sold in the United States to come up with a plan to reduce the risk of contamination by correcting problems and keeping records that government inspectors could audit.

The second rule would apply to the harvesting and production of fruits and vegetables to try and combat bacterial contamination such as E. coli.

"These new rules really set the basic framework for a modern, science-based approach to food safety and shift us from a strategy of reacting to problems to a strategy for preventing problems," Michael R. Taylor, deputy commissioner for foods and veterinary medicine, said after the announcement in early January.

The Grocery Manufacturers Association lauded the proposed rules and said implementing the Food Safety Act "can serve as a role model for what can be achieved when the private and public sectors work together to achieve a common goal."

Chris Waldrop, director of the Food Policy Institute at the Consumer Federation of America, said, "Preventive controls and produce safety are cornerstones of the FDA's new preventive system. We are eager to review the proposals and provide comments to the agency."

FDA officials said the agency planned to release three more proposed rules. One would require importers to verify that food grown or processed overseas is as safe as its domestic counterparts, and another would strengthen the quality of overseas third-party food safety audits. The third rule would address prevention controls for animal food facilities.

The formal proposed rules were expected to be released to the public in mid to late January. After that, the public will be able to comment and provide feedback to the FDA within 120 days.

It could take the agency about a year to analyze the feedback, make any revisions and release final versions of the regulations.

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NT

DATEINQUALITYHISTORY

QP occasionally looks back on a person or event that made a difference in the history of quality.

FEB. 12, 1919

Russell L. Ackoff, a man many knew as the leader of the systems-thinking community and a pioneer in the realm of operations research, was born on this date.

Unlike many in his field, Ackoff's educational background was rooted in philosophy, a discipline for which he received a doctorate from the University of Pennsylvania in 1947. That foundation was shared by C. West Churchman, his colleague at Case Institute of Technology and a co-author of *Introduction to Operations Research.* That seminal work, published in 1957, is widely accepted as the most influential early textbook on operations research.

His work in the field was far-reaching and even infiltrated the White House under President Bill Clinton, who relied on Ackoff as a consultant at the White House Communications Agency as it implemented systems thinking.

Ackoff died Oct. 29, 2009, at the age of 90 from complications following hip replacement surgery.

WORDTOTHEWISE

To educate newcomers and refresh practitioners and professionals, QP occasionally features a quality term and definition:

Eight wastes

Taiichi Ohno originally enumerated seven wastes *(muda)* and later added underutilized people as the eighth waste commonly found in physical production. The eight are:

1. Overproduction ahead of demand.
2. Waiting for the next process, worker, material or equipment.
3. Unnecessary transport of materials (for example, between functional areas or facilities, or to or from a stockroom or warehouse).
4. Overprocessing of parts due to poor tool and product design.
5. Inventories more than the absolute minimum.
6. Unnecessary movement by employees during the course of their work (such as to look for parts, tools, prints or help).
7. Production of defective parts.
8. Underutilization of employees' brainpower, skills, experience and talents.

SOURCE:
"Quality Glossary," *Quality Progress*, June 2007, p. 45.

Who's Who in Q

NAME: Andre Kleyner.

RESIDENCE: Indianapolis.

EDUCATION: Doctorate in mechanical engineering from University of Maryland in College Park.

CURRENT JOB: Global reliability engineering leader, Delphi Corp., electronics and safety division, in Kokomo, IN, and adjunct professor at Purdue University in West Lafayette, IN.

INTRODUCTION TO QUALITY: Kleyner took several college courses on the strength of materials and finite element analysis, which taught him about structural failures. His first job as a product assurance engineer gave him a real appreciation for quality and reliability.

PREVIOUS QUALITY EXPERIENCE: Kleyner said he has learned a lot developing new products as well as studying their field performance and later performing engineering analyses of warranty returns and statistical data processing.

ASQ ACTIVITIES: He's a new ASQ fellow and the past vice chair of measures and reporting for the Reliability Division. A certified reliability engineer, quality engineer and Six Sigma Black Belt, Kleyner also has presented at many ASQ section and division meetings.

OTHER ACTIVITIES: Kleyner serves as the chairman of the advisory board for business programs at Ball State University in Muncie, IN, and is the editor for the Wiley Series in Quality and Reliability Engineering, an international book series. He also reviews manuscripts for several international technical journals. Kleyner holds several U.S. and foreign patents.

PUBLICATIONS: He has authored two books on reliability and warranty engineering, including co-authoring the fifth edition of *Practical Reliability Engineering*. Kleyner also has written more than 30 articles for technical journals and conference proceedings.

RECENT AWARDS: Kleyner received the P.K. McElroy Award for the best paper at the Annual Reliability and Maintainability Symposium.

FAVORITE WAYS TO RELAX: Skiing, jogging and playing guitar.

QUALITY QUOTE: In reliability and quality engineering, physics trumps mathematics.

ASQ
25 ASQ MEMBERS NAMED FELLOWS

Last month, the ASQ Board of Directors named 25 ASQ fellows. The 2012 fellows are:

- Ram R. Bishu, department of mechanical and materials engineering, University of Nebraska in Lincoln.
- John H. Breckline, Key Quality Consulting, Fort Worth and Haslet, TX.
- Terrance A. Burns, Burns and Associates Inc., Richmond, VA.
- Randy G. Canfield, Union Bank, Los Angeles.
- Michael J. Dreikorn, IPL Group LLC, Bokeelia, FL.
- Marc P. Kelemen, NanoSynopsis Consulting LLC, Westlake, OH.
- Andre Kleyner, Delphi Electronics and Safety, Kokomo, IN.
- Robert E. Kukla, CI Group Inc., Edwardsburg, MI.
- Nicholas C. Leifeld, Serigraph Inc., West Bend, WI.
- Eric D. Mead, Beechcraft Corp., Wichita, KS.
- Michael G. O'Connor, Medtronic Inc., Minneapolis.
- Sung Hyun Park, Seoul National University, South Korea.
- Michael A. Parrillo, Lapp Group, Florham Park, N.J.
- Teresa Laurene Pratt, TE Connectivity, Winston-Salem, N.C., and Plexus International, Minneapolis.
- Nicole Radziwill, James Madison University, Harrisonburg, VA.
- Timothy J. Robinson, University of Wyoming, Laramie.
- Debashis Sarkar, Asia's service lean pioneer and author, Mumbai, India.
- Lalith Nimal Senaweera, Sri Lanka Standards Institution, Colombo, Sri Lanka.
- Dilip Anand Shah, E = mc3 Solutions, Medina, OH.
- Stefan H. Steiner, University of Waterloo, Ontario, Canada.
- Jerry L. VerDuft, California State University, Dominguez Hills, Carson, CA.
- Stuart Walker, Teleflex, Research Triangle Park, N.C.
- Steven Ellison Wilson, U.S. Department of Commerce Seafood Inspection Program, Silver Spring, MD.
- Guangbin Yang, Chrysler, Auburn Hills, MI.
- Mohamed Zairi, European Centre for Best Practice Management, Keighley, United Kingdom.

For more on the new fellows, visit www.asq.org/media-room/press-releases/2013/20130108-asq-fellows-named.html.

SHORTRUNS

THIS YEAR MARKS the International Year of Statistics, spearheaded by the American Statistical Association and more than 1,400 organizations in 11 countries. The worldwide Statistics2013 initiative will highlight the contributions of the statistics field to solving global challenges. For more information about activities and events related to the celebration, visit www.statistics2013.org.

OFFICERS HAVE BEEN elected for the U.S. Technical Advisory Groups (TAG) to the International Organization for Standardization/Technical Committee (TC) 176 on quality management and TC 207 on environmental management for the 2013-2015 term. The officers for TAG 176 are: Alka Jarvis, chair; and Mark Ames and Alan Daniels, vice chairs. The officers for TAG 207 are: Susan Briggs, chair; Joe Cascio, vice chair; and Susana Quirch, secretary.

THE ANSI-ASQ NATIONAL Accreditation Board/FQS has signed the Asia-Pacific Laboratory Accreditation Cooperation mutual recognition arrangement (MRA) for inspection. This means ACLASS and FQS become signatories of the International Laboratory Accreditation Cooperation MRA for inspection, calibration and testing. For more information, visit www.aclasscorp.com/news/2012/12/aclass-signs-aplac-mra-for-inspection.aspx.

THE COORDINATE METROLOGY Society has released the results of its third large-scale measurement study, developed to support the organization's certification cognitive exam development process. The study's main focus was to test the method of practical testing rather than the evaluation of the measurement results. To download the 83-page report, visit http://bit.ly/UPMe0X (case sensitive).

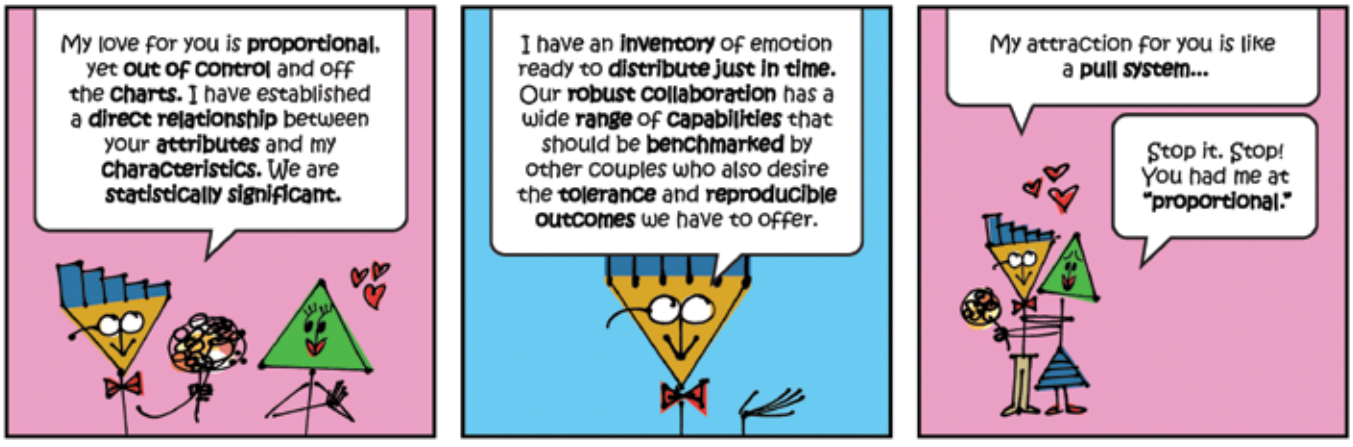
ASQ JOURNAL SPOTLIGHT

Every month, QP will highlight an open-access article from one of ASQ's seven other journals.

This month, be sure to check out "Insights on the Future of Quality Management Research," which appeared in last month's issue of *Quality Management Journal* (QMJ). In the article, James R. Evans, the journal's outgoing editor, and members of QMJ's editorial board provide insights and ideas to help the contributors to the quality management field identify topics to build new knowledge and to sustain the discipline.

To access "Insights on the Future of Quality Management Research," click on the "Current Issue" link on QMJ's website: http://asq.org/pub/qmj. From there, you also can find a link to information about subscribing to the quarterly publication.

Mr. Pareto Head BY MIKE CROSSEN



ASQNEWS

DIVE INTO THE DETAILS A 20-page brochure detailing the sessions, workshops and other events scheduled for the 13th annual ASQ Lean and Six Sigma Conference is now available. The event will be held March 3-4 in Phoenix. To download the brochure, visit http://asq.org/conferences/six-sigma.

DISCOUNT IN CONFERENCE PRICE ASQ members and nonmembers who want to attend this year's ASQ World Conference on Quality and Improvement can save some money with early-bird discounted pricing that's available through March 14. Visit http://wcqi.asq.org for more details about prices and the conference, to be held May 6-8 in Indianapolis.

RATE AND REVIEW Readers can now write comments and rate specific books that are available at ASQ's online bookstore. Visit http://asq.org/quality-press/index.html to offer your thoughts and reviews on any specific ASQ Quality Press book you've read, or read what others have said.

PRESENT AT NQEC March 1 is the deadline to submit proposals for presentations at this year's National Quality Education Conference. The event will be held Nov. 17-18 in Milwaukee. For more information, visit http://nqec.asq.org/index.html.

SURVEY

SOME MANUFACTURERS BRACE FOR SUPPLIER WOES IN 2013

While more than 75% of suppliers said they are confident they can fulfill their customers' needs this year, one-third of respondents to ASQ's 2013 Manufacturing Outlook Survey said they expect a shortage of parts or services because of a supplier problem.

To head off potential supplier problems, these respondents said they are working with their suppliers on process improvements to address volume capacity, while more than 26% are partnering with their suppliers' competitors. Other manufacturers said they are stockpiling parts in advance and expanding facilities to make the needed parts.

> "It's important for companies to **communicate openly** with suppliers to **avoid any disruption** in production."

Problems with suppliers was a familiar issue for many manufacturers: 80% of respondents said they have been adversely affected by a supplier's inability to meet their needs in the past, and they've had to go to other suppliers for parts or work with suppliers to improve processes.

"Any shortage of parts or services can have a dramatic effect on a manufacturer, so it's important for companies to communicate openly with suppliers to avoid any disruption in production," said Dick Gould, an ASQ fellow and a supplier management trainer and consultant.

"Conversely, it's important to suppliers to work with manufacturers to provide them with the quality parts or services to ensure a long-term relationship," he said.

The survey, conducted in November, took feedback from more than 1,250 manufacturing professionals from around the world. For more survey results, visit www.asq.org/media-room/press-releases/2012/20121220-suppliers-manufacturers-survey.html.

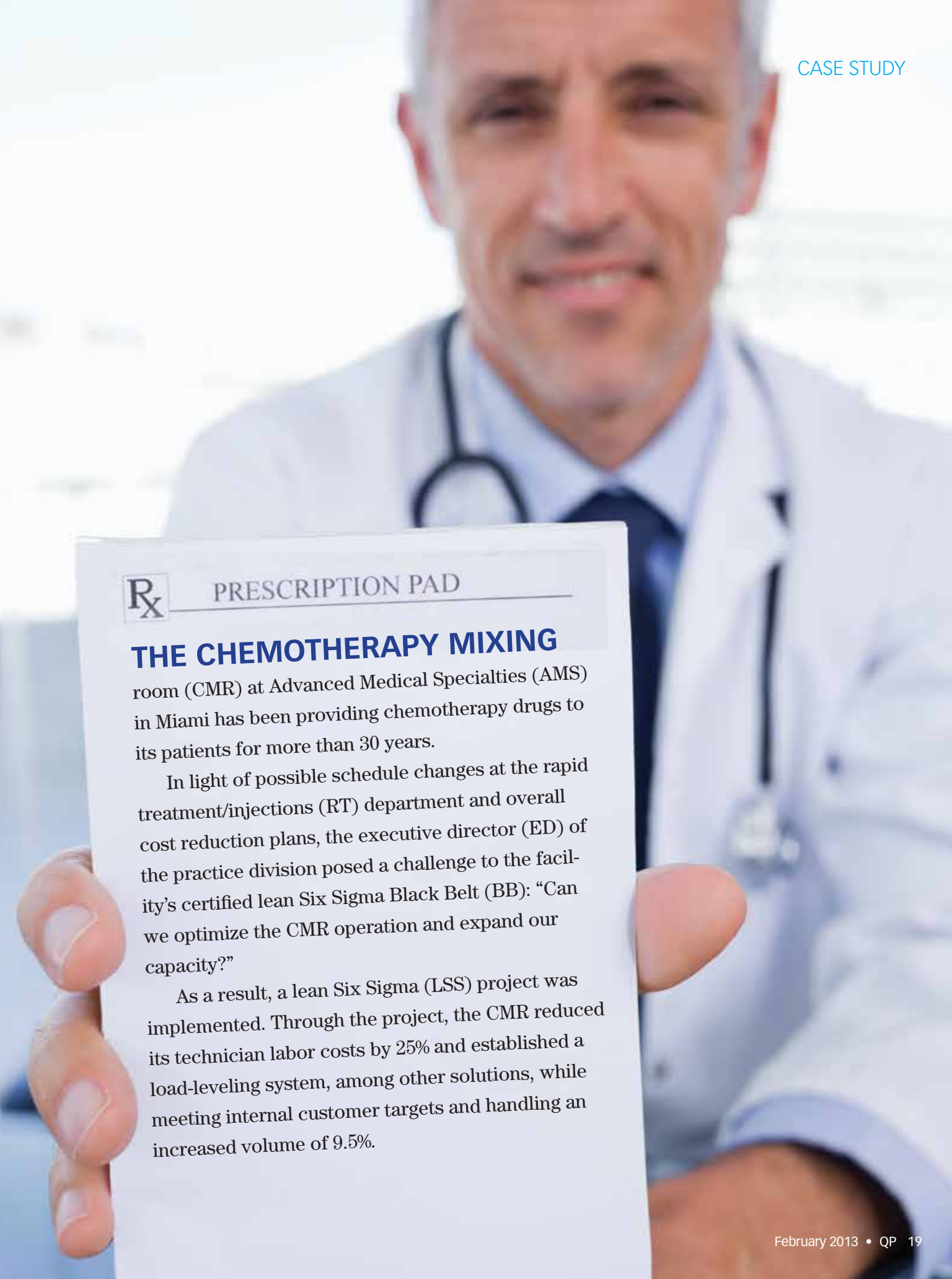
The Right Blend

by Vera Vanicek

In 50 Words Or Less

- Faced with cost reductions and scheduling changes, a chemotherapy mixing room (CMR) implemented the define, measure, analyze, improve and control method and lean tools to optimize operations.
- The CMR reduced its labor costs by 25% and established a load-leveling system to meet internal customer targets and handle increased volume.

Lean Six Sigma is used in a **chemotherapy mixing room** to optimize operations



Rx PRESCRIPTION PAD

THE CHEMOTHERAPY MIXING

room (CMR) at Advanced Medical Specialties (AMS) in Miami has been providing chemotherapy drugs to its patients for more than 30 years.

In light of possible schedule changes at the rapid treatment/injections (RT) department and overall cost reduction plans, the executive director (ED) of the practice division posed a challenge to the facility's certified lean Six Sigma Black Belt (BB): "Can we optimize the CMR operation and expand our capacity?"

As a result, a lean Six Sigma (LSS) project was implemented. Through the project, the CMR reduced its technician labor costs by 25% and established a load-leveling system, among other solutions, while meeting internal customer targets and handling an increased volume of 9.5%.

Although several lean tools were used by the BB and operational team, the Six Sigma define, measure, analyze, improve and control (DMAIC) template provided the critical framework to assist in guiding the team to formulate solutions.

Room for improvement

The CMR in the southern division of AMS is required to supply oncology drugs, pre-medications and injectables to an average of 86 patients every day, which is equivalent to an average of 227 individual production orders.

At the start of the lean project in early April 2011, the department was staffed by a supervisor, who is a registered nurse, and four technicians. The department operated with two mixing hoods and two drug dispensing machines. Shifts were staggered, with half the staff members starting at 7 a.m. and the other half at 9 a.m.

The department's primary purpose was the mixing of chemotherapy drugs for four different locations—two on-site and two remote. The drugs for the fourth remote location were typically prepared in advance at the end of the previous day (this location closed during the project due to low volume, not because of the project).

During the pre-define phase, the BB made a series of observations and noticed three major opportunities for process improvement:

1. The workload was heavier in the morning (from 7 a.m. to 10 a.m.) than in the afternoon. There was no systematic priority system in place, and technicians would find themselves looking for something to do in the afternoons.
2. The CMR and adjacent office had clutter and layout issues leading to inefficiencies.
3. There was no systematic inventory control system for supplies, which contributed, in part, to the clutter observed.

In addition, the nursing manager expressed her concerns about the CMR's ability to supply the RT area in a timely fashion because she had received complaints from the RT nurses about having to wait for injectables for their patients.

