# Continuous Quality Improvement as a Central Tenet of TQM: History and Current Status

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## ABSTRACT

**Purpose:** The great promise of continual quality improvement advocated by early quality gurus like Deming and Juran has not been fully realized. This paper explores the reasons for the limited success of implementation and institutionalization of continuous quality improvement.

**Approach:** About 100 quality professionals from diverse organizations answered questions related to this study. Additionally, the authors executed a wide-ranging literature search including the use of Google Scholar.

**Findings:** Nearly all quality professionals queried in this study agree that compliance to an external quality standard such as ISO is mandatory for their organizations. However, there is disagreement as to whether or not compliance with the continuous improvement proviso in most quality standards is actually implemented and functioning.

**Research limitations/implications:** The sample size is small and there is a need for a larger universe of quality professionals, registration/standards organizations, and academic researchers.

**Practical implications:** Many organizations from a broad array of economic sectors both public and private must comply with external quality standards. Most external quality standards contain a requirement for evidence of continuous improvement. However, the potential for improvement associated with compliance is frequently not realized.

**Originality/value:** Continuous quality improvement is central to many quality standards including ISO 9001. Unfortunately, many ISO compliant organizations are unable to operationalize and sustain the process of continual improvement. This paper provides a novel examination of this problem and suggests ways that organizations can leverage the potential for improvement via their existing quality systems.

**Category:** Research paper

**Keywords:** quality improvement; TQM; continuous improvement; ISO; audit

## 1 INTRODUCTION

Since the prehistoric beginnings of human material culture, craft production has exhibited bona fide processes of quality control. A unique physical object is usually made and inspected by the same person. Aesthetic and utilitarian values of the individual article are achieved by variation imparted by the maker; whether art or craft, the process is the same. This history is well reviewed by Shewhart (1986) and Juran (1995). By the late 1800s, a new form of production emerged first in Europe and then in the US: mass production. A key element of mass production was the "scientific" approach to work including differentiation of labor by skill level advocated and successfully implemented by Frederick Taylor (Taylor, 1914; Locke, 1982). Quality was removed from the auspices of the maker and assigned to the inspection or quality department. The genius of Henry Ford and early mass producers of the late 19th and early 20th centuries was to realize the productivity advantages implicit in the separation of set-up, production, and inspection/checking. While the actual link between Ford and Taylor is tenuous, mass production of automobiles used division of labor techniques pioneered by Taylor, the father of industrial engineering (Locke, 1982). Ford was quoted as stating that mass production had been achieved when the production system employed no "fitters" (Hounshell, 1985). That is, the individual industrial processes making a part were set up by skilled workers and checked, usually via attribute gages, at the point of manufacture. The unskilled/semi-skilled worker simply installed the part with the (usually correct) assumption that the part had already passed an inspection and was correct. The installer did not have to "fit" or adjust/modify the part when she/he found that it did not fit as originally manufactured. While the English term "fitter" for an unskilled worker has persisted, especially in the U.K., the function has been disappearing for over a hundred years. In conventional mass production, final inspection was done by a separate quality inspector. When mass production (sans fitters) of automobiles was achieved by Ford before World War One, direct labor was reduced by 90%, retail price dropped dramatically, and the automobile became "The Machine That Change the World" (Womack, Jones and Roos, 2008) at least partially due to its relatively cheap retail price achieved by Ford's economies of scale and division of labor making possible the moving assembly line.

The Ford/Taylor system was enormously productive but difficult to change over from one product to another. The moving assembly line was very expensive to keep going and stoppages meant that costly workers and machines were idle. On time delivery of quality parts to the line was essential. The consistent dimensional control in Ford's mass production was achieved by highly skilled workers executing the machine set-up, and the effective use of attribute gages

first developed for other precision industries such as armaments and sewing machines (Hounshell, 1985). Still, the only functional strategy for inspection was to gage each part and stop the process when a critical dimension was found to be out of specification. While this sequence was much more efficient than the installer "fitting" the part, one hundred percent inspection was still fairly labor intensive.

