

Quality Management: Then, Now and Toward the Future

"We wanted to talk about quality, improvement tools, and which programs work. He wanted to talk to us about management, cultural change, and senior managers' vision for the company."

- A Ford executive in 1990, regarding a consultation with W. Edwards Deming.¹

The concept of "quality" has evolved to mean far more than the integrity of a manufactured product. Quality now represents a philosophy, a system of methodologies and practices, and an ongoing commitment to business excellence that encompasses all issues – and engages all individuals – within an organization. This paper traces the evolution of quality management, highlights some of the thought leaders who contributed to the science and practice of quality, and identifies leading methodologies in use today. Some of the misconceptions and mistakes leading to quality system failures will be also be examined, along with emerging trends.

From inspection to quality control to total quality management

The use of inspection to assure conformity to specific requirements dates back to the Middle Ages. For instance, Craft Guilds established standards to differentiate their goods and safeguard the reputation of their trade. Skilled craftsmen performed inspection and remedies were made right at the workbench. And through the early years of low-volume manufacturing, informal inspection of products and arbitrary review of worker output sufficed. However, as organizations and production yields became larger during the Industrial Revolution, the need for "quality control" through more effective operations became evident.

In 1911, the concept of quality took a huge leap forward when [Frederick W. Taylor](#) published 'The Principles of Scientific Management', using statistical theory to provide a framework for improving worker productivity in industrial organizations. Taylor introduced several important concepts, including:

- 1) Functional specialization: defining and allocating tasks to be performed under standard conditions (with inspection as just one of the tasks)
- 2) Process analysis of time and motion to increase productivity.
- 3) Quality control (by inspection of the final product) formalized as a distinct function conducted by individuals *not directly involved* in the production process.

Taylor's contributions are recognized as precursors to several engineering tools and cycle time reduction methods still in use today. While Taylor focused on productivity gains, in the 1920s, [Dr. Walter Shewhart](#) introduced quality control as a proactive function rooted in process, rather than relying strictly on reactive measures resulting from inspection. Applying statistical theory to the management of quality, he developed the first modern control chart and demonstrated that eliminating variation in the process

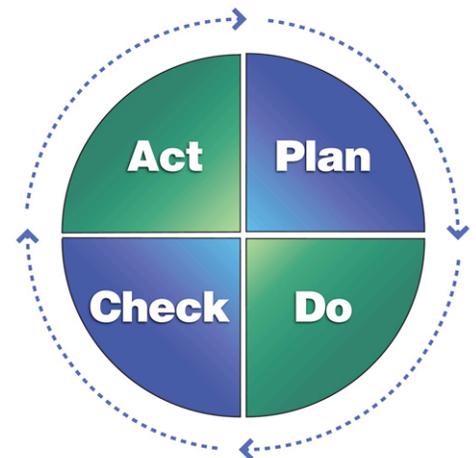
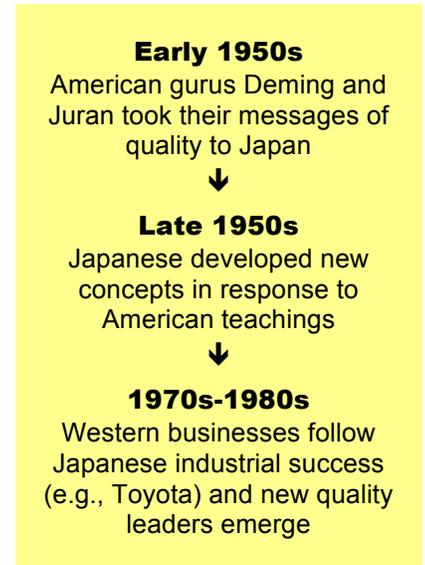
leads to a good standard of end products. He also pioneered the Shewhart Learning and Improvement Cycle, which contains four continuous steps leading to total quality improvement: Plan, Do, Study and Act (later adapted by Deming as the PDSA cycle). Shewhart’s belief that constant evaluation of management practices – as well as the willingness of management to embrace new ideas and disregard unsupported ones – form the philosophical basis for several of today’s quality management methodologies.

Shewhart’s statistical control techniques were adopted by the War Department for the manufacture of weapons during WWII, yet engineers in American private industry were slow to adopt his methods. As a regular consultant to the military, Shewhart was asked by Gen. MacArthur to help in the post-war rebuilding of Japanese industry. In his place, Shewhart recommended his Western Electric protégés W. Edwards Deming and Joseph Juran to spearhead the effort.