Starting with define

After these observations were made, the BB officially kicked off the project with the nursing manager, CMR supervisor and ED. A project charter was created, as shown in Table 1.

The problem was detailed to include the lack of optimization in the operation of the CMR, which led to underuse of labor during the afternoon hours. Based on this, the team agreed the goal of the project would be to improve employee utilization and to allow for RT to start servicing patients at 8 a.m. instead of 9 a.m.

The project charter included both "dark green," or hard-dollar savings, as well as "soft green," or less tangible but still valuable savings. Top management expected the hard savings to come from labor reductions. As far as the soft savings were concerned, the team agreed smoothing out the workload and improving the workspace environment would minimize the high stress levels department staff was under at the time. Metrics, boundaries and resources also were detailed and approved.

As part of the define phase, a suppliers, inputs, process, output, customers (SIPOC) diagram was created to establish the fundamentals of the process (Table 2).

Measuring the process

After the charter was approved and before gathering additional metrics, the BB established a service-level baseline for the supply of injectables to the RT department to understand the CMR process capability. For

Mixing room flow optimization /

TABLE 1

D M A I C

Problem statement The mixing room is not operating at optimal levels. It lacks load leveling and produces ahead, which leads to excess workload from 7 a.m. to 10 a.m. and employee underutilization in the p.m. hours.	**Metrics** **Primary metric(s):** Orders per hour (leveled load).
Goal To smooth out the workload to improve employee utilization and allow for rapid treatment (RT) to start servicing patients at 8 a.m. instead of 9 a.m.	**Boundaries** **In scope:** Baptist Hospital mixing room. **Out of scope:** Medical assistants, lab and others. **Customers:** Chemo nurses (the ultimate customer is the patient). **Stakeholders:** Mixing room, RT, chemo nurses. **Limitations:** No capital expenditure; technology changes to be reviewed by IT manager.
Expected benefits/savings **Dark green savings:** Labor reductions (1 full-time employee). **Light green (soft) savings:** Smoother flow throughout the day leading to lower stress for all employees; ability to satisfy RT orders starting at 8 a.m.	**Resources** **Project sponsors**: Maggy. **Project lead/Black Belt**: Vera. **Process owners**: Lourdes A. (mixing room supervisor). **Team members:** Cathy, Lourdes, Techs, Vera.

one month—with the help of the CMR supervisor—the BB quantified the number of injectable orders as well as the process time from receiving the order to providing the injectable to the staff.

The nursing manager reported the service-level target to be between five and 10 minutes from order drop-off to order delivery. Based on all the data collected, a basic histogram was developed to characterize the performance of the CMR (Figure 1, p. 22).

The data analysis revealed that the process yield was 96.2%. The analysis validated that the CMR was meeting its internal customers' expectations as established. The BB also analyzed the distribution of RT orders by day of the week (Figure 2, p. 23) and ran a one-way analysis of variance to validate that the differences in day of the week was indeed statistically significant ($p = 0.00$), as had been previously indicated by the department supervisor.

With this analysis now available, the BB began to gather information about employee use and how the technicians were using their time throughout the day. To assess the distribution of value-added (VA), value-enabling (VE) and nonvalue-added (NVA) activities for each of the technicians, she scheduled four full days to conduct time studies and to observe the staff. Prior to her observations, she obtained consensus from the nursing manager and CMR supervisor about how she would evaluate the activities observed:

SIPOC diagram / TABLE 2

Suppliers, inputs, process, outputs and customers (SIPOC): Mixing room process											
Who are the suppliers for our product or service?		**What do the suppliers provide to my process?**		**What are the start and end points of the process associated with the problem and the major steps in the process?**		**What product or service does the process deliver to the customer?**		**Who are the customers for our product or service? What are their requirements for performance?**	
Suppliers		**Inputs**		**Process (high level)**		**Outputs**		**Customers**	
1	M.D.s	1	Order	**Start point:**		1	Mixed chemo	1	Chemo nurses
		2		Order received via PC (PDF emailed) or dropped off rapid treatment (RT), Dr. D.				2	RT nurses, medical assistants
		3				2	Pre-meds	1	
2		1						2	
		2		**Operation or activity:**		3	Injectables	1	
		3		1	Order entered into Pyxis (a drug dispensing management system)			2	
3		1		2	Drugs/pre-meds dispensed	4	Pump/push	1	
		2		3	Drugs/pre-meds processed			2	
		3		4	Order inspected by supervisor	5		1	
4		1		5	Order released			2	
		2		6		6		1	
		3		7				2	
				8					
				9					
				10					
				11					
				End point:					
				RT/chemo receives drugs/pre-meds to administer to patient					

- VA activities are essential to delivering the product to the customer. Examples include mixing and prepping pre-medications.
- VE activities are required by the business to execute the VA work but add no real value from a customer standpoint. Examples include removing garbage, washing hands, entering orders and receiving drugs into inventory.
- NVA activities are waste. They don't add value from the customer's perspective and are not required. Examples include rework, such as fixing a drug dispensing mistake, waiting for orders and socializing when not on break.

As a result of the BB observations, a technician utilization chart was created to illustrate the distribution of these activities (Figure 3). The chart shows that half of the staff was spending about half of its time on VE activities. Based on this information, the BB charted the VE activities by time, as seen in the Pareto chart in Figure 4 (p. 24).

During the measure phase, the BB also met with the team to develop a value stream map (VSM), in lieu of a process map, which she felt would not provide the level of detail required for the project. The current state VSM can be seen in Figure 5 (p. 25). Because the area had obvious layout issues, the team also created a spaghetti diagram, which can be seen in Figure 6 (p. 26). Multiple pictures also were taken to illustrate the clutter and lack of organization in the area.

Analyzing critical areas

In the analysis phase, the BB and the team proceeded to evaluate the most critical areas stemming from the measure phase, as well as the previously created problem statement.

They learned that employee use was being affected by two primary issues:

1. The drug inventory and staging process was the No.1 VE activity, consuming an average of 50 minutes per day. Why was it taking so long?
2. The mixing of all the drugs was being done mostly during the first three hours of the shift.

The BB conducted detailed observations of the inventory and staging process and found several flow and ergonomic issues:

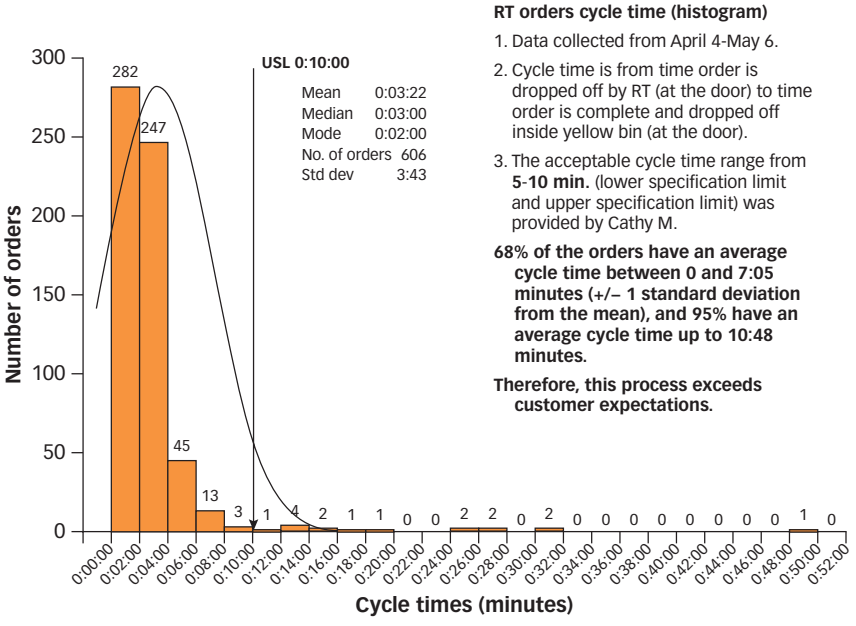
- The technicians didn't have a proper place to stage the drugs on arrival, although there were many boxes to open and drugs to unwrap.
- The invoice was cumbersome to read during the reconciliation process.
- Staff had to bend over and place trays with drugs on the floor while uploading into the machine.

For drug mixing, the supervisor explained she felt more comfortable getting all the mixing done first thing in the morning. It was a psychological issue for her—she thought it was best to just "get it done and out of the way" so she and the team could have peace of mind later in the day.

In addition to the two issues, the question remained: How many technicians are actually needed based on all the time studies conducted? The BB answered this with a staffing analysis derived from cycle time data, which yielded a need for only two full-time technicians. The analysis can be seen in Online Table 1, found on this article's webpage at www.qualityprogress.com.

Workflow and related efficiencies were affected by travel distances and excessive motion. For example, the technicians had to walk 12 feet from the drug receiving area to

Rapid treatment (RT) orders histogram / FIGURE 1



St dev = standard deviation

the closest storage refrigerator and 22 feet from the supervisor's printer to the drug dispensing machine. The poor layout was due not only to restricted floor space but also to the use of four separate storage refrigerators and dozens of bins for supplies.

Critical improvements

With the analysis phase underway, it became evident almost immediately that the project offered several low hanging fruits, so the team agreed to tackle the project issues by focusing on a few critical items:

- A new drug-receiving and inventory-reconciliation process would be implemented, featuring a designated staging area and a rolling cart on which to unpack the drugs. (This process would later be enhanced by improvements to the packaging of the drugs and the invoices from the distribution center). When the BB remeasured for results, this process cycle time had been reduced by 51%.
- The layout issues would be addressed through the 6Ss—sort, set in order, shine, standardize, sustain and safety.

The team kicked off the 6S on a Saturday when only the first S—sort—was implemented. Old desks were removed, unused cabinets were torn down and dozens of unnecessary papers and obsolete books (now accessible electronically) were discarded.

The second S—set in order—generated the need for pocket folders and other organizing tools, which became part of a list of more than 30 items identified as opportunities for improvement.

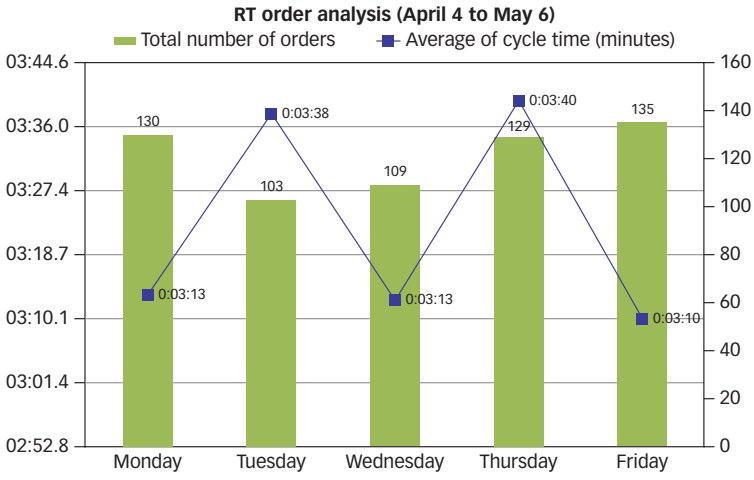
The third S—shine—was performed and made a part of the daily routine with the use of a 6S cleaning assignment sheet to be signed off by the staff daily (Online Table 2). Other improvements included painting the CMR walls and polishing the floors.

As part of the layout improvements required, the BB proposed the consolidation of the four household storage refrigerators into a single commercial-size one. The BB presented an analysis of space savings to the ED and demonstrated that with this consolidation, the CMR would gain almost 900 square feet and would have a state-of-the-art refrigerator to keep pre-medications and other drugs at the appropriate temperature.

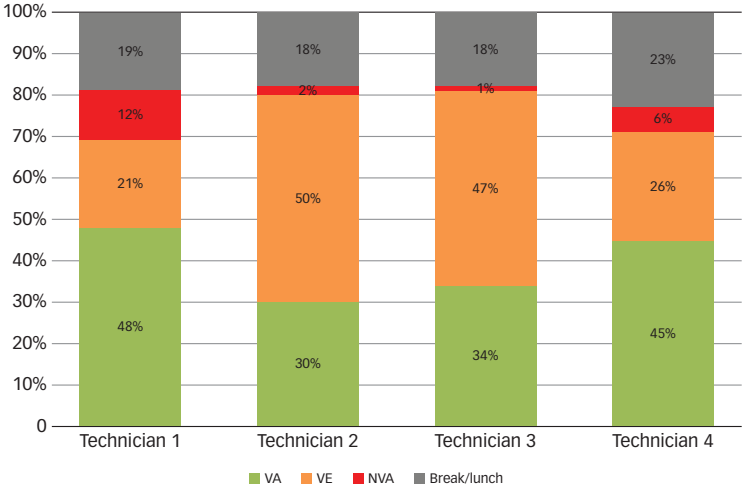
This proposal was approved by the ED, the new refrigerator was purchased and the space savings were achieved. Other items, such as cabinets and workstations, were also relocated, leading to a savings of almost 40 feet of walking distance for the technicians.

The storage of chemotherapy mixing supplies also was improved by eliminating dozens of bins located throughout the CMR and implementing a two-bin replenishment system based on two locations: a single wire cart inside the CMR and three supply racks in the supervisor's office. The quantity per container was calculated from data collected for average daily use and safety stocks, and from existing reports for lead times.

Rapid treatment (RT) order analysis by day of week / FIGURE 2



Mixing room technicians utilization / FIGURE 3



VA = value added
VE = value enabling
NVA = nonvalue added

A spreadsheet was developed to indicate quantity and frequency of replenishments for the team to pilot. Stemming from the pilot, the new system was further enhanced by the supervisor and team members, who condensed the replenishment frequency to one time per day for most supplies, all while reducing on-hand inventory by an estimated 50% through the use of visual signals for ordering.

To achieve a smooth workload throughout the day, it was obvious to the BB that load-leveling techniques were required. The basic principle was to base production on hourly buckets rather than in a single morning batch for the whole day—resulting in a smooth workload throughout the day.

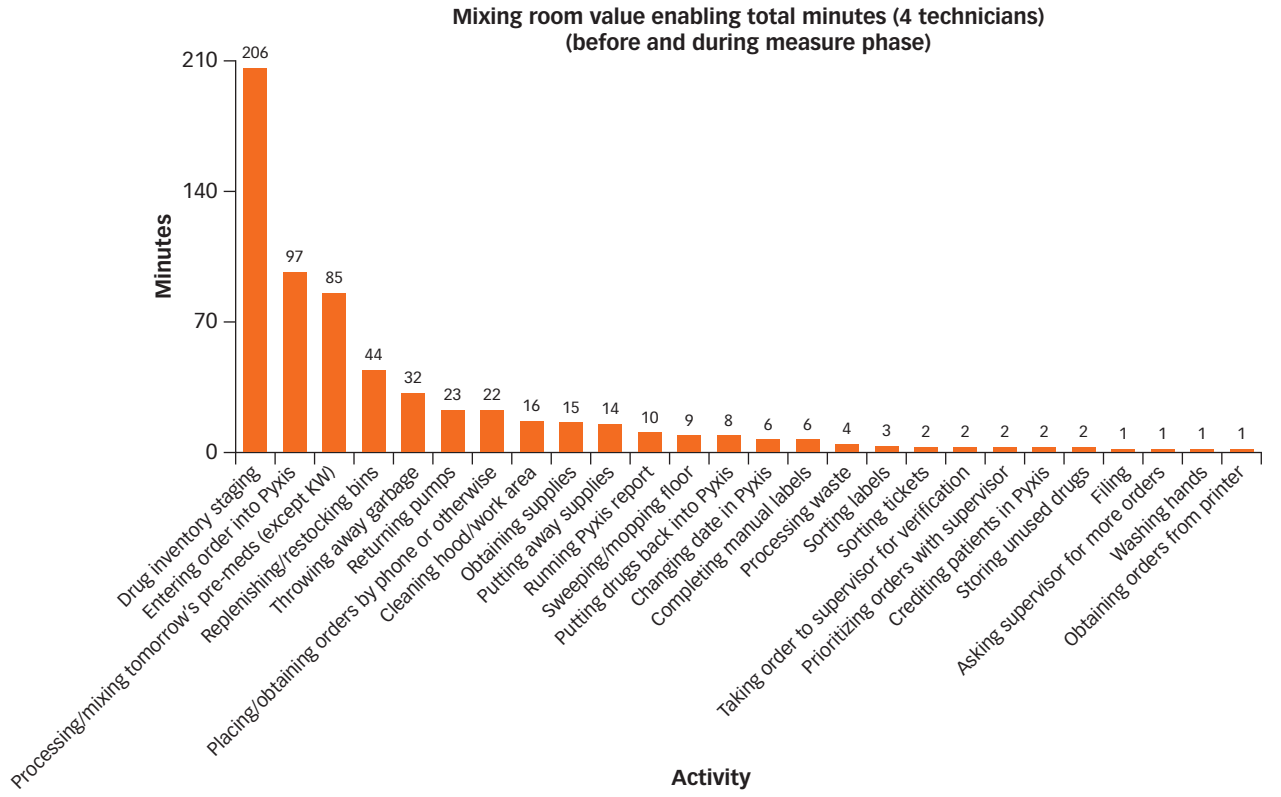
As a believer in visual management systems, the BB suggested a simple board where the day could be divided into one-hour buckets. The production orders would be processed for each one-hour cycle based on patient schedules, and the order tickets would hang from their corresponding hour on the board. The chemotherapy mixing would start one hour in advance. For instance, the chemotherapy needed for the 10 a.m. patients would be prepared starting at 9 a.m. to ensure it would be ready when needed.

When tickets were processed, they were removed from the board and affixed to the final product. Hourly labels without any tickets below indicate the orders for that hour were work in progress. A photo of a load-leveling board can be seen on p. 26.

As with everything else done for this project, the load-leveling strategy kicked off as a pilot. The kickoff took place in late June. Ten days later, the CMR supervisor said, "This is so good that I started training one of the technicians to mix chemotherapy drugs because the environment is not so crazy."

With the success of the load-leveling techniques and based on the staffing analysis, top management decided to reduce labor costs. The team recommended, and the ED agreed, to do this cautiously and approved the reduction of only one full-time employee instead of the two the analysis yielded. The ED believed this would give the team a chance to adjust to the changes without having to deal with the reduction of two technicians simultaneously.

Pareto value-enabling activities before improvements / FIGURE 4



KW = Key West practice location

Control: maintaining improvement

All improvements implemented in the CMR have been documented via pictorial procedures. Examples include:

- The new drug receiving process.
- Checklists, such as cleaning assignments.
- VSM (for the future state VSM, see Online Figure 1).
- Spaghetti diagrams (for the diagram after project implementation, see Online Figure 2).
- Pareto charts (see the after-implementation VE Pareto chart in Online Figure 3.)
- Weekly 6S audits.

The weekly audits include seven questions that are graded with either a one or a zero, indicating whether the requirement is present or not. The scores are then tracked by hand on a chart, and all project documents are posted on a team communications board located in the CMR.

