FUTURE OF QUALITY

After Six Sigma—What's Next?

by **Søren Bisgaard and Jeroen De Mast**

Is Six Sigma a fad that has now run its course? If you have been around long enough to have experienced Philip Crosby's zero defects and quality is free approach, Armand Feigenbaum's total quality management (TQM), Joseph Juran's trilogy, W. Edwards Deming's 14 points, Japanese style TQM, quality circles, Taguchi methods, *kaizen*, ISO 9000, the Baldrige criteria and now Six Sigma, not to mention reengineering, *poka yoke* and lean manufacturing,[1] it seems legitimate to ask what will come next.

Cynics, of course, have already gleefully begun to ask whether it will be called Seven Sigma. Others hope it will all fade away.

To hope quality management will go away is wishful thinking. It would be like reasoning that once you cleaned your house you never needed to do it again. Dealing with airlines and doing internet shopping provide daily reminders we still have a long way to go to achieve quality.

Thus, if quality problems will require continued attention, what will come after Six Sigma? The short answer is labels may come and go, but a scientific approach to problem solving will remain. Indeed, history supports this assertion.

If we look back to Walter Shewhart's days, the fundamental principle he promoted was the use of a systematic scientific approach to dealing with problems of variability that caused costly defects and quality problems. This idea has endured through all the numerous incarnations of quality management. We predict a scientific approach to problem solving will remain the foundation of our profession.

In 50 Words Or Less

- **Total quality management has morphed into Six Sigma's current incarnation.**
- **The next step for quality professionals should be systematic innovation.**
- **Systematic innovation involves carrying out a carefully managed sequence of steps using appropriate tools and roadmaps to improve an organization's competitive position, satisfy customers and reduce costs.**

An Evolutionary Process

As we look back over the past 70 to 80 years, we observe a slow evolution of our understanding of how to effectively mobilize an organization's energy to solve quality problems. Evolution relies on two fundamental mechanisms:

1. Variation (or change).
2. The selection of the most favorable variant by the principle of survival of the fittest.[2] This also applies to ideas, methods and approaches. Good ideas are promoted forward. By the process of survival of the fittest, less useful ideas are left behind and become extinct.

If we look at the current Six Sigma approach, we see it incorporates a wide variety of ideas that originated from previous incarnations of quality management. Indeed critics frequently contend Six Sigma is just old wine in new bottles. The implication is that this is bad. On the contrary, we find it reassuring. If something remains fit, why should it not be allowed to survive?

For the evolutionary optimization process to work, we need variation or change. In the quality management context, we need new ideas, methods and approaches. Through field testing, some of these will turn out to be useful. If so, they will be incorporated into the next generation of quality management.

Other new approaches will, despite their enthusiastic promotion, fall short of expectations. After appropriate field testing, such ideas will go extinct and no longer be part of the program.

The world keeps changing. Quality management will therefore always need to be improved and adapted to the changing circumstances. Thus, we constantly need to experiment with new ideas.

Six Sigma was a major step forward compared to previous quality management approaches. For example, ISO 9000 is likely now facing its evolutionary extinction. Proper documentation and institutionalization of procedures and responsibilities have proven valuable. These ideas are therefore retained under the Six Sigma umbrella. However, we believe ISO 9000's top-down and bureaucratic ways of implementation will likely yield to Six Sigma's decentralized, results oriented approach.

The TQM movement of the 1980s, including the approaches of Deming, Juran, Kaoru Ishikawa and Genichi Taguchi, was distinguished by a focus on quality improvement. This was a major change from the prevailing focus on inspection and quality control during the 1960s.

TQM incorporated a set of excellent tools for problem solving as well as many useful innovations in management. However, we learned quality initiatives nevertheless frequently failed. A major reason was the management of the programs—or more precisely its lack.

Indeed critics frequently contend Six Sigma is just old wine in new bottles.