[Dr. W. Edwards Deming](#) stressed the importance of management’s role, both at the individual and company level, in the delivery of quality. According to Deming, 80-90% of quality problems were under management’s control, emphasizing organization-wide cultural change and worker/management cooperation as the path to achieving high quality. Shewhart’s Learning and Improvement Cycle became popularized through Deming as the PDSA Cycle, as a methodology for pretesting and perfecting before implementation and for continual improvement. With the goal of reducing the difference between the customer requirement and process performance, Deming developed a number of theories, including his “[System of Profound Knowledge](#)” (theories of optimization, variation, knowledge and psychology), Deming’s [Seven Deadly Diseases](#) of management that contribute to quality crises, and his Fourteen Points to eliminate these mistakes and help organizations flourish. Deming’s 14-points serve as his complete philosophy of management, a plan that he believed applied to any size or type organization:

Deming’s Fourteen Points of Quality

- 1) Create constancy of purpose towards improvement of product and service.
- 2) Adopt the new philosophy. We can no longer live with commonly accepted levels of delay, mistakes and defective workmanship.
- 3) Cease dependence on mass inspection. Instead, require statistical evidence that quality is built in.
- 4) End the practice of awarding business on the basis of price.



Plan what is needed
Do it
Check that it works
Act to correct problems or improve performance
repeat steps 1-4 with new knowledge

- 5) Find problems. It is management's job to work continually on the system.
- 6) Institute modern methods of training on the job.
- 7) Institute modern methods of supervision of production workers. The responsibility of foremen must be changed from numbers to quality.
- 8) Drive out fear, so that everyone may work effectively for the company.
- 9) Break down barriers between departments.
- 10) Eliminate numerical goals, posters and slogans for the workforce asking for new levels of productivity without providing methods.
- 11) Eliminate work standards that prescribe numerical quotas.
- 12) Remove barriers that stand between the hourly worker and their right to pride of workmanship.
- 13) Institute a vigorous program of education and retraining.
- 14) Create a structure in top management that will push on the above points every day

In addition to Toyota, Deming's principles have contributed to the global success of Proctor & Gamble, Ritz Carlton, Harley-Davidson and other well-know organizations.

A colleague of Shewhart and Deming, [Dr. Joseph Juran](#) was an important contributor to the Japanese quality movement and a seminal figure in the evolution of quality management in the U.S. In addition to creating the "Pareto principle" for identifying vital processes (80% of the return comes from 20% of the effort), he wrote the first reference work on quality management, the "Quality Control Handbook". Outlining the sequential steps to achieve breakthrough improvement, Juran's book, "Managerial Breakthrough" serves as the basis for Lean, Six Sigma and other important quality initiatives.

Most distinctly, Juran describes quality from a customer viewpoint, where the degree of quality achieved is proportional to the number of features that meet customers' needs, especially in design, availability, safety, conformance and use. Rather than just focusing on the end customer, Juran believed that each person along the chain, from internal "customers" to the final user is both a supplier and a customer. While Juran developed numerous quality theories, two concepts in particular serve as the basis for establishing a traditional quality system and to support strategic quality management – Juran's [Quality Trilogy](#) for managing quality (quality planning, quality control and quality improvement) and his Quality Planning Roadmap.

Juran identified 8 milestones as integral to a quality planning roadmap:

- Determine who are the customers.
- Determine the needs of those customers.
- Develop a product that responds to those needs.
- Optimize the product features to meet your needs as well as customer needs.
- Develop a process that is able to produce the product.



- Optimize the process.
- Prove that the process can produce the product under operating conditions.
- Transfer the process to operations.

Throughout the 1950s and 60s, Japanese not only embraced the teachings of these Western quality “gurus”, but also expounded on what became enduring concepts. Originally developed and applied by Japanese industry, “[Kaizen](#)” is a core principle of quality management in general, and specifically within the methods of TQM and ‘lean manufacturing’. While Kaizen teams analyze systems to find opportunities for continuous improvement, most importantly, Kaizen is a *philosophy* embedded in the organization’s values. As such, Kaizen is lived rather than imposed, employing the following key concepts:

- **Every** is a key word in Kaizen: improving everything that everyone does in every aspect of the organization in every department, every minute of every day.
- Evolution rather than revolution: making 1% improvements to 100 things is more effective, less disruptive and more sustainable than improving 1 thing by 100% when need becomes critical.
- Everyone involved in a process or activity, however apparently insignificant, has valuable knowledge and participates in a working team or Kaizen group.
- Everyone is expected to participate, analyzing, providing feedback and suggesting improvements to their area of work. Management facilitates this empowerment.
- Every employee is involved in the running of the company and is trained and informed about the company, fostering commitment, interest and job satisfaction.