Working with Bell Laboratories, the research and development arm of the US national telephone company, Walter Shewhart initiated the use of statistical process control to inspect by sampling rather than one hundred percent inspection (Shewhart, 1924; 1931). "The year 1924—at a factory in Cicero, Illinois—saw the start of two of the most important developments ever in managerial thinking. In May that year Walter Shewhart described the first control chart which launched statistical process control and quality improvement." (Best and Neuhauser, 2006). His 1931 book title, Economic Control of Quality of Manufactured Product says it all. Shewhart's key achievement was not quality control per se, but economic quality control and improvement was generally limited to the cost savings associated with higher process yields and fewer bad parts.

Ford's moving assembly line combined with Shewhart's statistical methods of quality control contributed mightily to the creation of Detroit as "The Arsenal of Democracy" during World War Two and the subsequent rise and dominance of US manufacturing in the three decades immediately following the war. What must be said about the rise of US manufacturing from the end of World War Two and the mid-1970s was that this success was achieved in an economic environment almost completely devoid of competition. The "Detroit Big Three" automakers controlled over 90% of the car market with defects averaging 22 per vehicle. However, change was coming, especially from an unexpected recently defeated enemy – Japan. With some assistance from foreigners such as Deming and Juran, the Japanese post-war miracle incorporated Shewhart's statistical methods appended to existing production systems based on scarcity – scarcity of capital, raw materials, markets, technology, and labor (Womack, Jones and Roos, 2008). Oil price increases in the early 1970s drew American buyers into the showrooms of Japanese producers with small, high quality cars with good fuel economy. By the late 1970s one of three cars sold in the US was a Japanese car made in Japan. In trend-setting California, the Japanese market share was over 50% (Womack, Jones and Roos, 2008). The US government, acting to protect domestic car producers, negotiated the Voluntary Restraint Act (VRA) of 1981 with Japan (United States International Trade Commission, 1985).

By limiting the import of Japanese autos and protecting domestic producers, the American VRA tacitly acknowledged the superiority of Japanese manufacturing methods and ushered in the modern US era of "improvement" not just of product quality, but of all industrial and business processes. This era was heralded with the famous broadcast of "If Japan Can, Why Can't We" by Dr. W. Edwards Deming (Samson and Terziovski, 1999). Deming's assertions were not new;

Peter Drucker (1971) and others had been touting the advantages of Japanese management for years. The authors of this paper assert that the change from quality "control" (as per Shewhart) to continuous improvement (as per Toyota) began with the widespread study of Japanese manufacturing including the work of Ishikawa (1985), Shingo (1985, 1986, 1989), Ohno (1982, 1988), Kano (1995, 2001), Taguchi (1986) and others by Americans and Europeans. Sasaki and Hutchins (2014) and Hutchins (2012) document this period very well. Additionally, the International Motor Vehicle Project (IMVP) at the Massachusetts Institute of Technology (MIT) initiated the Assembly Plant Study (Krafcik, 1988; MacDuffie and Krafcik, 1992), introducing the term "lean" production describing the Toyota Production System, widely acknowledged as the paragon of Continuous Improvement (CI) practice. No more needs to be said about the ongoing importance of lean production since its introduction to the West in the 1980s via publications emanating from the IMVP and the popular book The Machine That Changed the World hitting the market in 1990.

In the 1980s continuous improvement using "lean" strategies was widely accepted and Deming was considered as the apotheosis of quality (some 121 scholarly articles on Deming published between 1994 (he died in 1993) and 2006) (Knouse, et al., 2009). The "Shewhart" cycle was introduced as early as 1931, and Deming's 14 principles included Principle 5: Improve constantly and forever the system (Deming, 1986; Knouse, et al., 2009; Zairi, 2013). Juran (1988) proposed his "Trilogy" of quality planning, control and improvement in an endless loop. ISO 9000, was first published in 1987 (Goldman, 2005). According to Goldman (2005), "ISO 9000 is a universal, quality assurance (not quality "control") management system." By 1990 or so, the lean/Toyota system, quality gurus, and ISO 9000 were consistent in their support of continuous improvement.