The exception was, perhaps, Juran's approach as explained succinctly in *Juran on Leadership for Quality*.[3] Thus, the main new contributions added to the body of knowledge and incorporated into Six Sigma have been a more focused and firm management of projects and the attention to change management theory and approaches.

In fact, we think Juran was ahead of his time. The current version of Six Sigma has adopted many of Juran's approaches. For example, the two trilogy concepts of quality improvement and quality control are incorporated in Six Sigma's define, measure, analyze, improve and control (DMAIC), and his third trilogy concept of quality planning is similar to design for Six Sigma (DFSS). Juran's project management ideas, no doubt field tested and evolved by him and his associates over many years, are similar to what is currently used in successful implementations of Six Sigma.[4,5]

What is also new in Six Sigma is its focus on results, especially in monetary and strategic terms. TQM largely measured success in terms of activities. The tacit assumption was if a company trained enough people in problem solving, and

America's Imperative

Our plea for a broadening of our professional mission from focusing on quality to systematic innovation is associated with urgency.

In December 2004, the U.S. Council on Competitiveness, a blue-ribbon committee of leading industrialists and academics, published a report entitled "Innovate America: Thriving in a World of Challenge and Change."[1]

This report is a compelling call to arms that explains the urgency of focusing on innovation to stem the economic dislocations inflicted by the globalization of the economy. The report opens with the following:

Resolved: Innovation will be the single most important factor in determining America's success through the 21st century.

America's role: The legacy America bequeaths to its children will depend on the creativity and commitment of our nation to lead a new era of prosperity at home and abroad.

America's challenge: America's challenge is to unleash its innovative capacity to drive productivity, standard of living and leadership in global markets. At a time when macroeconomic forces and financial constraints make innovation driven growth a more urgent imperative than ever before, American businesses, government, workers and universities face an unprecedented acceleration of global change, relentless pressure for short-term results and fierce competition from countries that seek an innovation driven future for themselves.

America's task: For the past 25 years, we have optimized our organizations for efficiency and quality. Over the next quarter century, we must optimize our entire society for innovation.

We are pleased the Council on Competitiveness has alerted public and private leaders and society at large to the importance of innovation. This supports our argument that the fundamental focus of the quality profession's effort ought to be innovation.

That the Council on Competitiveness believes, misquidedly in our opinion, that "the manufacturing strategies introduced over the past two decades of lean, Six Sigma-esque continuous productivity and quality improvement are no longer a source of meaningful competitive advantage"[2] is not their problem but ours.

Semantics and perception are important. In simple terms, by broadening our focus and using more appropriate terms that better reflect what we do, we can position our profession to be part of the solution rather than marginalized.

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2. Ibid, p. 16.

enough improvement teams were active, profitability would automatically improve. Quality was frequently pursued as an end in itself.

Six Sigma, on the other hand, measures success in terms of results, especially monetary outcomes. It incorporates the learned behavior that it is vital to align quality improvement with the company's strategy to translate quality improvement into profits.

Changes in the environment also contribute to the evolutionary process. For example, the last decade's dramatic changes in computer technology and statistical software, which have resulted in the effortless access and transfer of data, communication via the internet and even minor things like the use of PowerPoint for teaching and team project reports, have been important forces for change that propelled TQM forward to morph into Six Sigma. This computer and software revolution has contributed significantly to Six Sigma's current incarnation.

So What's Next?

So what will follow after Six Sigma? Of course, we don't have a crystal ball. Instead we prefer to discuss what we think ought to happen.

First and foremost, quality professionals should broaden their scope and call what we do "systematic innovation." What we are doing under the Six Sigma umbrella is focused on more than just quality. During the past decade we have increasingly seen the application of Six Sigma to problems such as reducing cycle times, reducing the cost of issuing credit cards, optimizing the performance of LCD screens, improving sales forecasting and reducing the time of hospital stays. These are what economists would call innovations. They are not directly related to defect reduction.