In the 1970s, American industry leaders were forced to take note of Japanese successes. Particularly in the automobile and electronics sectors, Japanese products started to overtake American market share offering higher quality products at a lower cost. In response to what became an economic crisis, U.S. corporations joined the quality movement, expanding on the theories and methods. With his book *Total Quality Control*, Armand V. Feigenbaum contributed to the conceptual foundation and practical application of quality management. Considered the originator of **Total Quality Management**, Feigenbaum stressed a systems approach to quality and focused on the costs of quality as separable into costs for prevention, appraisal and failures. Through the late 70s and 1980s, Philip B. Crosby emerged as a quality leader, with seminal concepts such as “Quality is Free” and “Zero Defects”. Crosby based his quality improvement process on “four absolutes of quality”:

- Quality is conformance to requirements
- The system of quality is prevention
- The performance standard is zero defect
- The measurement of quality is the price of non-conformance

Methodology: implementing quality

As many commonalities as there are in the philosophies of the “quality gurus”, it’s important to

realize there are also contradictions. As a result, there are MANY methods for quality improvement in use today that cover product-, process- and/or people-based improvement, including:

- **ISO** – Guidance on use for process improvement and process capability determination.
- QFD – quality function deployment, also known as the House of Quality approach, that focuses on customer wants or needs in the (re)design of a product or service.
- Kaizen – Japanese for change for the better; the common English term is continuous improvement.
- Zero Defect Program – created by NEC Corporation of Japan, based upon statistical process control and one of the inputs for the inventors of Six Sigma.
- **Six Sigma** – combines established methods such as statistical process control, design of experiments and failure mode and effects analysis (FMEA) in an overall framework.
- PDCA – Shewhart/Deming's plan, do, check, act cycle for quality control purposes. Six Sigma's DMAIC method (define, measure, analyze, improve, control) may be viewed as derivation of this.
- Taguchi methods — statistical oriented methods including quality robustness, quality loss function, and target specifications.
- The Toyota Production System – reworked in the west into “**Lean manufacturing**”.
- TQM – total quality management is a strategy aimed at embedding awareness of quality in all organizational processes. First promoted in Japan with the Deming prize, it has been adapted in the U.S. as the **Malcolm Baldrige National Quality Award** and in Europe as the European Foundation for Quality Management award (each with their own variations).
- BPR – business process reengineering, a management approach aiming at 'clean slate' improvements (abandon existing practices).

Several of the above have evolved as principle quality systems since they address the whole business and thus are more widely used. Keep in mind that organizations also employ a blend of quality philosophies and implementation methodologies to best align with their business goals and strategies:

ISO: Since 1947, the International Organization for Standardization has developed management and leadership standards for business, government and community, ranging from environmental management to business applications of risk and quality management. The [ISO 9000](#) series, standards that focus specifically on quality management and quality assurance, were developed to help companies achieve customer satisfaction, continuous improvement and regulatory requirements, as well as effectively document the elements needed to maintain an efficient quality system. The series now includes ISO 9000:2005 (definitions), ISO 9001:2008 (requirements) and ISO 9004:2009 (continuous improvement), and is based on eight quality management principles that can be applied by management for organizational improvement:

- Customer focus
- Leadership
- Involvement of people
- *Process approach*

- System approach to management
- Continual improvement
- Factual approach to decision-making
- Mutually beneficial supplier relationships

After a major update in 2000, the new standards are built around business processes, emphasizing improvement and meeting the needs of customers. Adaptable to all types of organizations, ISO 9001 is unique in that it not only specifies the requirements for a QMS, but also provides tools and a philosophical basis. While some approaches are based on attitudinal factors, ISO 9001 provides the framework to institutionalize the right attitude by supporting it with policies, procedures, documentation, resources and structure. The benefits of building an ISO 9001-based QMS include:

- Documenting processes forces an organization to focus on how they do business
- Documented processes create repetition, eliminate variation, improve efficiency and reduce costs
- Corrective and preventative measures are developed and become permanent company-wide solutions
- Employee morale is increased as they're empowered to take control of their work
- Customer satisfaction/loyalty grows as the company delivers proactive rather than reactive solutions
- Better products and services arise from continuous improvement process
- Improved profit levels as productivity improves and rework costs are reduced
- Improved internal/external communications— employees, customers and suppliers are assured a voice
- Verification by 3rd party auditor builds credibility with customer, supplier and competitive organizations

On the downside, ISO 9001-based quality management systems have been criticized for the amount of money, time and paperwork required for registration and maintenance. Further, ISO 9001 certification does not guarantee product or service quality, especially in cases where receiving certification is prioritized over achieving quality.

Six Sigma: is a methodology developed by Motorola in 1986 to improve business process by minimizing defects. It has since evolved into a broadly used organizational approach that focuses on reducing variations and achieving output improvements through problem solving. [Six Sigma](#) practitioners utilize the DMAIC method (define [the problem], measure, analyze, improve, control). Features that distinguish Six Sigma from earlier quality initiatives include:

- Achieving measurable financial returns from the project.
- Increased emphasis on passionate management leadership and support.
- A hierarchy of “Champions,” “Black Belts,” ‘Green Belts’, etc. to implement the Six Sigma process.
- Making decisions on the basis of verifiable data, rather than assumptions.

