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Quality Engineering as a Profession

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Quality Engineering as a Profession

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Abstract

Over the course of time, the profession of quality engineering has witnessed significant change, from its original emphasis on quality control and inspection to a more contemporary focus on upholding quality processes throughout the organization and its product realization activities. This paper describes the profession of quality engineering, exploring how today's quality engineers and quality professionals are certified individuals committed to upholding quality processes and principles while working with different dimensions of product development. It also discusses the future of the quality engineering profession and the future of the quality movement as a whole.

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1. QUALITY ENGINEERING AS A PROFESSION

Over the course of time, the profession of quality engineering has witnessed significant change, from its original emphasis on quality control and inspection to a more contemporary focus on upholding quality processes throughout the organization and its product realization activities. Today's quality engineers and quality professionals are certified individuals committed to upholding quality processes and principles while working with different dimensions of product development.

1.1. The Historical State of Quality Engineering

The profession of quality engineering, through the mid-twentieth century, was strongly associated with quality inspection and quality control, both of which arose in the years during and immediately after World War II. Companies seeking to ensure quality products applied end-of-the-line inspection processes, and quality engineers mainly participated in these activities. By the 1960s, statistical process control and root-cause analysis, among other tools, were gaining traction in industry and government agencies, resulting in a more comprehensive approach to quality.

Mainstream corporate views on quality evolved in America through the late 1970s and early 1980s, with the rise of various quality philosophies, such as those held by quality professionals Joseph Juran, William Edwards Deming, and Philip Crosby. The 1980s in particular were an exciting time to work in the quality profession. The international economic rise of Japan, largely driven by its adoption of the quality management principles championed by William Edwards Deming, led many industry leaders to adopt Total Quality Management (TQM) principles in an effort to improve their businesses and products by minimizing costs and defects. Successful commercial manufacturers significantly improved quality in their products while reducing oversight and inspection costs, integrating Deming's Fourteen Points of quality and attending his quality-focused conferences and workshops. Businesses embraced these changes, recognized the quality profession as capable of providing critical answers and tools for success, and spread TQM throughout their organizations.

In the 1990s, membership in the American Society for Quality (ASQ) declined immediately following Deming's death in 1993. TQM principles, which had led to increased ASQ membership during the 1980s, became perceived as faddish and outdated, although the quality movement continued to mature in other ways. ISO 9000 registration and membership became more widespread among various companies, and methodologies like Six Sigma became prevalent as the cost of quality began to raise concerns. Globalization of business markets began driving quality management activities to become more global in scope and action.

In his now-classic book *Quality is Free*, well-known quality professional Philip Crosby has described the role and functions of quality professionals as follows: reporting results clearly and objectively, leading the drive to improve quality, and using whatever educational programs

can be beneficial, while helping others being successful in their jobs. These principles continue to hold true, although integrated approaches to quality management are now more frequent.

1.2. The Current State of Quality Engineering

The traditional role of the quality professional has changed since the 1980s and 1990s. Today's business environment poses new challenges for quality and business operations, including a greater focus on costs, environmental sustainability, and time management. Customers, in both the industry and consumer fields, have increased their quality requirements sharply. Quality is increasingly becoming a strategic initiative among senior managers, as more corporations focus on quality management as a component of their overall business strategy. Quality today is more complex than in previous decades, and increasingly focuses on creating high-quality processes rather than solely delivering high-quality products and services. For today's quality professionals, a solid quality assurance framework is essential to satisfy this more demanding, value- and timetable-driven environment.

Along with the more global nature of quality throughout different levels of the organization, jobs available for quality engineers are more dynamic today than they were in the past. Today's quality engineers follow the product realization processes and testing procedures that ensure that products fulfill quality standards, customer requirements, and safety regulations. Quality engineers can work on a variety of projects, and are fundamentally responsible for regulating, overseeing, documenting, and analyzing quality assurance procedures and quality testing of final products. Whereas the quality organization of yesteryear worked to implement end-of-the-line quality inspection and quality control, today's quality professionals often work closely with all sides of product development, from manufacturing and the supply chain to design development, project team leads, and even upper management. In addition, quality management as a strategic objective is a top-down process that engages all levels of a company, from executive leaders to product realization teams.

Most engineers working in quality-related departments or organizations have completed a bachelor's degree program in engineering, usually followed by further specialization via a master's or doctoral degree. Aspiring quality engineers typically focus on a branch of engineering relevant to their future career field, and after gaining experience with a quality organization often seek professional certification from the ASQ. Succeeding in a quality engineering job often requires several attributes beyond specific engineering and subject matter expertise: because quality engineers engage with many individuals, teams, and components within an organization, they must have excellent communication and collaboration skills. Attention to detail and problem-solving abilities are also crucial.