Quality professionals recognize these types of projects ultimately are aimed at satisfying customers. But it seems contrived to call such efforts "quality." Defect reduction, or even the broader conception of quality as customer satisfaction or "fitness for use"[6] is, after all, only a means to an end. What we are trying to do more broadly is to improve an organization's competitive position, better satisfy our customers and reduce costs. So why not use the more appropriate term—innovation? This broader economic perspective is more productive. It connotes something bigger and more important.

Quality improvement as we know it is about process and product innovation. It is about improving anything: product designs, process designs, radical changes, incremental changes or even new ways of managing.

Process innovation usually aims at reducing costs of current production processes, or more generally, efficiency of the entire supply chain. This is typically the objective of DMAIC type projects. Product innovation is about creating new product offerings or features that have more appeal to customers. This is typically the charter of DFSS projects.

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Systematic Innovation

Innovation broadly defined as an economic concept includes the development of new:

- Products and services.
- Methods of production or provision.
- Methods of transportation or service delivery.
- Business models.
- Markets.
- Forms of organization.

But, innovation is typically considered the product of genius. Many associate it with the stereotypical image of someone having a flash insight. It need not be so.

Innovation can be a systematically planned and

organized activity with a high degree of predictability of purpose and end results.[7] Tools and roadmaps can be applied to schedule and manage the innovation process. As Juran says, "A project is a problem scheduled for solution."[8] Thus the appropriate term for our efforts is "systematic innovation."

Incidentally, innovation is not the same as invention. To convert an invention to an innovation requires the innovator to work hard to develop and commercialize the invention to the point at which the product is reliable and of high enough quality a customer is willing to pay for it.

To systematize the process of innovation and reduce the precarious dependence on genius, tools can be used to systematically analyze customer needs and expectations, investigate and diagnose the problem of meeting these expectations, develop a solution to the problem and accompany the solution with appropriate controls to ensure it will continue to work.

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In other words, systematic innovation involves carrying out a carefully managed sequence of steps akin to DMAIC or Six Sigma's define, measure, analyze, design and verify strategy and using appropriate tools—statistical and other—and roadmaps.

DMAIC and the use of quality tools, especially the data driven ones, embody a scientific approach, which has been the foundation for the quality profession since Shewhart's days.

What the quality profession brings to the table in regard to innovation is what is embodied in the adjective "systematic." The Six Sigma body of knowledge can, with minor adjustments to the scope and terminology, be applied to systematize the innovation process.

If we do so, we would assume a much more important role: guiding upper management to see our work is of strategic importance for the survival of the organization where we work. With this wider, more visionary scope, it is hoped we will receive more and better recognition for what we do.

Economic Focus

The ultimate quality award is improved bottom-line profitability.[9] Satisfied customers come back for more and encourage business associates, family and friends to do the same.

In other words, we need to adopt an economic way of looking at things. We don't want to imply we should focus narrowly on short-term profitability. But, we do think we need to look at our work and the role we play from an economic perspective.[10] We need to raise our eyesight and not just focus narrowly on operations management issues, measuring what we do in the currency of defects.

Indeed, one of the important developments that occurred in the transition from the 1980s style TQM to Six Sigma was the legitimization of a hard-nosed approach to evaluate the cost of poor quality and project savings. Again, Juran was ahead of us. The first edition of Juran's *Quality Control Handbook* from the early 1950s contains a lucid exposition of the importance of economics of quality.[11]

Innovation and Economic Theory

A primary reason for preferring the term innovation is its recognized importance in economics and management theory. According to the visionary economist Joseph Schumpeter, innovation is the fundamental impulse that sets and keeps the economic engine in motion.[12]

To many business executives, quality is a nuisance issue they typically hope will just go away. But as Schumpeter explained, "The primary reason for profits is as a premium for the risk of innovation."

Innovation introduces a dynamic element that creates change. New and useful innovations generate initially significant profits for the successful entrepreneur. Innovations, of course, also typically destroy previous products, processes and businesses.