The weekly audits also allow for continuous improvement for all process changes made—not only 6S related ones—and the audit form allows the supervisor to note and track new opportunities for improvement as they are discovered.[1]

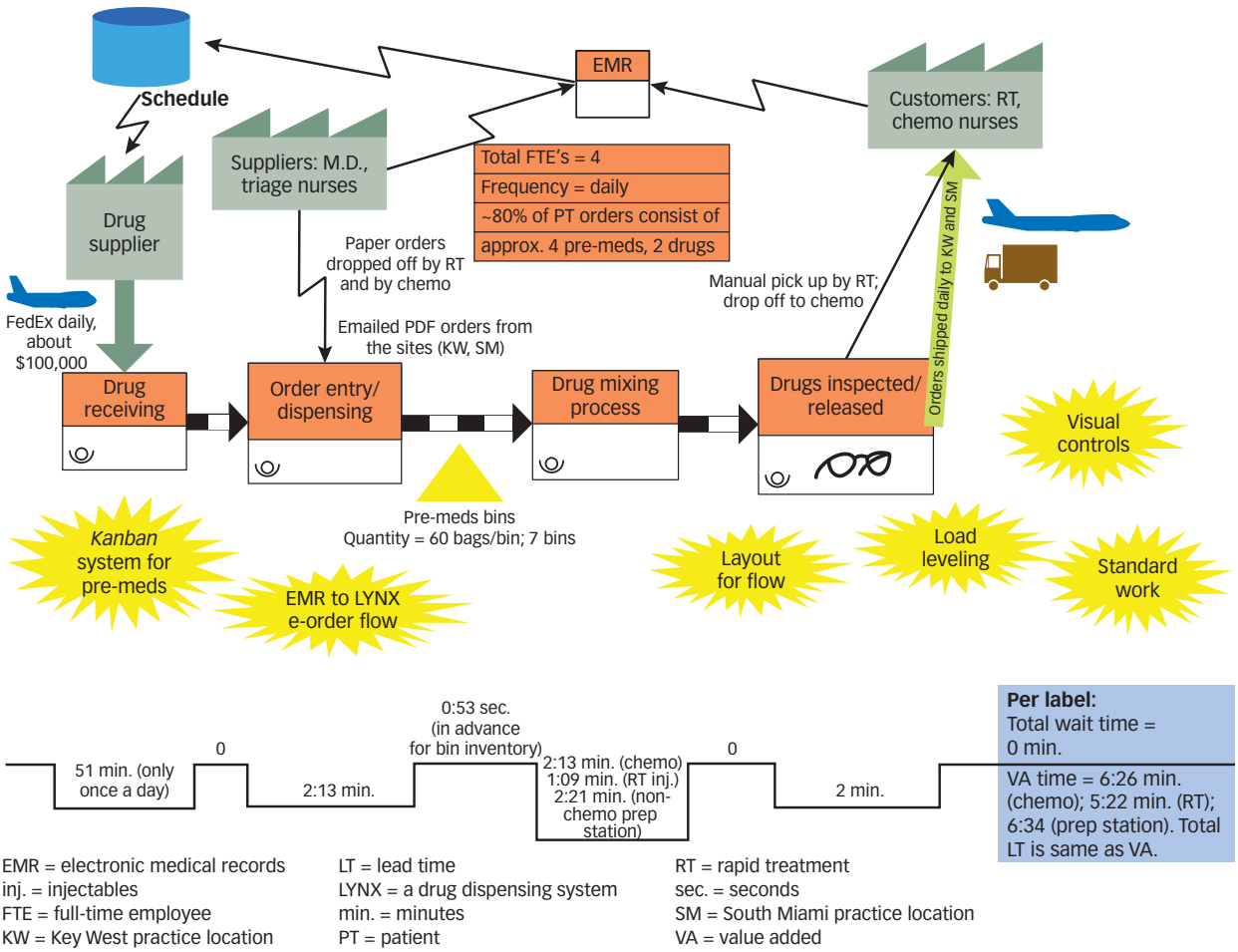
The control phase project summary includes a few items pending for improvement, namely:

- Reassessment of the drug entering process. This item is pending the arrival of replacement drug dispensing machines.
- Validation of inventory supply savings. This item is to be completed by the BB.

Changes made, lessons learned

Although this project focused on improvements in capacity and operational efficiencies, AMS is a Quality Oncology Practice Initiative-certified practice.[2] As such, the CMR has a robust quality inspection process

Value stream map—current state mixing room / FIGURE 5



EMR = electronic medical records
inj. = injectables
FTE = full-time employee
KW = Key West practice location
LT = lead time
LYNX = a drug dispensing system
min. = minutes
PT = patient
RT = rapid treatment
sec. = seconds
SM = South Miami practice location
VA = value added

in which the CMR supervisor is required to approve every order processed by her staff by signing off on the order label.

Only orders that have her signature are allowed to be released and accepted by the treatment nursing staff. Prior to administering treatment, two treatment nurses also verify the medication and dosage against the doctor's orders as well as verifying the patient's name and date of birth.

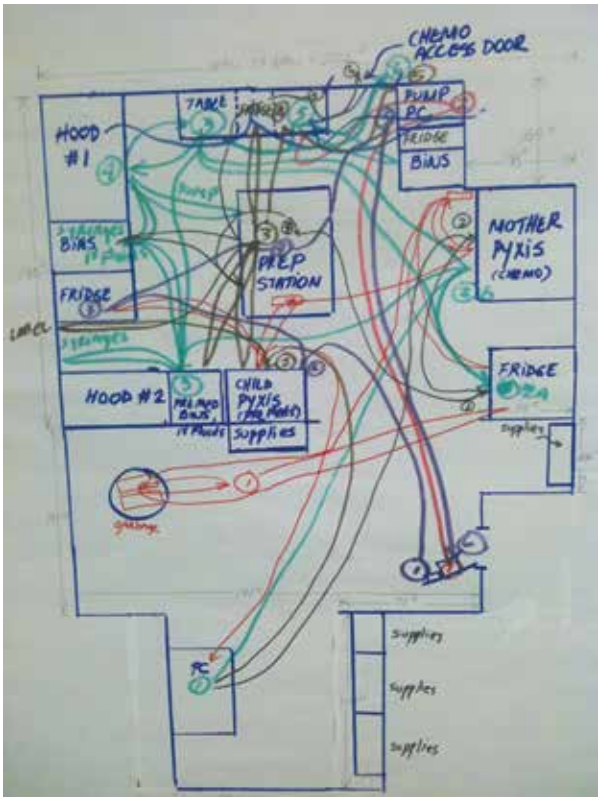
The CMR project allowed the BB the opportunity to apply a multitude of lean and Six Sigma tools to further optimize a department operation. One of the most important tools used was the successful application of change management on the team, especially the transformation of the supervisor from being only a team member to becoming a dynamically active participant in the LSS process.

The supervisor became a change agent who at first resisted the changes but quickly and enthusiastically embraced all the positive impact a LSS project could have in her area.[3] She saw that change, although difficult, also could be an opportunity to learn and gain the support needed to fine-tune her department.

This project, as all quality improvement projects implemented at AMS, includes a lessons learned section in the closeout report. For the CMR, the six lessons learned were provided by the nursing manager, the CMR supervisor and the BB:

1. Data are powerful tools to drive decisions.
2. Having an outsider look at the process is helpful.
3. The project validated it wasn't necessary to mix all chemotherapy at once.
4. The project was an ongoing learning experience.
5. An open-minded, fully engaged and enthusiastic supervisor is the most important tool for a BB.
6. Implementations are experiments until proven capable. QP

Spaghetti diagram before improvements / FIGURE 6



A LOAD-LEVELING BOARD was used in the chemotherapy mixing room as a visual management tool to help keep the workload flowing smoothly throughout the day.

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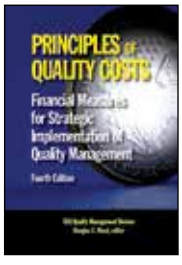

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Lessons in LABELING

Cancer center **reduces lab specimen errors** with lean Six Sigma

by Nina Braswell, Jill Koroseta and Amy Grogan

WHAT KIND OF CARE would you want for a loved one who is fighting cancer?

This is the question the experts at Cancer Treatment Centers of America (CTCA) ask themselves every day, and it's this question that motivates all employees to create a culture in which continuous improvement becomes a habit.

To fully achieve this goal, CTCA recognized that it had to begin by empowering its employees, or stakeholders, to make a difference. The lean Six Sigma program at CTCA does just that: empowers employees with the tools necessary to improve their workplace and work processes, which ultimately affects patients.

In 50 Words Or Less

- Incomplete information on specimen-container labels at a cancer center led to errors and often meant a second round of specimen collections, representing rework and wasted time.
- The define, measure, analyze, improve and control method guided the center to improve the labeling part of the collection process, saving time and money.

To have the lean Six Sigma concepts integrated into the culture, there is a portfolio of lean Six Sigma courses offered by job title. For example, front-line employees participate in a seven-week A3 performance improvement lean course and, for those who qualify, an 11-day Green Belt training course. Furthermore, supervisors, managers and executives attend Champion training to acquire the skills and learn the tools and templates needed to support employees who attend lean Six Sigma training.

CTCA's lean Six Sigma vision is to have a fully integrated lean Six Sigma philosophy across the entire enterprise through empowered employees who consistently strengthen a standard model of care, which is entirely driven by advanced, whole-person treatment options and the kind of care you would want for family members. CTCA calls this "the mother standard."

Collection manager label

This standard at CTCA is designed to inspire process innovation and to effectively, efficiently and responsively drive the delivery of a superior patient experience.

In June 2011, CTCA became the first institution in healthcare to receive a recommendation from the American Council on Education (ACE) for college credit for the A3 (two lower-division semester hours) and Green Belt (six upper-division semester hours) courses.

THE DEVICE used at Cancer Treatment Centers of America to help automate the specimen collection process and ensure accurate patient identification and specimen labeling.

ACE is the major coordinating body for 2,200 of the nation's higher education institutions. With its recommendation, CTCA has made its patient-driven program a relevant component of employees' personal and professional development. The business results have been exceptional.

One of the authors of this article, Nina Braswell, the laboratory quality assurance coordinator, was the Green Belt student who applied the skills and tools she learned in class while working on the following high-impact project at CTCA's Midwestern Regional Medical Center in Zion, IL, using the define, measure, analyze, improve and control (DMAIC) process.

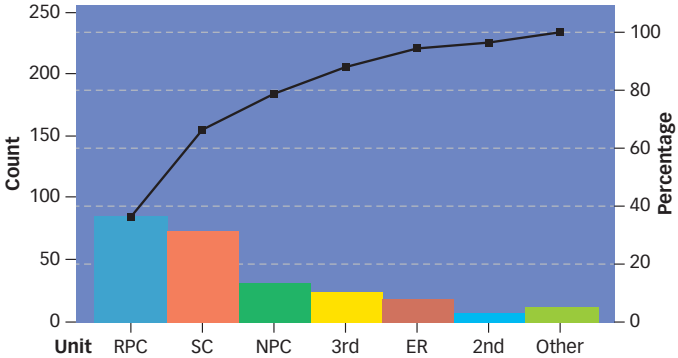
Define

The DMAIC process starts when a problem has been identified. The define phase helps to clarify the understanding of why it is a problem.

The laboratory was receiving, testing and verifying results from incompletely labeled nonblood specimens. A label is considered incomplete if it does not contain one or more of the following pieces of information: patient's name, medical record number, date, time of collection, specimen type and tech code, which is the identification number of the person collecting the specimen.

It was determined that the specimen that had the most incomplete labels was urine for urinalysis. Standards state urine specimens must be examined within

Pareto chart of unit / FIGURE 1



Unit	RPC	SC	NPC	3rd	ER	2nd	Other
Count	84	71	29	21	15	4	9
Percentage	36.1	30.5	12.4	9	6.4	1.7	3.9
Cumulative percentage	36.1	66.5	79	88	94.4	96.1	100

ER = emergency room
NPC = new patient center
RPC = return patient center
SC = stem cell

one to two hours of collection or they cannot be used for analysis. After two hours, the specimens' constituents change, degrade or disappear.

It was evident a new process needed to be implemented to meet standards and guarantee the quality of results for all nonblood specimens. The baseline showed that only 15% of the nonblood specimens were labeled completely.

Measure

The purpose of the measure phase is to obtain a current-state baseline of the process while collecting accurate data that truly represents the effects of the process.

Temporary label

Data collection confirmed the most common error was missing information on the nonblood specimens. It also was clear that three primary units (as shown in the Pareto chart in Figure 1) were responsible for 79% of the incompletely labeled nonblood specimens:

- Return patient clinic (RPC)—36.1%.
- Stem cell (SC): inpatient and outpatient—30.5%.
- New patient clinic (NPC)—12.4%.

It was determined that the time of collection was the most frequently omitted information. Additionally, it was discovered that five different types of labels were being used: chart labels, collection manager labels, handwritten labels, temporary labels and cup labels (see photos). Data collection highlighted the need for the standardization of labels and the information to be included on them.

Analyze and improve

In the analyze phase, you examine the process, identify the root causes of defects and variations in the process, and validate these with the data collected in the measure phase. In the improve phase, you also formulate and test solutions, and implement a future state of the process that increases customer satisfaction, reduces or eliminates defects and variations within a process, and increases productivity.


Cup label

The root cause analysis of the incomplete specimen labels revealed there was not a standardized and uniform process for labeling nonblood specimens. Data showed and confirmed there was a need to implement a new standardized process that would guarantee quality results.

Handwritten label

Using a collection manager to draw blood had been previously implemented. With a collection manager, the patient's armband is scanned, and laboratory orders for that patient are displayed. The blood is drawn and tubes are labeled at the patient's bedside. This guarantees positive patient identification.

Collection managers also can be used for any type of laboratory specimen. The collection manager label provides all needed information—except for time of collection for urine samples. The time printed on the collection manager label is actually the time the labels print and not necessarily the time of urine collection.

Because of the time-sensitive nature of urine samples, the actual time of collection is needed, so an additional time label is now affixed to the bio-bag. Patients, RNs and patient care technicians can now capture time of collection on this additional label.


Chart label

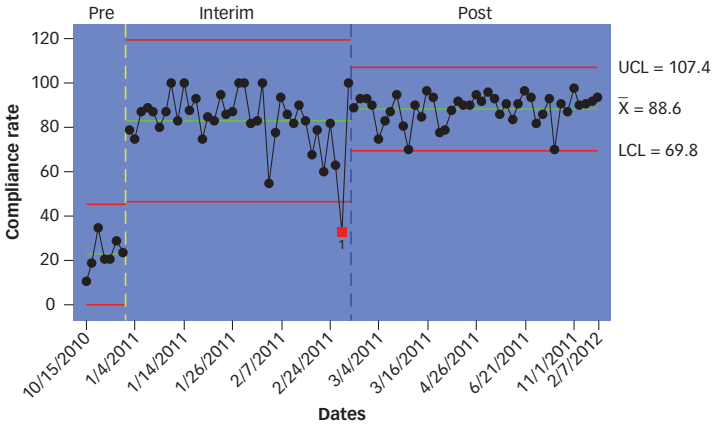
Using a collection manager also ensures only specimens with a physician's order will be collected. This prevents nonvalue-added time for the lab employees. Previously, lab employees needed to call an average of 15 times per week and ask for orders to be put into the electronic health record.

This step also eliminates the nonvalue-added time for hospital staff to obtain orders from the physician, who may or may not want testing on the specimen collected. The time spent calling was an average of three minutes per patient for a total of 39 hours per year.

A pilot program was implemented on Dec. 22, 2010, in the RPC. A training document was created, and all RPC RNs and the laboratory phlebotomy staff were trained on the new process. Auditing began on Jan. 3, 2011.

Following the success of this pilot, the NPC was added to the audit on Jan. 17, 2011, and an increase in

Pre, interim and post-compliant control chart / FIGURE 2



UCL = upper control limit
X̄ = median
LCL = lower control limit

■ = Only three urine samples were collected on Sunday.

completely labeled specimen compliance from the RPC and NPC was noted. From this pilot, results improved by more 250% (see "Interim" in the staged control chart in Figure 2).

Finally, the ER, intensive care units, and the SC, infusion and inpatient oncology units were added to the program on Feb. 21, 2011. An initial decrease in compliance was noted because of a learning curve for the new units. Beginning Feb. 28, 2011, units were contacted to either re-collect the specimen or come to the lab and write the time on urine specimens. RN managers were emailed about all noncompliant issues.

By Feb. 28, 2011, this new approach had resulted in a 23% increase in the compliance rate. More than one year after full implementation of the project, the compliance rate since the start of the project has increased by 287%.

Control

The purpose of this phase is to quantify the improvements that have been made, evaluate the implemented future state process, implement process controls and define the standard work instructions for the newly implemented process.

Braswell, in conjunction with her project team members, decided on the following four steps to ensure the project's sustainability over time:

1. Set a threshold for properly labeled specimens.
2. Reject incompletely labeled specimens.
3. Require the lab to contact the RN manager with date, employee, patient information and issue if the number of labeled specimens falls below the threshold. An audit will take place one day or week for one month. If compliance stays above the threshold, the audit will be discontinued.
4. Add labeling requirements to new RN/patient care technician orientation.

Results of the entire project included:

- Increased patient satisfaction due to less re-collection of specimens.
- Increased label compliance by 287%.
- Saved 1,040 urine cups, for a total savings of $166.40.
- Reduced nonvalue-added time for employees from processing unnecessary specimens by 39 hours per year, yielding a soft savings of $525.

Higher patient satisfaction

Increasing labeled laboratory specimens compliance by 287% has had a positive impact in more ways than one. Most notably, patient satisfaction has increased as a result of reducing the amount of specimens that were incompletely labeled.

Moreover, because most specimens are now labeled completely and uniformly, the time spent processing unnecessary specimens has decreased. Overall, the project has demonstrated how CTCA uses the model standard of care. The infusion of lean Six Sigma methods into the culture helps employees focus on what is truly important: caring for patients. QP

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❑ Analyst	❑ Director	❑ Manager	❑ Scientist	❑ Technician
❑ Associate	❑ Engineer	❑ Mechanic	❑ Six Sigma Black Belt	❑ Unemployed
❑ Auditor	❑ Facilitator	❑ Nurse	❑ Six Sigma Green Belt	❑ Other
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Know the WHY

Know what you're working toward before embarking on an improvement project

by Owen Ramsay

WORLDWIDE ECONOMIC uncertainties, consistently high fuel prices and major changes to the political landscapes of many oil-rich nations have caused the price of gold to more than triple over the past five years. The soaring price of gold attracted many to Guyana and led to significant exploration and mining activity. That put the onus on the Guyana Geology and Mines Commission (GGMC) to continually improve.

In 50 Words Or Less

- One of the primary reasons improvement projects fail is a lack of alignment with an organization's vision, mission, goals and objectives.
- In an attempt to avoid that issue, a government agency in Guyana deployed a multi-tool method that resulted in reduced process times and improved customer satisfaction.

The GGMC is a semi-autonomous government agency that employs 247 people at its head office in Georgetown and at sites in the mining districts of Guyana's interior regions. GGMC's principal business activities include:

- Processing applications, and issuing permits and licenses for mineral and petroleum exploration, exploitation and operations.
- Collecting revenues from solid mineral and petroleum exploration and exploitation operations.
- Ensuring compliance with statutory and policy imperatives relevant to solid minerals and petroleum exploration, exploitation and operations.
- Developing policy and a legal framework for the promotion and orderly development of the mining and petroleum sectors.

The GGMC is the only lawful authority through which exploration and mining titles are issued in Guyana.

In 2008, the GGMC reviewed its vision, mission and core values, and embarked on a performance improvement program. The organization committed to a lean Six Sigma rapid improvement method (LSSRIM) that included balanced scorecard principles as a key driver in helping the commission achieve its strategic objectives.[1]

LSSRIM uses quality and performance metrics that led the GGMC to identify and execute 16 projects during a two-year period. To satisfy the human resource requirement of the projects, more than 40 senior staff members were trained on LSSRIM.