The certifications offered by the ASQ pertain to several specific quality areas, providing peer recognition that an individual has demonstrated proficiency in and comprehension of a particular quality area. ASQ certification is awarded to candidates who: 1) have a specified level of education and/or experience, 2) provide proof of professionalism, and 3) pass a standardized exam in the certification area. Current ASQ certifications include Quality Auditor, Quality

Engineer, and Quality Process Analyst, among others. In particular, the Quality Engineer certification recognizes that an individual has understood and can properly apply the principles of product and service quality evaluation and control. The body of knowledge that falls under this certification category can be applied to development and operation of quality control systems, application and analysis of testing and inspection procedures, and facility with quality cost concepts and techniques, among other areas. The value of an ASQ certification is increasing in today's world, as more companies have formally recognized ASQ's certifications as verification of an individual's knowledge of quality theory and techniques.

Other quality-related certifications exist for quality engineers; prominent among them is Lean Six Sigma. Six Sigma, a framework for successful process improvement first pioneered by Motorola in 1986 and later combined with Lean manufacturing principles in 2002, promotes quality through promotion of efficiency, elimination of waste, and reduction of defects. Several third-party certification bodies exist within the Lean Six Sigma community, helping professionals pursue the different levels of Six Sigma recognition. These include Lean Six Sigma Yellow Belt, Green Belt, and Black Belt certifications. Black Belt, the highest level of certification, recognizes professionals who possess a thorough understanding of the Lean Six Sigma methodology and who lead improvement projects, typically in a full-time role. Individuals can obtain Lean Six Sigma training through a qualified institution, Lean Six Sigma, or corporate program.

Several quality certifications exist on the corporate or companywide level. The best known of these certifications belong to the ISO family, mainly ISO 9000. The ISO 9000 families of quality management certifications address various aspects of quality management and contain some of ISO's most widely recognized standards. The many ISO standards in the 9000 family provide guidance and tools for companies and organizations to ensure that their products and services consistently meet customer requirements and that quality is consistently improved. They include ISO 9001:2008, which sets out the requirements of a quality management system; ISO 9000:2005, which covers the basic concepts and language of quality management systems; ISO 9004:2009, which focuses on how to make a quality management system more efficient and effective; and ISO 19011, which guides internal and external audits of quality management systems. In particular, ISO 9001:2008 sets out the criteria for a quality management system and is the only standard in the family that can be certified to. It operates under a set of eight quality management principles that can be used by any organization, and that are currently being implemented by over one million companies and organizations in over 170 countries. Companies can pursue certification through inviting an independent certification body to audit the organization's processes and verify their conformity to the ISO standard.

1.3. The Future of Quality

As much change as there has been in the nature of quality engineering during the last few decades, the profession will only continue to grow and expand. The ASQ's 2011 Future of Quality study panel, consisting of a collection of quality experts and professionals, identified eight forces shaping the future of quality: global responsibility, consumer awareness, globalization, the increasing rate of change, the workforce of the future, the aging population,

twenty-first century visions of quality, and innovation. According to the panel, quality control and improvement will no longer be sufficient for the twenty-first century quality profession. Instead, change, transformation, a focus on excellence, and innovative products that maximize the quality of the engineering process will fuel quality engineering in today's world.

Globally, the quality profession is embracing innovation, as evidenced in the inclusion of innovation in the 2011-2012 Malcolm Baldrige National Quality Award criteria. Although the exact relationship between quality and innovation has been fraught in the history of quality engineering, many quality experts today recognize that the two need not be mutually exclusive, and that they complement each other very well. Quality professionals are already successful with tools and techniques that apply to the innovation process: identifying opportunities, finding conceptual solutions, and then realizing and delivering those solutions. In the years to come, quality engineers could find themselves ensuring the integrity of quality processes and products, as well as teaming with other members of the organization to create a rich environment for innovative, quality-focused solutions to engineering challenges.

According to the ASQ and many quality professionals, the quality management system of the future will likely morph into a business management system that addresses and incorporates the whole enterprise, from engineering through management. A quality methodology must be deeply embedded throughout the organization, at all positions and in every relevant process. Organizations seeking to create quality products must be nimble and flexible, as well as focused on excellence and value generation. Quality, then, will link and integrate multiple processes leading toward customer satisfaction, from the levels of product realization to business support to strategic direction, planning, and control. Even as the world undergoes rapid change, quality engineers and other quality professionals can help ensure that quality remains central to the technologies, innovations, and management strategies that will shape the discipline of engineering in years to come.

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