The typewriter's demise as victim of innovations in computer technology is an example. Schumpeter

called that process "creative destruction."

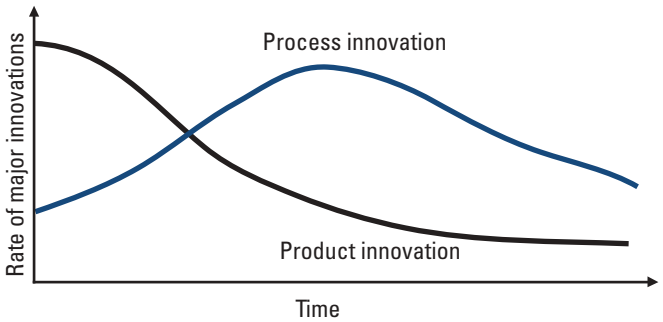
A high initial profit for a new innovation attracts other entrepreneurs and investments. Consequently, the volume starts to increase, and with these adjustments to the supply, prices gradually fall and competition gets tougher. Thus, the price of products naturally converges over time to the level at which there is hardly any profit left.

The recent history of the computer industry provides ample examples. This convergence toward commoditization is also the reason for the current trend toward outsourcing to countries with lower labor costs. The weaker competitors and those that do not innovate eventually go out of business.

This is the punch line: Innovation is a critically important strategic issue an organization ignores only at its own peril. So what is needed is a profession educated to systematically carry out innovation tasks. That would be a natural fit for the quality profession.

Most innovations are incremental but cumulatively important. As indicated in Figure 1, innovations are initially in the life cycle of a product focused on the product's design. But after some time, a dominant design will settle in. Subsequent innovations are primarily focused on the process and are essentially aimed at reducing costs. Defects inflate the costs, so here we again see quality as a concept subsidiary to innovation.

FIGURE 1 Process Innovation



Adapted from William J. Abernathy and James M. Utterback, "Patterns of Industrial Innovation," *Technology Review,* Vol. 80, No. 7, 1978, pp. 40–47.

The Professional of the Future

Given the strategic importance of innovation in today's turbulent world of fierce, global competition and rapid change, companiess should launch swarms of organizationwide innovation initiatives.

Organizations should employ effective and well-trained systematic innovators, with quality improvement initiatives no longer executed by a designated quality department. Instead, such initiatives are delegated to agents—Black Belts and Green Belts—throughout the organization.

This resonates with the observations of economists that suggest improvement projects and innovations must involve people that have intimate contextual knowledge.[13, 14]

Thus, innovation should be seen as an integral part of everyone's task rather than the responsibility of a separate department and a few specialists.

Besides training many of its professionals in systematic innovation skills (be it under the label of Six Sigma or its successor), the organizational structure should be designed to cultivate an experimental and risk taking attitude. This is necessary for innovation. Risk aversion and other organizational impediments should be minimized.

When carefully built over time, the cultivation of these competencies in an organization can lead to important sources of competitive advantage. General Electric's carefully built Six Sigma culture exemplifies this.[15]

This cultivation of competencies has an important consequence for training and education. It is no longer sufficient to be an expert manager, marketing professional or engineer. The competitors in low-cost countries increasingly also have experts. Most are inexpensive.

In addition to being an expert, a 21st century professional must be well trained and experienced in Six Sigma type systematic innovation skills. A scientific systematic approach to problem solving is a core competency. If our profession seizes the opportunity and adopts as its mission the idea of being the systematic innovators, we might well find ourselves the leading profession of the future knowledge economy.

Accept and Benefit From Change

This widening of the focus to what Ron Snee and Roger Hoerl call the real economy[16] is healthy; it creates variety and enriches the quality profession. It introduces the economic perspective we've described in this article. Besides truly innovative and useful ideas, we should expect there will also be new labeling and wrapping of our "merchandise."

Some people, especially those in the protected academic world, will deplore this change. But this phenomenon should be seen as the quality profession brushing up its offerings and marketing itself to ensure its future.

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