Alignment with vision

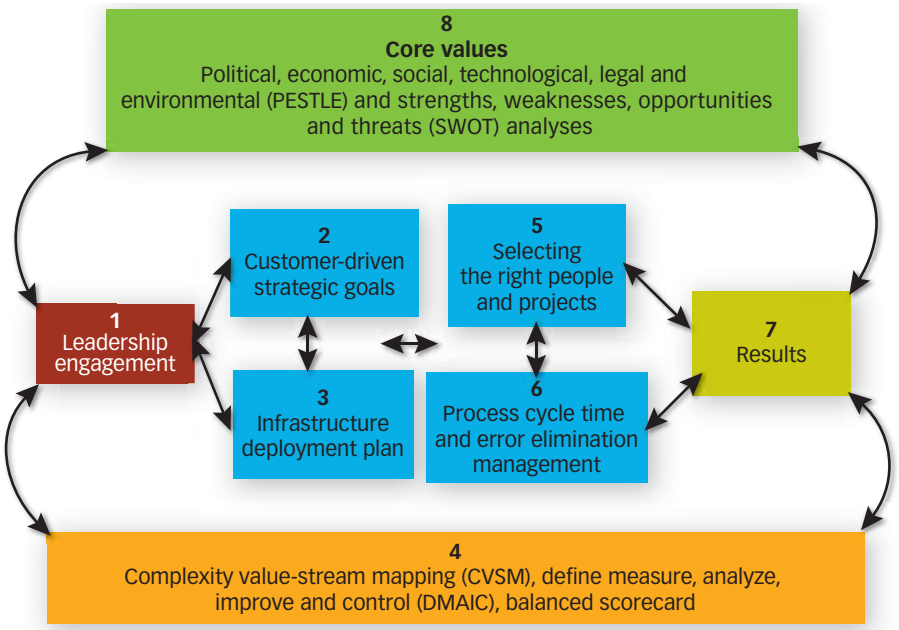
One stated goal of LSSRIM was to communicate the vision, mission, core values and strategic objectives at all levels of the organization. For most organizations, vision statements express what the organization would like to accomplish and what it would like to be in the future,[2] mission statements succinctly describe the organization's purpose, and goals and objectives are defined by division or department managers.

Often, projects executed by departments are the result of the priorities of the day and are not necessarily linked to the stated vision, mission, goals or objectives. This leads to inconsistencies in priorities set by managers and communicated to their staffs, which makes it difficult to introduce new thinking and concepts required to support a consensus around the vision.

To achieve consensus, an organization's top management must look for ways to ensure all levels of the organization understand and are aligned with its vision and strategy. One technique some organizations use to avoid inconsistencies created by the lack of alignment is to employ a cascading process via a balanced scorecard.

The cascading process is critical to the successful realization of an organization's vision because the process links or aligns the vision with the mission, goals and associated priority projects for each department. It is through this alignment process that strategic direction is communicated and commitment from everyone is gained.

Lean Six Sigma rapid improvement methods framework: a systems perspective / FIGURE 1



Often, projects are the result **of the priorities of the day** and are not necessarily linked to the stated **vision, mission, goals or objectives.**

By knowing the vision, mission, goals and key projects arising from the strategy, everyone in the organization can gauge his or her effectiveness as a contributor.

Knowing the score

The balanced scorecard, popularized by Robert Kaplan of the Harvard Business School and David P. Norton, president of Renaissance Solutions,[3] is a strategic management tool that aids the alignment process while guiding improvement efforts in the overall efficiency and performance of an organization. The balanced scorecard can be used to efficiently and effectively:

- Clarify an organization's vision and strategy.
- Communicate vision and strategy throughout an organization.
- Align department and individual goals.
- Link annual budgets to strategic objectives and long-term targets.
- Identify and align strategic initiatives.
- Conduct periodic performance reviews to learn about and improve strategy.

Kaplan and Norton used the concept of a balanced scorecard to supplement financial measurements with criteria that measured performance from three additional perspectives: customers, internal business processes, and learning and growth. It enabled organizations to track financial results while simultaneously monitoring progress toward building the capabilities and acquiring the intangible assets they would need for future growth.

For the GGMC, the balanced scorecard became an effective tool—through LSSRIM workshop activities—to guide top management, managers and staff into ownership or buy-in of the vision, mission, strategy and core values. The imperatives emphasized during the buy-in process were to understand the factors influencing current performance and gain the general support of the staff on the commission's future direction.

About the method

LSSRIM was the efficiency and effectiveness management tool used by the GGMC to achieve the desired changes to the commission's business processes and culture. It encouraged executive management to prioritize improvement projects based on metrics that recognized the alignment of customer needs and corporate priorities as defined by the commission's top management. LSSRIM draws from:

- Lean principles.
- Six Sigma.
- Balanced scorecard principles.
- Business environment analyses such as strengths, weaknesses, opportunities and threats (SWOT) analysis; and political, economic, social, technological, legal and environmental (PESTLE) analysis.
- Core values and concepts tied to the Malcolm Baldrige Performance Excellence Program (see Figure 1).[4]

The application of LSSRIM recognized the importance of corporate values and philosophies within the GGMC's culture that defined its managerial style and work ethic. Because the most influential people at the commission were in top management, the expectation was for them to make continuous business improvement part of the culture by setting the necessary rules and exemplary behavior for others to follow. Leadership commitment from the top was an essential prerequisite for success.

Understanding the current state

In November 2008, the now-retired Commissioner William Woolford and his top managers undertook a review of the GGMC's operations from 2003 to 2007, with the idea of using LSSRIM to design a system to improve performance. The review, done within the LSSRIM framework, focused on:

- Key performance indicators (KPI) identified in accordance with the balanced scorecard concept (see Online Figure 1 and Online Table 1 at www.

qualityprogress.com).

- Environmental scans using SWOT (Online Table 2) and PESTLE analyses (Online Table 3).
- Core values of the commission (Online Table 4).[5]

Through LSSRIM workshop activities, the GGMC's top management used information from its vision, mission, historical data, environmental analysis and core values in the first quarter of 2009 to develop a strategic plan. The priorities of the strategic plan focused on:

- Extant mining policy.
- Policy directives from the minister responsible for mines and minerals, and the board of directors.
- Demand, prices and price forecasts for mineral commodities, mineral production and financial targets.
- The mission, vision and objectives of the commission.
- Existing and projected challenges, and core competency development needs within the mining sector and the commission.
- The quest for improved performance and continual improvement.
- Responsiveness to the needs of customers and stakeholders.

Metrics and associated key performance indicators (KPI) / TABLE 1

		KPI or target	Operational performance indicator (OPI) or target	Related outputs	Key activities
Customer perspective	**Strategic objective 4**: To promote, monitor and enforce good practice to achieve minimal levels of pollution of soil and water resources, reduce mine accidents, and comply with standards and law.	75% reduction in mining areas with turbidity in receiving waters less than critical turbidity (30 NTU) 75% of the times sampled/year by 2012.	Percentage of fortnightly sampling activities per year, per mining area when turbidity was less than 30 NTU.	Reports, data and information, compliance reports, citations, charges and cease work orders.	Regulation, inspection and monitoring, compliance enforcement and claim verification.
		80% of operations in compliance in key aspects by 2012.	Percentage annual increase in compliance in key aspects by operations.	Reports, maps and data analysis.	Quality monitoring, technical assistance, education and awareness.
Financial perspective	**Strategic objective 5**: To optimize revenues and costs while meeting GGMC's obligations.	To achieve a costs/revenue ratio of _____ by 2012.	Percentage annual increase in revenues from each major budgeted subhead.	Reports, data and information.	Revenue projection.
Business process perspective	**Strategic objective 6**: To provide good quality and efficient services and products for our customers and effective liaison with key stakeholders.	Average time to process permits, licenses and certificates, maps reduced from _____ to _____ by _____.	Percentage annual increase in permits, licences and certificates, 100% adherence to service/quality procedures.	Permits, licenses, certificates and maps.	Processing, issuing and renewing licenses.
		Average response time for dealing with enquiries reduced from _____ to _____ by _____.	Percentage increase in the number of inquires responded to _____.	Information: data and correspondence.	Data sourcing and vetting, preparation of responses.
		Average level of satisfaction (in percent terms) with GGMC services by customers.	Average level of satisfaction (in percent terms) with GGMC services by customers.	Survey reports.	Commissioning or conducting surveys, receiving feedback.
Learning and growth perspective	**Strategic objective 7**: To ensure GGMC has the necessary capacity in terms of: HR, financial management and IT to efficiently serve an expanding mining sector.	Average percentage of key and core technical skills developed annually.	Percentage of staff in key core technical areas trained annually.	Approved HR strategy.	Analysis of competencies and capacity needed.

GGMC = Guyana Geology and Mines Commission
NTU = Nephelometric turbidity unit

Communicating the balanced scorecard objectives promotes commitment and accountability **to the long-term strategy.**

The balanced scorecard translated the vision and strategy of the GGMC into action by introducing four management processes. In keeping with Kaplan's balanced scorecard approach, the first management process focused the commission's attention on four perspectives of its vision and strategy (Online Figure 2). Strategic objectives were identified (Online Figure 3), and metrics and associated KPIs were used to support the strategic objectives linked in accordance with the balanced scorecard concept (Table 1).

Effective communication was the emphasis of the second management process, which focused on communicating the priorities of the commissioner and top management throughout the commission, and linking the strategy to division and department objectives (Online Table 5).

Through the weekly management and department meetings, as well as LSSRIM workshop activities, the GGMC staff was included in the broad-based communication program that encouraged the top-down and bottom-up sharing of information about strategy, division goals and objectives. Communicating the balanced scorecard objectives throughout the commission promoted commitment and accountability to the commission's long-term strategy.

Division and department planning using the balanced scorecard was the objective of the third process in which strategic planning efforts and the budgeting process were integrated to ensure the budget supported the stated priorities. Measures of progress were selected from all four scorecard perspectives, and SMART targets were set for each of them (Table 2, p. 40-41). SMART targets have the following characteristics:

- Focus on **specific** needs and opportunities.
- Establish a **measurement** for each objective.
- Be sure objectives are **attainable**.
- Set stretch objectives that also are **relevant**.
- Indicate a **time frame** for each objective.

The commissioner and his top management staff determined the actions necessary to drive the commission toward its targets. The lean Six Sigma methods were then applied to improve the processes most critical to the commission's strategic success.

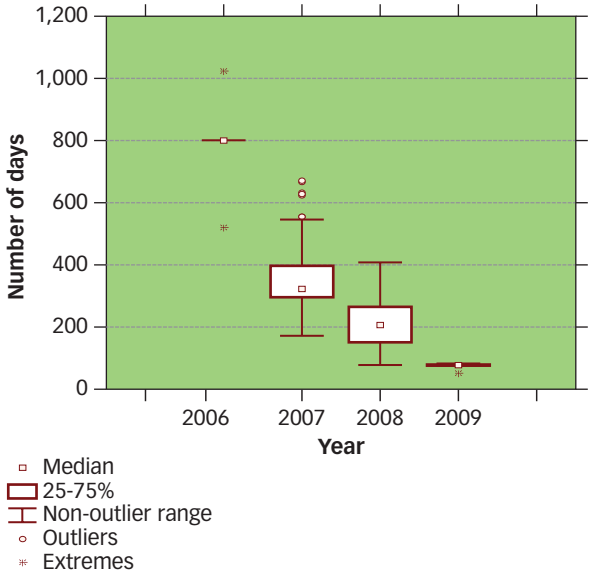
The ability to know at any point in the implementation process whether the strategy formulated by top management was working—and if not, why—was the focus of the feedback and learning management process.

Performance measurement against balanced scorecard target outputs, key outcome data related to costs and the timely collection of key performance information in all core areas were regularly reviewed for feedback, reported to top management and the board of directors, and communicated to staff. The reviews also allowed top management to anticipate and respond to risks and opportunities within the business planning process.

Getting results

During LSSRIM workshop activities, emphasis was

Box plot of lead time data: 2006-2009 / FIGURE 2



placed on top management's balanced scorecard strategic objectives, process thinking, the importance and use of data, and the Baldrige core values. The strategy led to:

- Alignment of vision, mission and objectives.
- A customer-centric approach to service quality.
- Reductions in complaints by stakeholders.
- Culture changes that encouraged personal growth, effective communication and data-driven decisions.
- Delighted internal and external customers because higher quality service was consistently delivered in less time. The average lead time for one of the major processes improved from 337 days to 76 days (Figure 2, p. 39). Also, the external customer satisfaction level improved from 7.5 in 2009 to 8.4 in 2010 and 8.8 in 2011.
- Improved processes due to significant reductions in service defects (anything that was unacceptable to customers).
- A greater sense of teamwork because staff members easily shared ideas with each other to solve problems.
- The application of effective problem-solving methods to determine the root cause and achieve sustainable process change.

To date, GGMC management continues to build on the LSSRIM culture of continual improvement, customer satisfaction and staff involvement by using the balanced scorecard to ensure alignment of purpose, achievement of objectives, and conformity to customer and applicable regulatory requirements. In addition, the commission's land management department achieved ISO 9001:2008 certification in March 2011, along with an error-free external audit.

Land management department targets based on strategic objective 6 / TABLE 2

Performance improvement area	2008 target	Key indicators	Activities to achieve target
1. Information dissemination: timeliness and accuracy.	All information for public consumption must be 100% accurate and updated.	100% applicable stock sheets updated. Random checks must reveal a 95-100% updated and accurate database. Random checks of application verification procedures must reveal 100% compliance. 80-85% of requests for information to be responded to within one week of receipt.	Staff made aware of the value of disseminating accurate and timely information. Establish accountability of officers. Guidelines established for updating and certifying information on maps and database. Guidelines established for verification of information.
2. Clarity of procedures.	Creation and implementation of standard operating procedures document.	100% of staff accept and adhere to procedures.	Reviewing of key tasks. Documenting procedures for all aspects of work. Gaining top management's consent to the procedures. Implementing procedures.
3. Efficiency in operations.	Improvement in processing of applications for licenses and permits by 70%. Reduction in errors by 90%. 70% reduction in complaints and litigations.	85-95% satisfied clientele. Fewer complaints and litigations.	Documentation of procedures. Information to be disseminated must be done in an across-the-board manner through published notices. Staff adhere to set procedures in attending to issues related to their work. Certification and approval of information to be disseminated.
4. Promotion of information on land availability for mining, exploration and quarrying.	Attendance at all possible local conferences, workshops or forums where the dissemination of information on mining and quarrying may be applicable.	Promotional materials on mining and quarrying.	Preparation of promotional materials on mineral licensing issues. Dockets and flyers.
5. Availability of technologies to enhance efficiencies.	Acquisition of requisite software and tools.	75-80% improvement in operational efficiencies.	Purchase of updated map info software and other relevant software. Purchase of photocopying machine.

Why it worked

The GGMC's success was the result of effective leadership that aligned, motivated and inspired staff to embrace new thinking and culture changes based on the application of lean principles, Six Sigma concepts, the balanced scorecard principles, and the core values and concepts of the Baldrige program.

Woolford's leadership, steadfast focus on managing efforts and resources, timely interventions, intellect, good spirits and commitment to LSSRIM and the ISO 9001:2008 certification process kept the entire team on task. The results were higher levels of customer satisfaction, significant reductions in lead times for key processes and a greatly enhanced image for the commission. QP

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5. Guyana Geology and Mines Commission, "Performance Improvement Plan," May 10, 2008.

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Land management department targets based on strategic objective 6 / TABLE 2 (CONTINUED)

Performance improvement area	2009 target	2010 target	2011 target	2012 target
1. Information dissemination: timeliness and accuracy.	All information for public consumption must be 100% accurate and updated.	All information for public consumption must be 100% accurate and updated.	All information for public consumption must be 100% accurate and updated.	All information for public consumption must be 100% accurate and updated.
2. Clarity of procedures.	Standard operating procedures document being functional.	Revised standard operating procedures document.	Improvements in processing applications for licenses and permits by 93%. Reduction in errors by 95%.	100% of staff are fully trained in their area of responsibility.
3. Efficiency in operations.	Improvement in processing of applications for licenses and permits by 90%. Reduction in errors by 95%. 80% reduction in complaints and litigations.	Improvement in processing of applications for licenses and permits by 95%. Reduction in errors by 95%. 85% reduction in complaints and litigations.	Attendance at all possible local conferences, workshops or forums in which the dissemination of information on mining and quarrying may be applicable.	Mineral properties data available online for browsing. Acceptance of online applications for mineral properties. Payment system established for receipt of online applications.
4. Promotion of information on land availability for mining, exploration and quarrying.	Attendance at all possible local conferences, workshops or forums in which dissemination of information on mining and quarrying may be applicable.	Attendance at all possible local conferences, workshops or forums.	Acquisition of requisite software and tools.	Improvement in processing of applications for _____. Reduction in errors by 100%.
5. Availability of technologies to enhance efficiencies.	Acquisition of requisite software and tools.	Acquisition of requisite software and tools.		Attendance at all possible local conferences, workshops or forums.

Don't Lose Patients

Hybrid approach helps hospital streamline key process

by Todd Creasy and Sarah Ramey

CLINCH VALLEY MEDICAL Center—a for-profit, 175-bed hospital operating in western Virginia and part of a healthcare organization with operations in 18 states—has been undertaking lean Six Sigma initiatives for about three years.

During its continuous improvement efforts, the hospital employed the principles of 6TOC[1]—a combination of lean Six Sigma and the theory of constraints (TOC)[2] in which organizations resolve process flow constraints or bottlenecks in a service-delivery system with lean and Six Sigma tools.

The hospital's senior management team decided to focus on the preadmission testing (PAT) process as part of the hospital's continuous improvement initiative. PAT evaluates, assesses, educates, and prepares patients and families for successful and safe hospital experiences. Along with the emergency department, these services are a cornerstone to hospital revenue.

PAT is the front door to a patient's experience in any hospital and provides patients their first impression of the hospital and services rendered. Nearly all outpatient procedures are considered elective surgery in that patients can select the hospital organization at which they wish to receive the surgical procedure. A poor PAT experience can send the potential patient elsewhere.

PAT is also a vital part of the process for operating room (OR) clinicians. During PAT, all of a patient's pertinent information is collected—medical history, current medications, lab results and electrocardiograms. Without a streamlined process, one or more of these aspects can be inadvertently omitted. This omission can result in delayed surgery or cancellation, leading to lost revenue.

In 50 Words Or Less

- Concerned about inefficiencies in a key process, a hospital combined lean Six Sigma and the theory of constraints to identify and eliminate bottlenecks.
- As a result, the hospital cut wait time for its patients by 70% and eliminated the main cause of customers seeking other providers.

Hearing voices

The PAT process at Clinch Valley Medical Center begins with the patient's physician contacting the hospital and scheduling a surgery appointment. It concludes with the patient arriving home from the hospital after having health and prescription reviews, procedures scheduled, and any necessary X-rays and laboratory tests conducted.

The list of stakeholders for the PAT process includes patients, physicians, nurses, PAT assessors, lab technicians, OR schedulers, the medical records department, hospital admissions and other employees in the physician's office.

Based on the fact that customer experience can enhance an organization's revenue and margins and can help organizations differentiate themselves through total customer experience,[3] voice of the customer (VOC) data were collected from these PAT stakeholders. It was determined the process had six areas of concern:

1. **Patient education.** Patients didn't understand their financial obligations and weren't being educated about the preadmission process and ultimate outcome.
2. **Effective communication.** Throughout the process, there wasn't effective communication that included the external physician, PAT nurse, hospital coordinators and patient.
3. **Patient scheduling.** Patients were visiting the hospital in very erratic patterns and not in a consistent flow.
4. **Waiting**. Patients were experiencing excessive wait times, and their time in the hospital was not being managed well.
5. **Documentation.** Documents were being reproduced two and three times for various departments in the hospital.
6. **Bottlenecks.** The process produced excessive amounts of work-in-process information backups and patient delays.

As a result of these problem areas, the PAT process was determined to be time-consuming and a potential contributor to patient dissatisfaction.

Process exploration

With three months to improve the process, the hospital collected a sample size of 62 consecutive patient experiences during one week. The PAT process had an average unnecessary patient wait time of about 20 minutes (standard deviation of about 18 minutes), with some waits exceeding an hour. The goal of the PAT project was to reduce patient wait time by 30%.

The improvement drive continued with the construction of a high-level process flow chart that included a suppliers, inputs, processes, outputs and customers (SIPOC) diagram (Table 1). The critical-to-quality areas within the SIPOC dealt primarily with patient education, pre-screening accuracy, stakeholder communication and scheduling of the surgical procedure.