Six Sigma employs many widely used quality management tools, such as Design of Experiments, Pareto charts, Chi-square test, Cost-benefit analysis, root cause and regression analyses, and more. While the approach has achieved significant bottom-line results for many organizations, it has also been criticized for potential negative effects such as ignoring the customer, stifling creativity (especially in research) and being oversold or inappropriately applied by consultants.

Lean manufacturing (or 'lean thinking'): Leveraged and promoted by Toyota as instrumental in its success, the [lean thinking](#) methodology focuses on improving workflow to reduce waste, which in turn, will improve business performance. Guidelines/applications such as identifying value streams and

achieving many small improvements should lead to positive outcomes such as uniform output, less inventory and improved flow-performance measures. However, this methodology is sometimes criticized for ignoring the customer perspective, as well as underutilizing statistical/systems analyses.

The Malcolm Baldrige National Quality Award (MBNQA) is a business excellence model that arose from TQM principles (while the name 'TQM' became sullied from overuse and misuse). [MBNQA](#) was developed by Congress in 1987 to raise awareness and adoption of quality management principles to increase U.S. competitiveness. In addition to recognizing companies that have implemented successful quality management systems, the “business excellence model” provides practical tools for setting and measuring goals. Recipients, which range from manufacturing and service companies to education, healthcare and non-profit, are selected based on the Baldrige Criteria for Performance Excellence, which includes:

- Leadership – of upper management and in the community
- Strategic planning and implementation
- Customer and market focus – in building strong and lasting relationships with stakeholders
- Measurement, analysis and knowledge management to support key processes
- Human resource focus on involving and empowering the workforce
- Process management, process design and improvement
- Organizational performance results using several key metrics

Keys to success

The greatest value (return for invested effort) from any quality system is achieved when the processes being improved align with the strategic and financial plans of the business. So, the key in selecting and implementing a methodology(s) is to tailor the approach to exploit strengths of the business and concentrate on weaknesses. Another important factor in success is the motivation for implementing a quality management system in the first place. Very often management's expectations are disproportionate to the amount of resources devoted to the initiative. QualityGurus.com compiled input from quality professionals on why QMS initiatives have failed, including:

Lack of Vision

- Lack of clarity in business objectives
- No urgency for growth
- Lack proper understanding of customers and competition

Lack of Management Support

- Lack of understanding/interest in quality concepts within the organization
- Lack of interest/commitment from top management
- Weak management and leadership
- Failure to allocate proper resources

Incorrect timing

- Implementation of a QMS without building the quality culture

Incorrect approach

- Not properly understanding customer demands

- Lack of review & recognition mechanisms
- Failure to define objectives that link QMS strategically with business goals
- Failure to train the improvement team
- QMS stakeholders (employees, customers, suppliers) not fully engaged

The future of quality management

W. Edwards Deming proposed that an organization's commitment to quality signaled its intent to stay in business. As industries face the fierce competition of a global economy, Deming's statement is as true as ever. At the 2010 Global Forum on ISO Updates, a new category of standards for Social Responsibility and sustainability were introduced as well as increased sectoral standards for local governments, oil and gas, education. With healthcare reform's call for bundled services, accountable care and pay for performance, quality management is rapidly becoming as firmly entrenched in the culture of service organizations as it has been in manufacturing. And the healthcare industry's need is fueling the growth of integrated quality management systems (IMS) to find the correct balance between quality, risk, environmental and social responsibility costs and efficiencies. Moreover, the lightning speed at which technology is changing products, services and delivery methods requires large organizations to be ever more adaptable and agile.

The challenge for quality managers moving into the future is largely about allowing for change in a field that relies on constants. While so much attention today is paid to the bottom line, quality has a profound impact on the top line as well –remaining fluid to recognize, respond to and *anticipate* customer wants and needs to drive satisfaction and loyalty – a focus that grounds the future firmly in the concepts taught by the original quality leaders over 60 years ago.

“Change and innovation are as much attributes of quality and how we manage quality as they are of the products, processes, and services that are produced and delivered.”

– A.V. Feigenbaum²

Footnotes

- ¹ Swift, J. A., Vincent K. Omachonu, and Joel E. Ross. "Strategic Quality Planning." *Principles of Total Quality*. 2nd ed. Boca Raton, Fla.: St. Lucie Press, 1998. 59.
- ² "No Boundaries: ASQ's Future of Quality Study." *ASQ Minnesota*. N.p., n.d. Web. 17 Apr. 2011. <www.mnasq.org/files/presentations/2010_noboundaries.pdf>.

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