The column in the table marked "Process" affords a high-level view of the PAT procedure. The rule of thumb for SIPOCs when initially considering the process column is not to exceed four to seven horizontal levels. This type of process documenting activity can lead to a better understanding of the process and identify possible improvement alternatives.

With a room full of PAT stakeholders following the 6TOC principles, the process was dissected at a high level (Figure 1, p. 46). A process flowchart was created indicating natural process break points and which Green Belt (GB) team would attend to that portion's improvement needs.

When this process was mapped, the stakeholders were asked to identify bottlenecks within the process. This is where TOC and its five basic tenets proved useful:

1. Identify the bottleneck.
2. Exploit the bottleneck (get the most out of it).
3. Subordinate the system to the speed of the bottleneck's flow.
4. Alleviate the bottleneck (make significant changes that reduce or eliminate the bottleneck).
5. Begin identifying more bottlenecks.

The bottlenecks were identified as:

- Step 6—Surgeon's office informing patient of PAT date and surgery information.
- Step 8—Patient time in waiting room with beeper.
- Step 10—Pre-registration and the collection of patient information or payment.
- Step 15—Start of patient assessment.
- Steps 18-19—Direction and education regarding laboratory test and X-rays.

This process is similar to the explanation of healthcare as a chain of handoffs.[4] Bottlenecks were considered along with natural breaks in the process to portion out the smaller segments that comprise the larger PAT process.

Before the groups of stakeholders were released and GBs formally assigned to each section of the process, the team explored early improvement ideas by using a functional deployment matrix (FDM). Similar to a prioritization matrix,[5] an FDM is a quantitative method for brainstorming necessary inputs and desired outputs using a simple, two-dimensional format.

Table 2 (p. 47) lists the key process input variables and key process output variables as determined by the PAT stakeholders who constructed an FDM during an all-day meeting.

Improvement initiatives

The PAT improvement team pursued bottleneck exploitation or elimination using lean Six Sigma tools and followed these seven improvement steps:

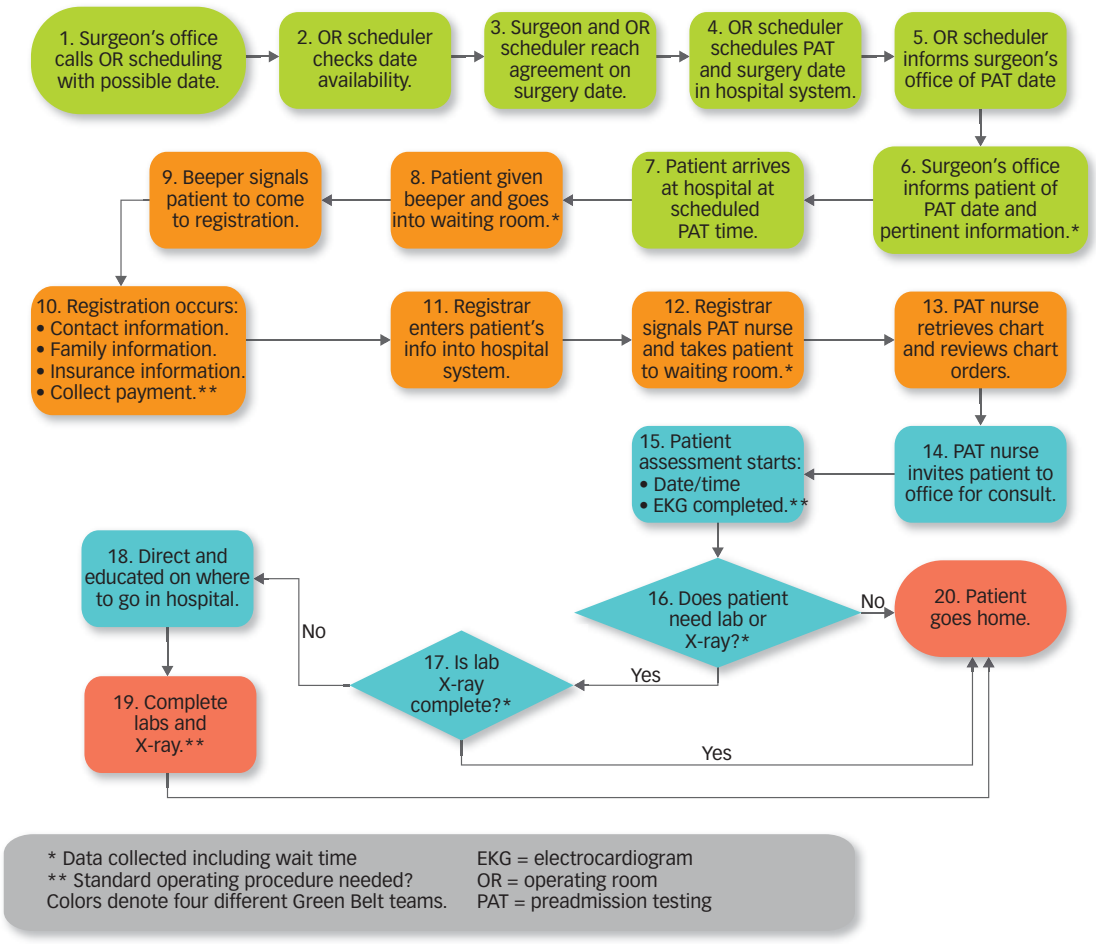
1. Three paper-based forms each containing two pages and one computer-based form were combined into a single computer-based form. This eliminated work redundancy by the PAT nurse and also sped up the process time for each patient, thus reducing total time in the PAT system.
2. Because there was an information gap between the local, referring clinics and the hospital's internal practices and processes, the patient information booklet was revised and reformatted for use with surrounding clinics. Based on clinician VOC, a communication guide was constructed to enable office administrators and clinicians to better understand the hospital's internal process needs and to educate patients.
3. The delivery process by which local clinics forward patient charts to the hospital was changed. Formerly, the patient was responsible for delivering the chart to the hospital, which resulted in administrative delays. By using VOC from one of the clinics, this chart

Suppliers, inputs, processes, outputs and customers / TABLE 1

Supplier	Input	Process	Output	Customer	CTQ
Physician Patient	1. Physician. 2. Patient. 3. Ailment. 4. Doctor's office – administration.	Physician schedules surgery appointment.	1. Surgery date established. 2. Instruction booklet is given.	1. Patient 2. CVMC. 3. Scheduler.	1. Date – correct. 2. Instruction – correct and concise. 3. Surgery – correct procedure.
Physician Patient	1. Physician. 2. Patient. 3. Ailment. 4. Physician's office – administration.	OR scheduler schedules PAT appointment.	1. PAT date/time. 2. Process education.	1. Patient. 2. Physician. 3. PAT nurse.	1. Patient knows PAT date/time. 2. Patient knows process.
Patient Scheduler Physician's office	1. Patient. 2. PAT schedule.	Patient arrives at hospital and registers.	1. Patient is pre-registered. 2. Patient pays money. 3. Insurance information is acquired. 4. Patient receives directions.	1. Patient. 2. PAT nurse. 3. Hospital. 4. OB.	1. Patient knows where to go. 2. PAT nurse notified in timely manner. 3. Payment to CVMC. 4. Correct insurance company information.
Physician Patient	1. Patient. 2. Correct physician orders. 3. Consent form.	Patient is assessed (EKG and H&P).	1. History—surgery/patient education completed. 2. EKGs completed. 3. Anesthesia assessment completed.	1. Patient. 2. OPS. 3. OB. 4. Anesthesia.	1. Correct patient history. 2. Correct patient education. 3. Correct chart to OPS.
Physician Patient OR scheduler	1. Patient. 2. Physician orders (via PAT nurse).	Patient is transferred for ordered tests (labs or X-rays).	1. Copy to patient (lab and X-ray). 2. Patient education.	1. Patient. 2. Laboratory. 3. X-ray.	Timely, completed, accurate and obtained/scanned.
Patient OR Scheduler	1. Patient. 2. OR schedule.	Patient leaves discharged with surgery date/time.	1. Schedule surgery date and time. 2. Patient education.	1. Patient 2. OPS and OB.	Correct patient information.

CTQ = critical to quality
CVMC = Church Valley Medical Center
EKG = electrocardiogram
H&P = history and physical
OB = obstetrics
OPS = operations
OR = operating room
PAT = preadmission testing

PAT pre-improvement process flowchart / FIGURE 1



acquisition bottleneck was alleviated. A courier now picks up all patient charts daily from surrounding clinics and delivers them to the hospital. Reducing chart delivery variation in this process has resulted in no lost patient charts or paperwork.

4. The internal method by which the patient's chart travels from hospital registration to the PAT nurse was changed. Previously, the PAT nurse would retrieve the chart from registration and escort the patient to a doctor's office. In an effort to reduce patient waiting time, a member of the registration group walks the patient and pertinent chart to the PAT nurse after completion of patient registration. This process standardization has eliminated the bottleneck, improved communication and dramatically reduced wait time.
5. Patient transport was redesigned. Formerly, the patient would travel from the PAT area to radiology or the lab for X-rays or specimen collection. Adhering to lean principles, a patient-movement step was removed. Now, the PAT nurse draws the specimen, thus eliminating specimen collection bottlenecks, and transports the patient to radiology if necessary.
6. The process for collecting patient-prescription information was altered. Formerly, if the patient did not bring a complete list of current medications to the hospital, the PAT nurse would call local pharmacies and construct an accurate list while the patient waited. With the new standardized process, the PAT nurse schedules time at the end of the day to contact the pertinent pharmacies for specific patient information. Not requiring patients to wait while making calls reduced patient wait time.
7. Within the hospital's IT group, a custom-built pa-

Functional deployment matrix / TABLE 2

	Key process output variable (KPOV) *	Correct, complete information and education	PAT properly scheduled	Friendly patient service / diplomatic	Waiting time	Complete assessment		
	Patient (customer) priority Rank *	9	7	9	9	6		
	Key process input variable (KPIV) *						Calculated rank	Calculated percent rank
1.	Physician office has information.	8	9	3	3	3	207	13.69
2.	Information and process is correct.	9	9	3	5	8	264	17.46
3.	Patient knows where to go.	9	7	6	7	2	259	17.13
4.	Standard operating procedure.	10	5	6	8	9	305	20.17
5.	Communication tool.	9	4	9	3	5	247	16.34
6.	Employee scheduling.	2	8	8	6	5	230	15.21

* KPIVs, KPOVs, rankings and non-calculated numbers were acquired from stakeholder opinions in all day team meeting.
PAT = preadmission testing

tient tracking system was developed to serve as a signaling device. This system alerts the nurses in outpatient surgery of a bottleneck in the PAT area. After being notified, a nurse arrives to alleviate the bottleneck and associated stress. Applying human resources in times of peak patient inflow exploits the bottleneck's capacity for service, thus reducing patient wait times.

Removing process steps or combining steps for synergy's sake are a tenet of lean. The new process has 17 steps (Figure 2, p. 48) compared with the former, which had 20.

More importantly, a post-improvement sample size of 61 consecutive patients during the course of one week—two months after the project was initiated and improvements began—revealed the average patient wait time dropped from about 20 minutes to just under six minutes, a reduction of around 70%.

In addition, the standard deviation narrowed from 18.9 minutes to just under 6.3 minutes, a 67% reduction. The effect of these process changes is illustrated in Figures 3 (p. 48) and 4 (p. 49) in the form of box plots.

Proving improvement

Practitioners of process improvement are sometimes perplexed at the outcomes resulting from their labors. They wonder whether the performance after the improvement change is truly different than the baseline data or is simply a process operating on a good day.

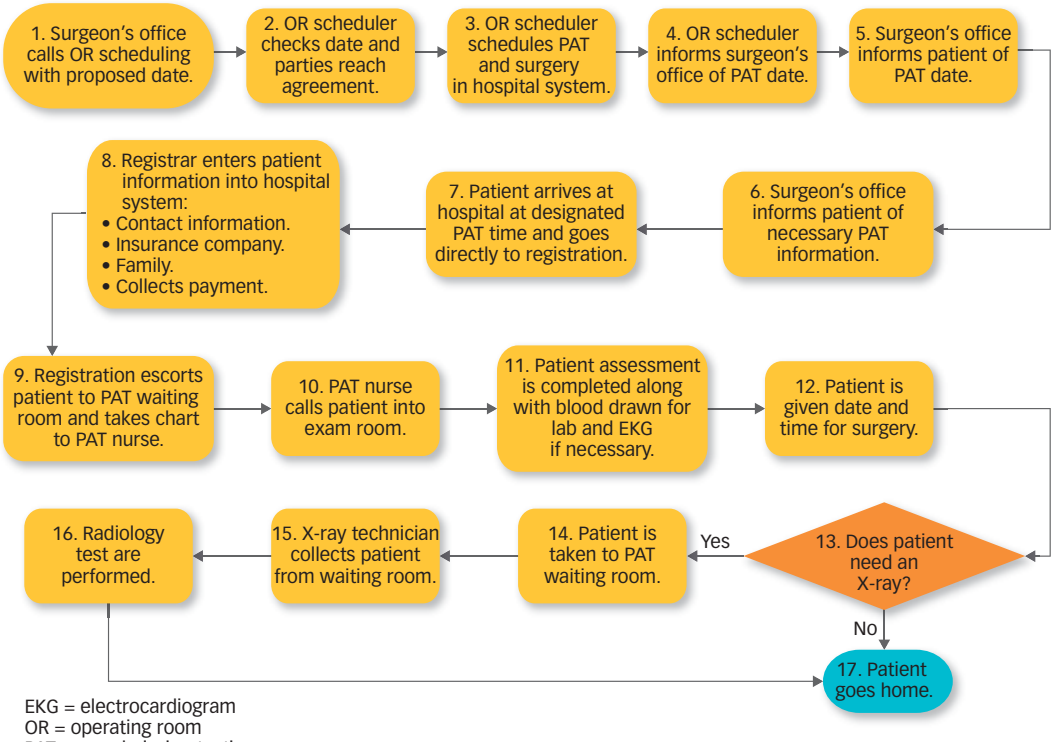
The answer lies with a two-sample t-test,[6] which analyzes data under the assumption the populations from which the samples are drawn are not different (the statistical difference between the population's mean is zero), and therefore the process hasn't changed statistically.

A p-value of greater than 5% (assuming a 95% significance level) indicates the comparator samples may actually be from the same population—hence no significant change in the process. P-values of less than 5%, however, are indicative of the data sets not being taken from the same population and suggest the post-process improvement sample is significantly different.

This test quantitatively illustrates what all improvement practitioners desire to know: the process has improved, and the time and energy invested were not in vain.

After examining the results of the two-sample t-test, Clinch Valley Medical Center discovered the p-value was 0 (confidence interval for mean difference = 8.52, 18.61). A test of equal variance (hypothesizing the variations were the same) provided a p-value of 0 for two other

PAT post-improvement process flowchart / FIGURE 2

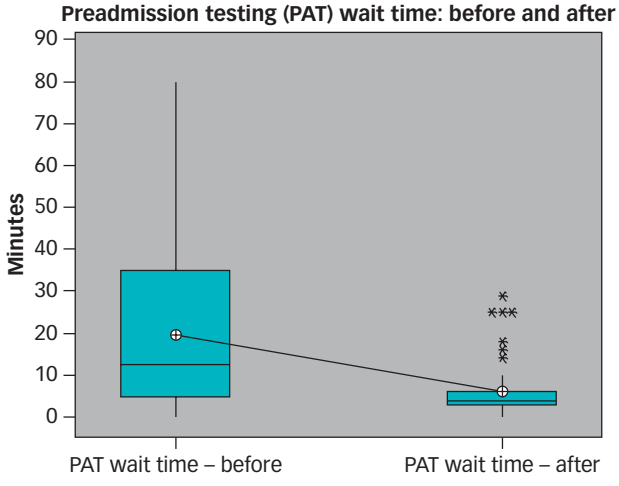


EKG = electrocardiogram
OR = operating room
PAT = preadmission testing

statistical tests: an f-test and a Levene's test.

Again, this suggests the samples came from different populations, implying the GB team made a difference in the hospital's PAT process. Figures 3 and 4 provide graphical evidence of this outcome.

Box plot comparisons / FIGURE 3



What did we learn?

The hospital took away five lessons from this project:

1. An easy solution is not always a good solution. What is considered straightforward may not account for all the dependencies within a process. For example, the stakeholder departments relied heavily on the PAT nurse to manage the process. Although straightforward, this was not the best solution.

Also, patients were asked to bring their own paperwork with them to the hospital. This resulted in incomplete or missing information. A daily courier service to each patient's primary-care physician remedied this problem.

2. It's the process, not the people. Professional staff working within a process—often for years—can take ownership, which can translate to professional identity. Tweaking the process means adjusting their responsibilities or covertly conveying they have been doing it wrong for years. Tact and finesse are required to overcome this obstacle.

For example, the PAT nurse had been managing the process alone for more than five years and had been a hospital employee for about 30 years. Initially, he wasn't

open to suggestions or process modifications. He took pride in his responsibilities and had difficulty seeing the need for improvement. Focusing on the process rather than the person helped change that perspective.

3. Good data are key. Data have a way of draining all the emotion out of the room. But valid data enable team productivity. The PAT nurse heavily associated his identity to his work tasks. One week of initial wait-time data, with subsequent weekly data follow-up for two months, helped convince him of the need for change.

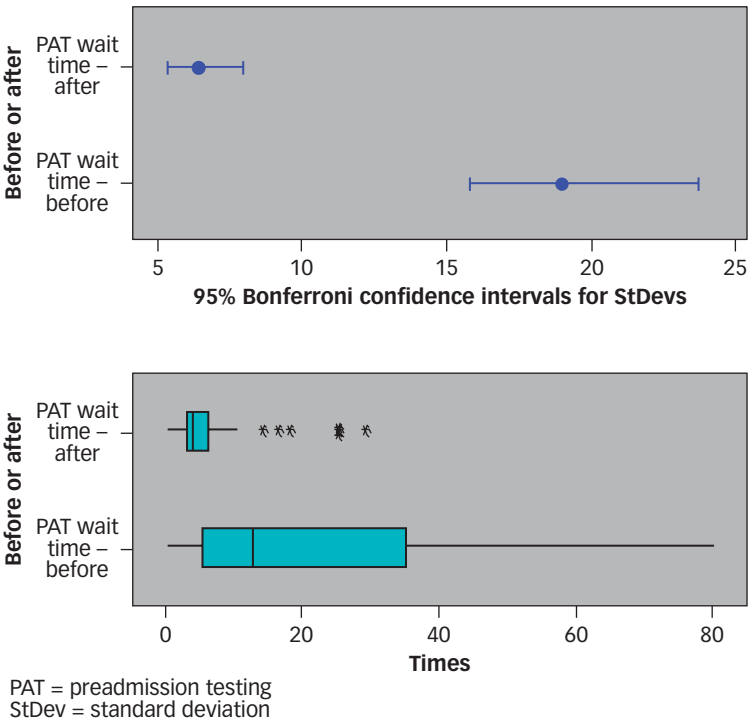
4. Get your hands dirty. Unless you get involved with the day-to-day operations, you may never get an accurate assessment of the inner workings of a process. Few solutions can come from an uninvolved project team. GBs from the team accompanied the PAT nurse and collected process wait-time data daily with standardized forms.

5. See the results quickly. Success breeds momentum. As is often the case with processes that have multiple transfer points, momentum is required to reach the tipping point and beyond. Throughout the improvement process, patient wait-time data were collected weekly, trended and reported to the PAT nurse and his supervisor. This constant process attention through data proved to be invaluable.

In the future, hospital reimbursements from Medicaid and Medicare will align even further with improved performance standards. With the advent of the consumer-patient concept due to the rising popularity of consumer-driven health plans, hospital patients will start becoming more price-centric.

This will force hospital administrators to focus intently on all improvement opportunities to help drive down price, thus attracting patients while enhancing quality efforts to receive maximum reimbursement from the U.S. government. The 6TOC approach can aid administrators in their quest to deliver a better healthcare model, which provides a better patient experience and improves quality of care. QP

Test for equal variances for times / FIGURE 4



F-test	
Test statistic	0.11
P-value	0
Levene's test	
Test statistic	29.77
P-value	0

PAT = preadmission testing
StDev = standard deviation

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Box Paradox

Thought leadership should reign supreme

WITHOUT ANY DATA to support this, I'm willing to wager that anyone who has been employed in a manufacturing or transactional environment for five years has either been directed to or heard someone direct others to "think outside the box."

Whenever I hear this phrase being tossed around by managers in meetings, I often want to raise my hand and say, "Excuse me. I don't understand what you want me to do. Could you please explain to me exactly how you think 'outside the box?'"

The phrase has become another tired cliché. If this box—that most of us seem to spend our lives thinking inside of—is such an undesirable thing, how has it become such a common thing?

I remember working with John Evelyn of Trident Leverage Group, a quality consulting firm, when he asked a table of executives what their jobs were. There was the litany of remarks about strategies, initiatives, leadership and vision. In other words, very management-sounding responses.

"No," Evelyn said. "There is something you were all hired to do that is the same." Silence.

"Think. Weren't you all hired to think?" Evelyn asked.

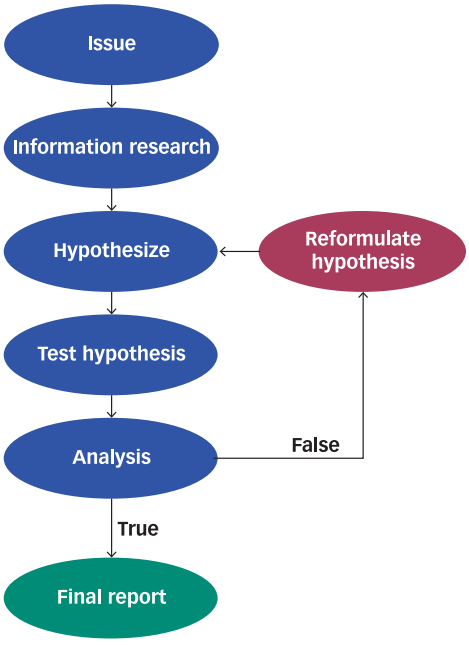
Well, who would disagree? Evelyn asked them to define thinking. More silence. The job most of us were hired to do, and we cannot define it. I would assume that at some point, it could be career limiting. Since that time, I have seen this same scenario many times.

This might be a high-risk extrapolation, but with thought underlying almost all human actions, and the fact that we pay people large sums of money to do it, it seems as though a large percentage of us can't define it. But we do prefer thinking be done outside the box, even though most of us don't know how to do it or what it means. We still, without hesitation, direct people to think outside the box.

If you Google the phrase, "Think outside the box," you get 150 million results. A common definition seems to be, "Think creatively, unimpeded by orthodox or conventional constraints."

There's that word "think" again. Assuming we know what that is, it seems the whole idea is to avoid "conventional constraints."

Scientific method / FIGURE 1



Six Sigma and the box

So what does the box have to do with Six Sigma? Basically, Six Sigma is a large box inhabited by a lot of different tools, methods, theories and hypotheses. Because it is a large and diverse box, it doesn't provide much of a conventional constraint. You can roam around the Six Sigma box with very little in the way of restriction.

Often, people are trained to be a type of belt by learning the define, measure, analyze, improve and control (DMAIC) method—a smaller box inside the large Six Sigma one. People have argued that the DMAIC process kills innovation and is just a knock off of plan-do-check-act. In reality, both are versions of the scientific method (Figure 1) that most of us learned at some point in elementary school.

All these methods constrain us to some

extent, which is really more an issue of rigor than constraint. They are structured thought processes that reduce the risk of a wrong or inaccurate conclusion.

It's after you're inside the DMAIC box that you begin to have constraint issues. Now, you create separate design, measure, analyze, improve and control boxes. When you're taught about those smaller boxes, you frequently learn the tools rather than the box.

In the analyze phase, for example, the thought process is to analyze the data to determine which sources of variation (causes) have a significant impact on the process output. Figure 2 shows what this phase looks like with its respective tools.

Now, the big Six Sigma box has been reduced to a DMAIC box, which has shrunk to a list of tools. In many cases, the list of tools even has a sequence. That has really begun to create conventional constraints.

As you progress through the tools for each phase, you are frequently given a step-by-step process to properly use the tool. The box is now significantly smaller. The focus of training has moved to a step-by-step approach, which once again applies the conventional constraints. At this point, the entire focus has left Six Sigma greater than the DMAIC box, and it's only concerned with the proper execution of steps.

Just when you think you've been mentally driven into this minute box, a hand goes up in the back of the room, and a voice says, "I cannot understand this without an example. Please give us an example." Wanting to score well on the instructor reviews, of course, you provide an example from your last deployment.

"How's that?" you ask.

"That example isn't from our industry. I need an example from our industry to be able to understand," the voice answers.

Rather than explain that there will be a session after class for lazy learners, you comply again in the name of scoring well on the instructor reviews.

What has now happened is that maybe someone has had an a-ha moment. What has really happened is the class has been mentally driven into such a small box that after they leave the class, the particular tool application has become so constrained that finding a specific application is virtually impossible.

The entire concept of site support for Six Sigma projects was created to ensure there was someone available as a resource to help draw people out of those minute boxes so they can think freely enough to create value for the organization.

Somewhere along the line, organizations have taught themselves to value the person who can regurgitate dogma and formulas. Those things can be easily recited by a person who has never progressed beyond the knowledge and comprehension stages of Bloom's Taxonomy (see Figure 3), an adult learning model. Value to the organization comes from application, a level higher in the model.

Staying relevant

We have created this conundrum for ourselves. Frequently, our classrooms are inhabited by people unwilling to put any effort into learning. They were raised in a system that rewarded memorization. We have handicapped our trainers because they now know there is an evaluation at the end of each class that is more concerned with entertainment than knowledge transfer. The entire learning environment is driving in a direction that does not deliver the product they desire: a belt that is free-thinking and competent in solving problems.

The way we train belts to become experts in the application of Six Sigma is designed to drive them into the box. The classroom is where the boxes are created. It complicates learning and executing application within a project.

It is incumbent on Champions, deployment leaders and Master Black Belts to ensure the people they mentor understand knowledge that should be created within the context of what W. Edwards Deming refers to as a system of profound knowledge.

Learning to think outside the box should be priority. It is the key to innovation in problem solving. Perhaps it is even more: It is the key to staying relevant in the 21st century. QP

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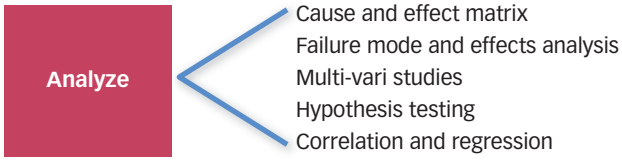
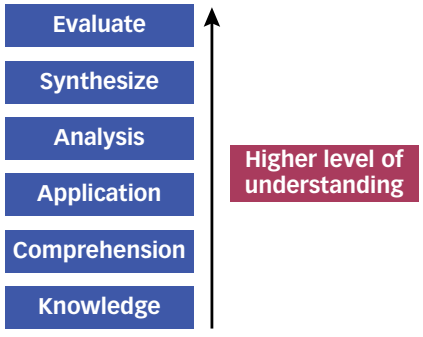
Analyze phase / FIGURE 2



Bloom's taxonomy / FIGURE 3



Keeping It Continuous

Gurus bring quality to life for organization founder

MY JOURNEY into quality is a story that I've told a few hundred times because it's become a part of my outreach to customers in beginning the relationship-building process that is so critical in business today.

I'm often asked about my journey because I am the founder of an accreditation organization for a specialized sector of the healthcare industry—the durable medical equipment (DME) or home medical equipment (HME) sector. The idea for the organization stemmed from the passing of the Medicare Modernization Act (MMA) of 2003, but when someone asks me: "How long have you been in the business?" I find it is best answered by telling the story of my quality journey.

Studying the concepts

Stepping back in time to the late 1990s, I was going through what most consider one of life's greatest stressors: change. I'd been working in the human services field for nearly 25 years and because so many other things in my personal life were changing, I thought I would look at a career change, too. I made the decision to return to higher education and pursue a master's degree in healthcare administration.

It was during my coursework that quality as a field, as a concept and as an art form came alive for me. In class, I was introduced to the works of W. Edwards Deming, Joseph M. Juran and Eliyahu M. Goldratt. I most strongly identified with Goldratt's concepts—so much so that I sought out one of his workshops, traveled 1,000 miles to attend and achieved my goal of getting his autograph. I placed it right next to the autographed copy of Juran's *Quality Handbook*.

Scott Stegall, an instructor in my master's of healthcare administration program, brought quality alive for me and energized me to positively move forward through the challenges I was facing personally and professionally. It seemed like such a natural path, as if a secret door had opened to reveal a new journey to embark upon. Little did I know then how true that would be.

An opportunity arises

Fast forward to the early 2000s, and I was able to make the career shift I was looking for. I took a position as a quality director for a member service organization that works primarily with the DME/HME industry. I became known as the organization's "flowchart queen" and "quality geek."

When the MMA was passed, one of the stipulations set into law was to identify that all DME/HME organizations that bill Medicare for reimbursement were now mandated to achieve accreditation to continue to submit claims. My organization's CEO thought it would be opportune to develop an accreditation organization because there were nearly 100,000 DME/HME organizations and only a few accrediting organizations to accommodate them. I was offered the challenge to develop the accreditation organization, and I wholeheartedly accepted.

In January 2005, the Healthcare Quality Association on Accreditation (HQAA) was formed as a private, not-for-profit organization. In November 2006, HQAA was accepted by the Centers for Medicare and Medicaid Services as a deemed authority for accrediting DME/HME companies. Today, HQAA has accredited more than 7,000 locations in the United States, Puerto Rico, Virgin Islands and Guam.

Quality leads the way

By using and blending the principles of the gurus Deming, Juran and Goldratt, along with Philip B. Crosby, Ken Blanchard and Stephen Covey, quality was the road I took to design, create and implement a new accreditation organization.

Quality is the air we breathe in our organization. Quality is the foundation of our decision making and planning. We have broken a few barriers that once existed in the accreditation world and have set new paradigms that our competitors now follow. Quality was the sustenance for our organization, and it will always dictate what we choose to do and how we choose to do it.

My personal tag line is "keep quality continuous." That is something I strive to live by every day and share with those that I work with. This is my quality journey—one that I know is ever-changing and ever-challenging. With our oxygen tanks full of quality air, we'll continue to meet our challenges head on and with pleasure. QP

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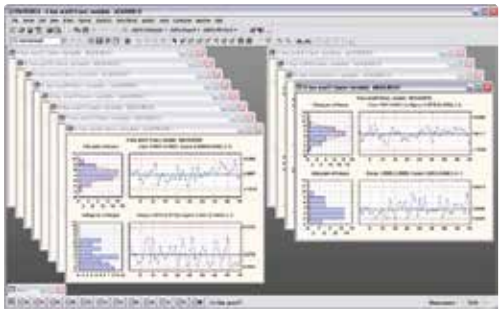
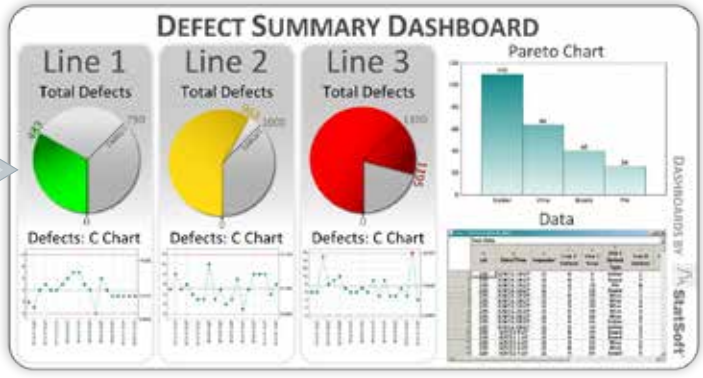
STATISTICA™ Enterprise / QC

Stop wading through endless charts



Start reviewing color-coded dashboard summaries!



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QP201210r01

Who's Responsible?

Find a balanced approach to reaching development goals

SO MANY unemployed people, so few jobs. Or should it be so many jobs, so few people skilled enough to be employed in those jobs? In today's rocky economy, there are different schools of thought depending on who you're talking to.

Experience, field of choice and educational background all factor into gaining employment and progressing in your career. One factor not often discussed is career level of the individual. A 20-something-year-old manager often has different goals and career satisfaction levels than a 40-something-year-old manager.

A vicious cycle

A recent study published in *Harvard Business Review* describes this phenomenon in more detail.[1] The study results show that today's early career professionals are constantly in job-search mode, always seeking a way to make it to the top in the shortest possible time.

These early career professionals are often high achievers with degrees from top universities in sought-after fields of study. Many of the professionals in the study continued interviewing and seeking other positions while still in the first year of employment. The findings also showed that early career professionals change positions or organizations, on average, after 28 months.

Researchers investigated why these top achievers would aggressively seek other options rather than try to build on what they currently have. The most common reason was change in salary. Each time an early career professional would change organizations, they would get a large increase in their compensation package. Earlier generations were not always this fortunate. Many members of earlier generations were forced to make employment changes (voluntarily or not), often for a cost—loss of or stagnant salary, less chance of upward mobility and the struggles associated with continually having to start over.

But the researchers also emphasized that increased compensation was not the only reason for early career professionals to make a leap. A lack of serious training and development was a main reason many young professionals were not satisfied with their current employers.

The employers surveyed for the study said their organization generally satisfied their training needs with on-the-job development rather than a more formal, structured program. From these responses, it seems the employers in the study valued development, training, mentoring and coaching, yet few of them currently have or plan to have these types of programs in place. Employers are hesitant to add formal training and development programs due to cost—both financial and time. Many organizations surveyed said, "If we invest in these employees, they will take our investment to greener pastures."

Thus, it becomes a vicious cycle: Employers won't train workers because they might leave. Companies can't find trained workers, and current workers leave because they didn't get any training or development opportunities at their employer.

Meeting everyone's needs

I mentor some early career professionals who echo the study's findings and say: "If the organization doesn't care enough about me to offer training and development, then I'll go somewhere that does." Such statements lead to me to ask them: "Whose goals are we talking about—yours or the organization's?"

That very same question was once asked of me more than 20 years ago when I was an early career professional. I echoed the same mantra of today's early career professionals until a person mentoring me forced me to consider that my own goals were separate from my organization's expectations. Had I not thought about that question, I would not have reached the goals I have thus far.

Organizations set their policies based on past history and future goals. All career professionals—no matter what level—must take the same approach. I once had an employer that did not support ASQ activities or certifications, but I knew

that they were advertising for higher level positions requiring certifications. The company wanted a certified quality engineer (CQE), but would not provide time or funds for current employees to obtain the CQE.

I took it upon myself to find a CQE program I could do on my own time and retooled my budget to cover my own expenses. After I obtained the CQE, I was more marketable to my employer and future employers. My employer recognized my own endeavors and offered me one of the open positions. Years later, after that employer was sold and closed, my increased marketability paid off in obtaining the next job.

Some organizations are taking on the issues discussed in this study with a modified approach—they are looking at their distant future needs (pending retirements, growth in business and infrastructure changes) and meeting with today's young people to talk about what they can do for the organization and what skills are needed.

For example, an organization in the Pittsburgh area that specializes in water and energy industries offers tours and summer programs for pre-college students. The intent of this program is to garner student interest and educate them about jobs that will be available and what training and skills are needed for work in these roles. This modified approach allows the employee and the employer to work together to meet the needs of each party. I used the modified approach throughout my career—determining what I needed to do to reach the next step in my current organization while also preparing for the future if I needed to make a move.

The *Harvard Business Review* study's conclusion echoes the idea of using this modified approach: Offer promising candidates a more balanced menu of development opportunities, and they may stay with you. Show them now what the future holds, and what they need to do to get there. Professionals, it is then up to you to do the work to get there. QP

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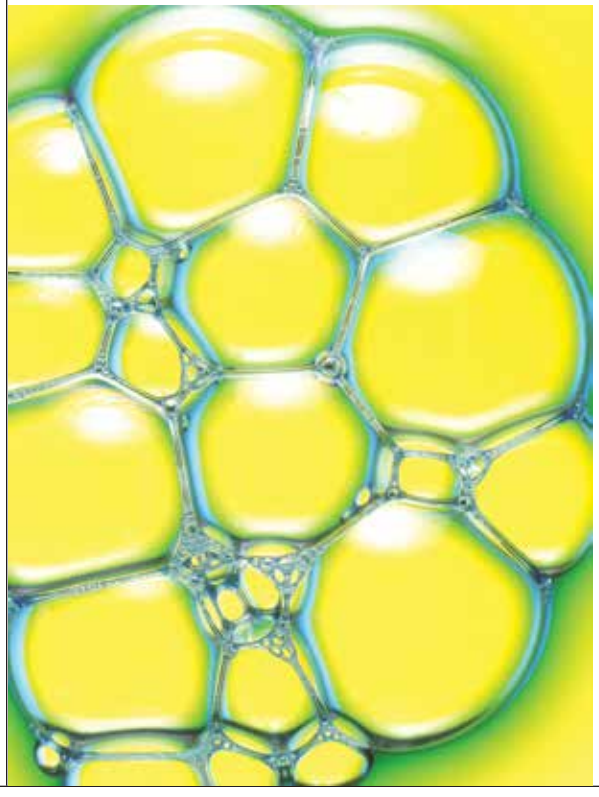
BY JULIA E. SEAMAN
AND I. ELAINE ALLEN

Group Effort

Cluster analysis applied in more disciplines to help find answers

CLUSTER ANALYSIS is being widely used in disciplines as diverse as marketing, genomics and climate change. The technique lends itself to large ("big") data sets and small, focused data sets—from qualitative variables to Likert scales and surveys as well as to quantitative variables.

Clustering is an unsupervised statistical technique and also may be called classification or segmentation. It's defined as unsupervised because there is no targeted or dependent variable being modeled. Algorithms are applied to group the data based on some calculated measure of similarity. In general, the ordering applied to the groups of variables minimizes the variability within a cluster or group while maximizing the variability between groups.



An easy application of clustering in quality is the detection of anomalies in the data after clustering is completed: Any outliers should branch away from the main groupings. This is analogous to control charts, but no boundaries are created to be measured against. The grouping is based on the data and criteria in the clustering algorithm. Cluster analysis with large data sets provides a novel way to determine which groupings are important for more scrutiny or further analysis.

For example, clusters are a good way to identify fraud and suspicious charges in accounting and credit card transactions with data sets too large for classical statistical modeling. Clustering can be used to group transactions so different attention and effort could be applied to each different cluster. It is possible to implement the analysis for a data stream and reconfigure the clusters as data are updated on the fly.

Another common quality application is in microarray image processing and data acquisition of gene expression. The quality of clusters are ranked by the intensity of the signal-to-noise ratio (similar to the intra versus inter-cluster variability to filter promising genes for further analysis[2,3]).

Basic method, types

Because the definition of "similarity" is difficult to define and clustering can be subjective, you can start with some basic mathematical assumptions. The measure used to discriminate between clusters must exhibit the properties in Table 1.

Clustering usually takes two general forms:

1. In partitional clustering, groups are created, but relationships between data points within the groups are not quantified. This type of clustering is similar to sorting your data based on similarity.
2. Hierarchical clustering has two subgroups. Data points are successively divided from one group down to the individual data point level (top-down approach) or successively combined into groups (bottom-up approach, also called agglomerative) using quantitative methods.

Graphical representations of the hierarchical method can give you an overview and allows you to quickly identify anomalies using a tree-like classification diagram called a dendrogram. You can look at the dendrogram to determine the correct number of clusters.

In Figure 1, there are two highly separated groups suggestive of two clusters. Unfortunately, things are rarely this clear. If you are using more than a few variables to determine your clusters, you will need multiple size, color and shape options to create a plot of your data.

If we add an outlier to this data set, it is obviously displayed in the dendrogram. Note there are now three groups in Figure 2, but the third group contains only one element: the outlier.

Dendrograms are especially useful for microarray data. The microarray plate

contains thousands of DNA spots and is used to measure the expression of specific genes within varying experimental condition. It is commonly used to genotype patients and probe biological functions of proteins.

The plate output shows a signal that indicates gene activity on a red to yellow to green quantitative spectrum. Clustering can be used to assess the quality of microarray signals and to analyze the results so you can group genes with similar response patterns. The dendrogram is a useful visualization for both these purposes.

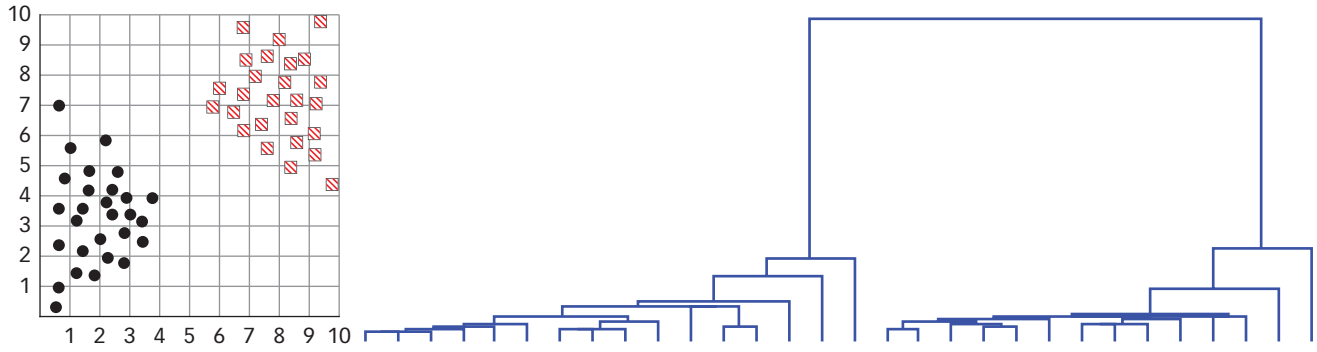
For data collections performed with multiple replicates, such as microarray chips, clustering is a great method to get an overview of the performance quality. Samples that have similar profiles will cluster together, and any suspect replicate will split off on its own branch. Follow-up analysis of the suspect replication is needed to confirm the data set is, indeed, an outlier and not an effect of the chosen algorithm.

Clustering also may reveal the

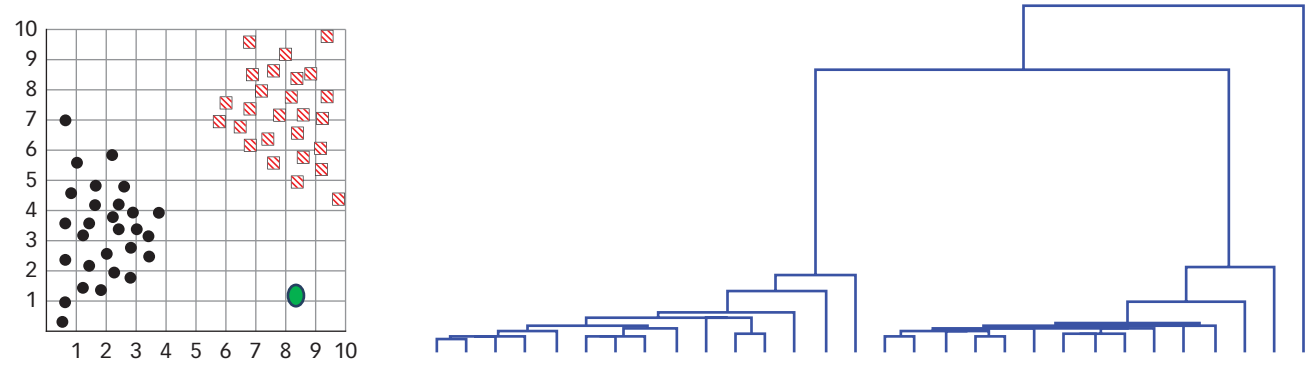
Cluster properties / TABLE 1

• **Symmetry**	D(A,B) = D(B,A)	Otherwise you could claim "Plums look like apricots, but apricots look nothing like plums."
• **Constancy**	D(A,A) = 0	Otherwise you could claim "Plums look more like apricots, than apricots look like apricots."
• **Separation**	D(A,B) = 0 if and only if A=B	Otherwise there are objects (plums and apricots) in your world that are different, but you cannot tell apart.
• **Triangular Inequality**	D(A,B) ≤ D(A,C) + D(B,C)	Otherwise you could claim "Plums are very like apricots, and apricots are very like pluots, but plums are very unlike pluots."

Example of two clusters / FIGURE 1



Example of three clusters / FIGURE 2



presence of any underlying confounders that affected the replicates. For example, the data may split early into two main groups that correspond to two different technicians or robotic systems.

Clustering is a very useful analysis tool. For microarray plates, experimenters use clustering to observe how genes responded to the tested conditions and what specific genes may be best for follow-up experiments. In addition to comparing one attribute list, clustering can be applied in multiple dimensions.

Often, microarray data may have multiple conditions (such as different drugs) that were tests. Clustering by gene and drug can show simultaneously what drugs caused similar changes over all the genes, and what genes changed similarly between all the drugs.

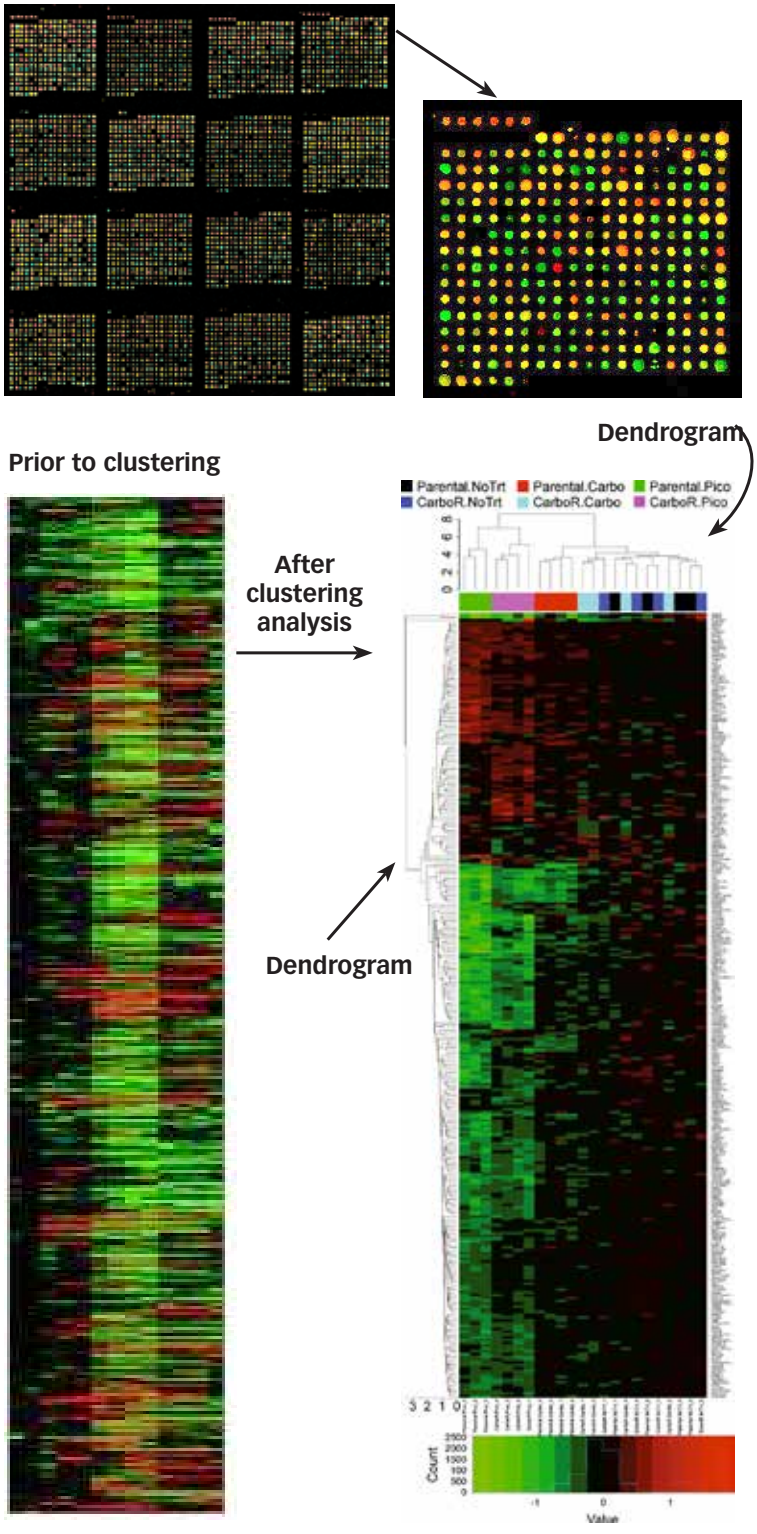
Other data qualifiers, such as gene function for the microarray, may be applied to test whether clustering branches follow the descriptor patterns. Using clustering, data patterns are easily displayed and groupings of interest can be identified for follow-up investigations. Figure 3 shows the assay plate prior to clustering and an example of the results following two-dimensional clustering.

Clustering algorithms

Partitional clustering is not as efficient as hierarchical clustering because each individual piece of data is classified in only one cluster, and the user must identify beforehand how many clusters are defined in the data. It does not identify anomalies in the data as quickly as hierarchical models, but it is useful for overlapping clusters in which a membership in the cluster group is important and not the subcluster divisions.

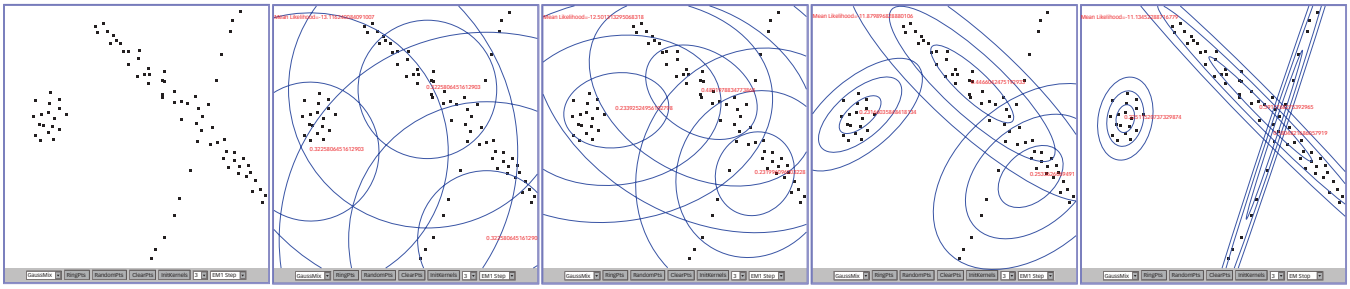
The most common algorithm used is k-means, in which k identifies how many clusters exist. The algorithm uses five steps after the analyst decides on the number of clusters. The continued

Assay plate clustering / FIGURE 3



Source: www.springerimages.com/Images/MedicineAndPublicHealth/1-10.1007_s00280-010-1435-5-2 (case sensitive)

Partitioning algorithm / FIGURE 4



iteration and definition of clusters is not as efficient as the hierarchical clustering techniques.

1. Decide on a value for k.
2. Initialize the k cluster centers (randomly, if necessary).
3. Decide the class memberships of the N objects by assigning them to the nearest cluster center.
4. Re-estimate the k cluster centers by assuming the memberships found above are correct.
5. If none of the N objects changed membership in the last iteration, exit. Otherwise, go back to step three.

Given the first plot in Figure 4, it is clear that three clusters exist, but they overlap. A partitioning algorithm will use the steps (the other four plots in Figure 4) to identify the clusters by iteratively computing cluster center and recalculating the center at each iteration.

There are many different hierarchal algorithms for quantifying the distance between clusters. These can be divided into distance measures that separate clusters by the average distance between their centers:

- Those that separate clusters by nearest neighbor (lowest variability within a cluster).
- Those that separate clusters by the maximum variability between clusters.

All distance-measure algorithms are scalable and iterative. The different algorithms have their own strengths and depend on the type of input data and desired results. The clustering algorithms are easily implemented within most statistical software (Statistical Product and Service Solutions, Stata, Statistical Analysis System and R), and most documentations explain the differences between the available algorithms.

Clustering can be an easily applied technique to examine **how well your data fit** into similar groupings.

Applications abound

Clustering can be an easily applied technique to examine how well your data fit into similar groupings. The technique can identify outliers from specific clusters. Also, for each data point, cluster analysis can calculate a quantitative measure of how far from the center of a cluster (measured as a multivariate mean or other statistic of central tendency) the point falls.

Measuring the overall variability within and between clusters indicate whether the cluster is cohesive. Cluster analysis can be applied to many types of data—categorical, ordinal and numeric—and has helped fields as diverse as marketing and biology. QP

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3. James J. Chen, Huey-Miin Hsueh, Robert R. Delongchamp, Chein-Ju Lin and Chen-An Tsai, "Reproducibility of Microarray Data: A Further Analysis of Microarray Quality Control Data," *BMC Bioinformatics*, Vol. 8, No. 412, 2007.

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Keeping Watch

Why supplier audits are growing in importance

NOW MORE than ever, supply chain management is important to ensure organizations can compete in the global market. Organizations continue to focus on core competencies, resulting in greater dependence on high-quality materials and services from suppliers.

An audit program is a key component for monitoring the external supply chain, the management of which is an enterprise within an enterprise. Many of the program requirements for internal and external audits are the same. But external audits are different due to the customer-supplier relationship.

Audit program managers must interface with procurement departments to ensure contracts contain access clauses and to schedule audits or other oversight services of the global supply chain. Oversight may be needed for first, second and perhaps third-tier suppliers depending on organization objectives, customer requirements and risk.

What's involved

The supply chain enterprise includes:

- Procurement.
- Requirements flow-down.
- A logistics network.
- Manufacturing and technology, and obsolescence management.
- Demand forecasting.
- The customer service relationship.
- Risk management.
- Performance management.

The external audit program most likely will be involved with the procurement, performance management and risk management aspects of the supply chain.

In many cases, the procurement department is the client that needs the services of an audit program. Procurement personnel are sometimes called procurement specialists, buyers, purchasing agents, purchasing managers and purchasing supervisors. Depending on its needs, the auditing organization may employ procurement and auditing personnel with international experience.

Procurement duties and responsibilities that involve the auditing function include:

- Creating and implementing performance metrics, such as key performance indicators.
- Monitoring and reporting trends in the supplier and contract base that could affect supply.
- Establishing and promoting relationships with suppliers and customers. The organization may need to develop close relationships with suppliers of critical material and services. In some cases, partnerships might be established.
- Following up on and monitoring supplier performance to ensure corrective action is taken on identified issues.
- Verifying special programs as needed, such as vendor projects, changes, buy-resale and private label.

Required reading

Usually, audit program managers and auditors are not involved in establishing supplier requirements but are likely to be involved in their oversight.

Requirements may be technical, logistical, administrative, legal or related to supplier processes. Technical requirements typically come from the process designer or owner; quality department; or technical, procurement or legal department.

Examples of technical requirements include physical characteristics, such as weight or dimensions; chemical composition; physical properties, such as hardness, smoothness and finish; and

Supply chains **can stretch across the globe** and thus can vary widely. In all cases, however, deadlines must be met **and customers satisfied.**

performance results.

Examples of logistical requirements include identification, such as barcode, name, serial number and color code; packaging, such as padding, box, pallet and spacing; instructions; packing lists; special storage conditions listed on packages; and storage service requirements.

Examples of administrative and legal requirements include hazardous response instructions and markings, first-aid instructions, purchase order or contract number, and disaster recovery plans, such as those for natural disasters, cyber attacks and material outages.

Examples of supplier process requirements include process variation monitoring, certificates of compliance, first-article inspection or other test requirements, and ISO 9001 plus or minus requirements.

There may be other requirements depending on the risks involved—for example, source inspection for expensive or large equipment. Inspection type, sample size and rejection criteria also may be part of the product or service requirements.

Logistical matters

For many organizations, the expansion of the supplier base has spawned the evolution of logistics management. The globalization and outsourcing of products and services has led to increasingly complex supply chains with longer lead times, more pipeline inventory, and the need to control downstream and upstream logistics.

Establishing a supply chain network includes supplier selection, and movement of goods and services to their final destinations. Audit programs don't develop the supply chain network, but they must verify and monitor activities to ensure requirements are met.

Movement of goods and services includes modes of travel, such as train, air, roadway and sea; distribution and storage services; storage conditions; technical services; expedited services; and controlling storage costs and expenses, such as detention and demurrage fines.

Supplier selection may include initial evaluation, maturity model results and assessment of capabilities.

Risky proposition

Supply chains can stretch across the globe and thus can vary widely. In all cases, however, deadlines must be met and customers satisfied. Language and cultural barriers must be overcome because effective communication is an important factor for success. E-audits are an increasingly viable option and becoming an important audit program strategy to ensure proper oversight and control of risks.

Management is always concerned about risk and has been taught to avoid unnecessary risk. The ISO 9000 standards and similar sector-specific standards represent strategies to reduce risk for selected areas, such as product liability, environmental controls, and occupational safety and health.

Because fewer business processes are being controlled internally, there is a greater need to manage supply chain risk. This presents a difficult situation because increasing dependence on supplier organizations increases a customer's business risk.

The risk management scope should include controls throughout a product's life cycle across all organizational processes and its external supply chain. The scope of the program could be limited by product or may include select enterprise processes.

The purpose of the program should be to ensure customer requirements are being met, and to prevent external product failures and nonconformities. An effective risk management program will reduce the chances of undesirable and harmful consequences to the organization.

The absence of a risk management program puts the organization in a reactionary mode and exposes it to unknown problems. Having a risk management program allows the organization to be proactive by eliminating problems before they occur. The benefits of proper verification and monitoring of the supply chain include:

- Reduced probability of delivering nonconforming products and services.
- Increased probability of achieving organizational objectives.
- Reduced probability of delivering product or services behind schedule.
- Increased probability of compliance to quality, environmental and safety regulations, plus the avoidance of undesirable consequences.

If there are specific identified risks and risk treatments, the audit function may be asked to verify they are being controlled and properly treated. Auditor and audit program managers are usually not asked to assess identified risks unless they are specifically assigned to the team for such purposes.

Adjust your monitor

During any visit or interface with a supplier, an auditor has a duty to report any potentially significant risks to the audit program manager and the client. Depending on the risk and criticality of the product or service, supplier monitoring may include many activities. Monitoring and reporting needs will continue to change due to organizational needs, changes and relationships with suppliers.

Monitoring and verification may include:

- Assessment of capabilities.
- Source inspection.
- Ongoing inspection (100% inspection, acceptance and skip lot inspection).
- Certification of conformance.
- Surveys.
- A conformity audit.
- A contract audit.
- A risk-based audit.
- Verification of corrective actions.

In many cases, suppliers are asked to conform to a management system standard, such as ISO 9001. If a supplier is asked to comply with that, plus specific additional requirements found in another standard—such as ISO 13485 (medical devices) or ISO/TS 16949 (automotive)—it may be called an ISO 9001-plus audit. Audits of small supplier organizations that are asked to implement only certain parts of a management standard such as ISO 9001 might be called ISO 9001-minus audits.

External auditors may need additional training in working with different cultures. A misunderstanding can delay an audit or damage a business relationship. For the same reason, external auditors may need to have technical knowledge about the parts and processes that yield the product being supplied.

Audit results are one input to maintaining an effective supplier relationship. The results may be the basis for increasing or decreasing oversight of the supplier organization. Some organizations have supplier levels that affect not only oversight, but also the share of the business, and have monetary consequences. The higher the supplier level, the less oversight needed. QP

NOTE

This article was excerpted from chapter 16 of *The ASQ Auditing Handbook*, fourth edition, edited by J.P. Russell. It's available in the Quality Press Bookstore at http://asq.org/quality-press/display-item/index.html?item=H1435 (case sensitive).

J.P. RUSSELL is the founder and managing director of QualityWBT Center for Education. He also is an ASQ fellow, ASQ-certified quality auditor, voting member of the American National Standards Institute/ASQ Z1 committee and member of the U.S. technical advisory group for International Organization for Standardization technical committee 176. Russell is a recipient of the Paul Gauthier Award from the ASQ Audit Division.

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QP TOOLBOX

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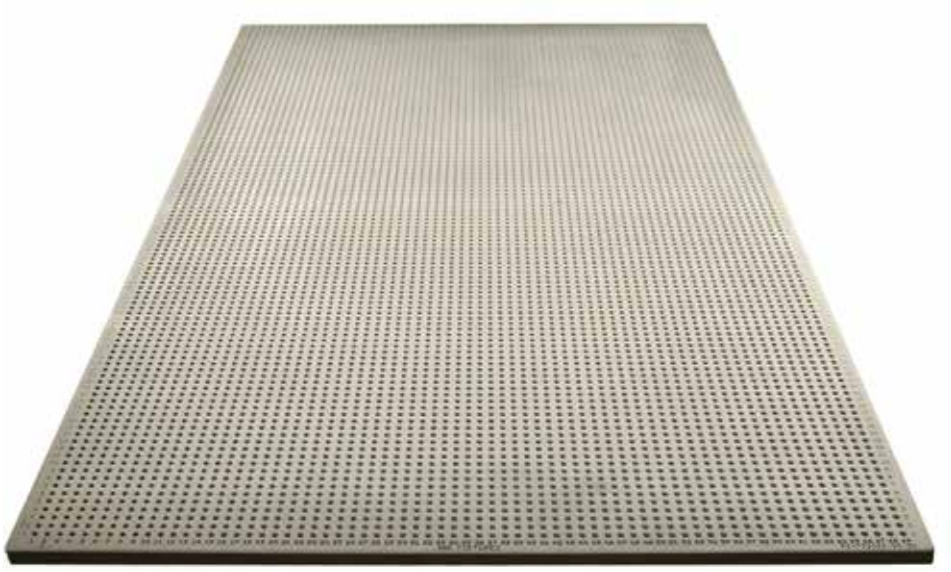
Fixture base plates from R&R Fixture are available in standard and custom sizes with English or metric threads. Multiple threaded holes on the base plate help increase the flexibility of the fixture. They are available up to 60" x 120". Choose either 1/4-20 or M8 threaded holes with hole spacing of 0.50" (15mm) or 1.0" (30mm) on center.

The base plates have been engineered of cast aluminum with a hard coat anodize coating called Ni-Tuff that will make the base plates last longer. Base plates can also be made of steel with a black oxide finish.

- Call: 616-847-6045.
- Visit: www.cmmfixture.com.



Mobile application ▾

Rice Lake Weighing Systems has released a mobile application for the weighing industry. The company's Load Cell Wiring Guide, which helps industrial scale technicians decipher the wiring colors of almost any given load cell brand and model, is now available as a free mobile application for smartphones, tablets and PCs. Users can selects the brand and model for their load cell, and the app does the rest, showing which wires represent excitation, signal and sense lines.

Users can immediately navigate to the app through their browser at www.ricelake.com/wireapp. Rice Lake Weighing Systems plans to make the tool more widely available through app stores in early 2013. The app is ideal for industrial scale technicians and service engineers employed in the weighing industry.

- Call: 715-434-5364.
- Visit: www.ricelake.com.

Robot

Intelligrated's Alvey robotics case packing solution features two robotic arms operating on a single programmable logic controller-based (PLC) system performing case depalletizing, packing and unpacking of bottles. It also features an additional robotic arm operating on proprietary controls demonstrating case palletizing capabilities.

Intelligrated's integrated PLC platform eliminates the need for traditional proprietary robot controllers by streamlining complex control communication, reducing response time and minimizing changeover delays. Alvey robotic systems integrate with other in-line equipment to provide flexible product handling.

- Call: 919-945-0566.
- Visit: www.intelligrated.com.

Welding machine

Primoceler has announced a laser-based welding machine for micro electro-mechanical systems (MEMS). The machine produces an extremely small heat-affected zone during the hermetic sealing of sensitive components, improving manufacturing processes and expanding the potential for packaging sensitive components under or inside glass.

A major challenge facing manufacturers has been producing packages that do not mechanically stress their MEMS while providing electrical interconnects,

protecting micromechanical elements and allowing for the system to interact with external environments as planned.

The machine includes an auto-focusing system that keeps the distance to wafer within micrometer accuracy.

The machine features a 19-inch touchscreen, intuitive software and a standardized user interface for the machine, laser and viewing camera. Customers have the options of integrating the technology with their production systems, including a vision system for alignment and viewing and full remote access for service and assistance.

- Call: 00-358-50-556-5513.
- Visit: www.primoceler.com.

Metrology software ▲

Heidenhain's Quadra-Chek metrology software provides increased functionality for inspection measurement machines. This software makes it possible to perform 2-D and 3-D measuring tasks in the field of metrology.

This version supports auto-focus functionality allowing for the desired search distance to be directly entered into the search distance field. Part programming improvements were added to support compensation for the thermal behavior of products that experience shrinkage or growth of material during the manufacturing process. This allows users to write a single inspection program for measuring parts with materials having a known growth or shrink rate throughout the manufacturing process.

Improvements were also added to currently existing radial and palletize methods of automatic part programming routines to help users when there are common features or parts that repeat angularly, around a datum or based on a palletized grid layout.

- Call: 888-488-3113.
- Visit: www.heidenhain.us.

Roundness tester ▲

Ametek Taylor Hobson's Surtronic R-Series roundness and form testers provide a high-throughput roundness measuring system for the shop floor and inspection room. The Surtronic R-Series uses a proprietary orientation mechanism that allows the operator to position a part for measurement in as little as 20 seconds. Throughput is further enhanced because there is no need to re-center when measuring a series of similar parts by using the centering attachment.

The instruments are designed for measuring high-volume bearing parts and for a wide range of quality control applications in automotive, aerospace, optics and process control of grinding, turning, milling and honing. Full compliant measurements can be taken with ±25 nm accuracy and 6 nm gauge resolution. Results are displayed on the touch-screen interface using the X-sight software.

- Call: 630-621-3099.
- Visit: www.taylor-hobson.com.

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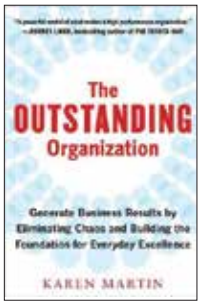
QP REVIEWS

The Outstanding Organization

Karen Martin, McGraw-Hill, 2012, 256 pp., $30 (book).



In this book, Martin has crystallized her theory on why organizations have so much difficulty achieving and maintaining excellence. The author defines four characteristics summarizing the foundation of any improvement strategy: clarity, focus, discipline and engagement. Each aspect is discussed in clear and understandable detail.

Examples are given to illustrate that lack of clarity is a major contributor to wasted time, inappropriate decisions and low morale. Focus leads to working on the significant must-haves and eliminates less significant efforts, which leads to more success overall.

Discipline is defined as a deliberate practice repeatedly performed. The learning model presented is focused on mentors and coaches, but misses an opportunity by not mentioning benchmarking to learn from others or sharing knowledge across the organization.

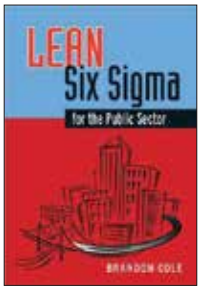
Engagement is discussed as the three C's: connection, control and creativity, which are tied to individual employee needs. Examples of pairing individuals working on the same task are related to demonstrate the benefits to engagement and improved results. Chapter six includes an example using the Navy's Blue Angels acrobatic team to demonstrate these four characteristics in action.

This book is a high-level checklist for upper management that, if properly absorbed and implemented, can make organizational improvement stick and become easier to execute. Be cautious, however, because all the characteristic changes require clarity, focus, discipline, engagement and hard work.

Bill Baker
Speed to Excellence
Santa Fe, NM

Lean Six Sigma For the Public Sector

Brandon Cole, ASQ Quality Press, 2011, 170 pp., $39 member, $65 list (book).



While we tend to think of eliminating waste and reducing variation from processes as something that only concerns the private sector, the fact is that the methods of lean and Six Sigma are just as applicable to continuously improving how government functions as well. The purpose of this book is to show how lean Six Sigma (LSS) can be used to improve how public sector organizations do business.

The book spans eight chapters, first covering what LSS is and what the differences are in applying LSS to the public sector as opposed to private sector companies. The next three chapters cover the establishment of an LSS program, the use of LSS tools to eliminate waste and an overview of the basic quality tools needed to reduce variation. The last three chapters cover the promotion and sustainment of an LSS program.

The book does a good job highlighting the differences between public and private sector organizations, and how to properly apply LSS to overcome those differences. It also excels in showing where you can use certain tools to maximize the impact of process improvements within the organization.

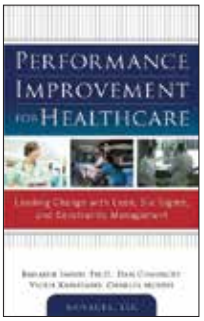
Where this book falls short is in the examples of how LSS tools and principles could be applied in public sector work. The public sector project highlights were, in some cases, short on details of how a particular tool worked in completing a public sector project. In addition, more detailed examples from public sector projects could have been used to demonstrate the use of a particular tool.

Overall, this is a good introductory book that, along with Ken Miller's *We Don't Make Widgets*, should be read by those who want to improve how public sector organizations work.

Brian Cocolicchio
New City, NY

Performance Improvement For Healthcare

Bahadir Inozu, Ph.D., Dan Chauncey, Vickie Kamataris and Charles Mount. McGraw-Hill Professional, 2011, 352 pp., $60 (book).



Authors Inozu, Chauncey, Kamataris and Mount present an integrated approach to using three improvement methods—lean, Six Sigma and constraints management—that have proven to be effective ways to transform hospital operations by focusing on patient outcomes, financial viability and employee satisfaction. The authors summarize their perspective on

the state of performance improvement in healthcare and how various keenly focused strategies fail to address healthcare's overall complex problems.

The book explains the principles and practice of constraints management, and demonstrates how this strategy can apply in healthcare. The authors present a pragmatic, readily accessible explanation of their approach to integrating the three identified improvement methods in the healthcare arena. They also explain the importance of thoroughly understanding the internal systems in a healthcare organization, how to effectively plan to deploy their approach, how to use the right tool for the right problem and the strategy of sustaining success over time.

While the material is aimed at connecting principles with important healthcare executives, it also manages to make the information applicable to any healthcare leaders interested in learning a better way to manage and control bottlenecks, eliminate waste, reduce errors, contain costs and improve outcomes for their customers.

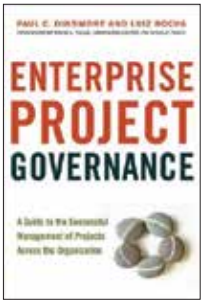
The work represents the ongoing maturity of performance improvement concepts and practices derived from successful manufacturing arenas that have been successfully applied to the healthcare service sector. This book is recommended for all healthcare chief executives, board leadership and quality managers.

Dale Farris
Groves, TX

Enterprise Project Governance

Paul C. Dinsmore and Luiz Rocha, Amacom, 2012, 271 pp., $34.95 (book).

This book presents ways to align diverse projects in a portfolio that addresses an organization's long-term strategies and objectives. The authors delve into areas such as selecting the right combination of projects, managing those projects through uncertainty and improving the predictability of outcomes. Also covered are means for managing very large, complex and ambiguous projects relating to joint ventures and strategic alliances all with flexibility and tenacity.



Corporate governance policies and guidance is derived from high-profile financial failures late in the 1980s and throughout the 1990s. Corporate governance is aimed at improving organizational performance through a corporate culture that gets directors and managers to focus on the effectiveness of projects and operational efficiency to produce returns on investments and growth. Enterprise project governance (EPG) aids in strengthening corporate governance policies and accountability.

Chapters about risk management and project portfolio management are particularly enlightening. Illustrations and discussion cite examples of how worldwide selections of organizations have addressed the principles and activities.

The concept and practice of EPG embraces the management of project portfolios in nearly every type of large organization. A roadmap lays out a plan for success, followed by a discussion of the challenges and roadblocks. It addresses the question of why EPG is needed.

Project planners and managers, and students of project management will derive insights they should consider for effective portfolio management of projects. If your organization is struggling to cope with the diversity and multiplicity of projects proposed and under way, this book is for you.

Russell T. Westcott
R.T. Westcott & Associates
Old Saybrook, CT

RECENT RELEASE

Six Sigma Green Belt, Round 2: Making Your Next Project Better Than the Last One

Tracy L. Owens, ASQ Quality Press, 2012, 137 pp., $30 member, $50 list (CD-ROM and book).

Minimizing Chaos

Tips for managing your documents

"CATASTROPHIC DOCUMENT failure" is what the auditor said when he saw the cardboard box on the table with papers flowering out of the top.

How many times have we audited a process and been met with an explosion of paper and documents with no rhyme or reason to their organization? How often have we found ourselves looking at myriad electronic spreadsheets or documents, each containing a mysterious fragment of information?

Much has been written about document control and management. But applying these basic principles can help transform a nightmare into a well-managed system.

1. Classification. Organization of a document system begins with creating "buckets" for information. The fundamental tool for managing complexity is breaking a complex system down into smaller logical pieces that can be managed.

What are the current document pieces that compose your system? Standards, test methods, policies, work instructions and procedures are some "bucket" labels that come to mind.

2. Think trees. The most effective way to arrange the buckets is based on a tree-like hierarchical structure. For example, Figure 1 shows a hierarchical classification scheme for classifying a work instruction.

This system of branching and forking is a highly effective and flexible method of classification. Using ideas of pruning and splicing, smaller trees can be joined to larger trees or larger trees thinned into simpler processes.

3. Centralization. The least value-added activity is to have documents or information in different locations, whether it is file cabinets, shoe boxes or on someone's hard drive.

One of the biggest failures related to document systems is being unable to find what you need in a timely and accessible manner. Today's electronic collaboration platforms, with their ease of configuration and array of development tools, make it possible to have a centralized documentation system that is reliable and readily accessible.

4. Clarity. Clarity of delivered content will help create manageable and effective user-oriented documents. Simple, short, grammatically correct and to-the-point language arranged in a graphically pleasing manner using bullets and tables goes a long way.

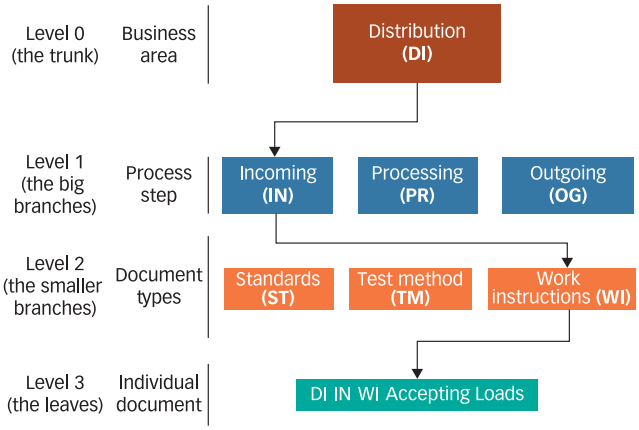
Long paragraphs, poor grammar, undefined acronyms, tiny fonts, overuse of color and poor use of white space sabotage an individual's cognitive ability to process information efficiently and effectively, and is unlikely to keep a reader interested past the title. Keep in mind: It's not just about conveying information, but also its meaning.

5. Document management. In a large organization, there may be many levels of document or information use and development. Authorship of documents may fall on many individuals' shoulders rather than a few technical document developers.

A small group or an individual must be responsible for managing document classifications, numbering, archiving, revision control, document consistency, author education and overseeing information access. Without centralized control and group oversight, junk will be created and stored haphazardly, and will eventually destroy the credibility of the best document systems.

The true test of a document system is how well documents enable an organization to function efficiently and thrive. Just as your household must be organized and clean, so must a document management system. QP

Hierarchical classification scheme / FIGURE 1



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CASE STUDY

Six Hospitals Combat Regional Emergency Department Congestion With Lean

Read how six urban hospitals that partner to serve mental health and addiction patients in British Columbia, Canada, worked together to curb emergency department congestion using lean.

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WEBCAST

The Seven Lean Six Sigma Tools: Value Stream Mapping

A value stream map is often viewed as a blueprint for lean and Six Sigma improvement efforts because this visual tool assists with identifying waste, reducing process cycle times, and implementing process improvements. Part of a series on the seven fundamental Lean Six Sigma tools, ASQ subject matter expert Jack ReVelle provides an overview of value stream mapping in this webcast.

Access this month's featured content and more Web exclusives in the ASQ Knowledge Center at asq.org/knowledge-center/featured.html.

StatSoft®

Making the World More Productive™

To: CEOs of US Software Companies
From: Paul Lewicki, CEO, StatSoft, Inc.
Date: October 22, 2012
Re: Aid for European Struggling Economies

Dear Colleagues,

As some of you may know, StatSoft has launched a program to offer free Enterprise Business Analytics software to struggling companies in Greece, Portugal, and Spain with the intent to help the economy in these developed and, until only recently, thriving nations, where now 25% of the population cannot afford the most basic necessities such as adequate nutrition or health care.

I invite you to join this initiative, which will not only reduce human suffering, but also have global, long-term benefits of reducing the risk to the Euro and the global economic system.

In our (software) industry, we are in a unique position to help tremendously those companies that are now in the paradoxical situation where (a) their highly educated workforce and developed infrastructure is prepared to greatly benefit from software designed to increase productivity and international competitiveness, but (b) their lack of credit prevents them from making any investments and acquiring the critical tools (software) that would radically increase their chances for a quick recovery.

These companies need not only the Advanced Analytics software that StatSoft is providing; they also need software for database management, enterprise resource planning, factory automation, and many other software tools and solutions.

The anticipated (caused by this program) loss of revenue for our industry from these cash strapped nations will be – in the case of most midsize software companies – limited to just a few million dollars; but, the "Return" on this small "Investment" in terms of the social and global benefits is virtually priceless given the depth of that economic calamity.

I have had discussions with my counterparts at several large software companies. While all of them understood the benefits, they raised concerns regarding the significant and unbudgeted cost involved in supporting this initiative, but there are a number of creative ways in which these costs can be reduced. We at StatSoft have developed some of them, and we are happy to share our ideas with you.

Also, we do not recommend that the free software offer be unconditional (e.g., multinational companies are excluded from the StatSoft program), and your company should include its own limitations. The time to act is now; if we wait until the next fiscal year, it may be simply too late.

I am looking forward to hearing from you and working with you on this initiative where every party involved will be a real winner.

Paul Lewicki, CEO
StatSoft, Inc.

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