## 2 TOTAL QUALITY MANAGEMENT, CONTINUOUS IMPROVEMENT, AND COMPLIANCE TO EXTERNAL STANDARDS

Popular labels such as "Total Quality Management" (TQM), "Total Quality" and Quality Management (QM) became prevalent in academic and popular business literature without canonical definitions. However Sun (2000), Hendricks and Singhal (1997) and many others consider continuous improvement to be an essential component of TQM. ISO 9000 remains globally important. On June 10, 2015 the yields of Google searches were as follows: Google Scholar searches yielded: ISO 9000-347,000, ISO 9001-88,000, ISO 9000 and continuous improvement- 43,100, continuous improvement- 3,910,000. Google Searches yielded: ISO 9000-15,300,000, ISO 9001-104,000,000, ISO 9000 and continuous improvement- 1,360,000, continuous improvement- 28,400,000.

Survival in many economic sectors is tied to registration to an ISO based standard. For example, the ISO-based TS 16949 establishes quality system requirements for most of the automotive supply chains in North America and elsewhere (AIAG, 2013). At the international level: "there seems to be an apparent positive relationship between the number of ISO 9001 certificates per 1000 inhabitants and the levels of economic development reached in different countries" (Sampaio, Saraiva and Guimarães Rodrigues, 2009). Earning registration to external quality standards is essential for many companies, important to many more, and may be tied to the economic success of companies and nations. The number of registered companies is growing worldwide.

ISO 9001:2015 Section 10 requires continuous improvement and the Plan-Do-Check-Act (PDCA) for the continuous improvement of processes. Does compliance to Section 10 lead to improvement of internal processes? Poksinska, Dahlgaard and Antoni (2002) cited by Sampaio, Saraiva and Guimarães Rodrigues (2009) concluded that companies "…maximize their benefits if they achieve ISO 9001 certification based on internal motivations." These "internal" motivations for ISO registration are those associated with continuously improving productivity, quality, customer satisfaction etc. One well known system for improving internal processes is the Toyota Production System (TPS) lean model of continuous improvement (Womack, Jones and Roos, 2008). The lean model incorporates tactics such as kaizen or continuous improvement teams and high levels of employee involvement in improvement suggestion systems. The authors posit that registration to an external quality standard is more likely to yield positive improvement results if the company's internal motivation for such registration is made manifest via ongoing internal continuous improvement efforts that engage all levels of employees (Booker and Tucker, 2015).

What happens when ISO 9001 is implemented? Evidence is equivocal as to the benefits of ISO 9001 registration (Naveh, Marcus and Moon, 2004; Naveh and Marcus, 2004; Sampaio, Saraiva and Guimarães Rodrigues, 2009). While the relation between ISO 9000 registration and business success is not settled, there is clearly a perceived benefit of registration as necessity for compliance with customer requirements. As mentioned previously, compliance to ISO 9001:2015 Section 10 requires documentation of continuous improvement. However, the "lip service" given to continuous improvement in a compliance audits is pervasive. There is a general belief among practitioners that managers view compliance as a cost, not an opportunity for improvement (Booker and Tucker, 2015). "When firms simply react to external pressures for getting certified, they may face ISO 9001 registration as a prime objective of itself, adopt a minimalist approach to achieve it, and thus achieve limited internal performance improvements." (Sampaio, Saraiva and Guimarães Rodrigues, 2009, p.48). And, it is common that when a large and geographically dispersed company is compliant to an external standard, many employees are not even aware of the quality standard and its requirements (Teehan and Tucker, 2014).

## 3 WHAT HAPPENED TO CONTINUOUS IMPROVEMENT?

As has been articulated previously in this paper, continuous improvement has been a basic principle of the quality movement since the beginnings of the modern era in the 1980s. Kaizen, with its origins in the Toyota Production System, has been institutionalized as a means of business survival. A Google search done on June 15, 2015 yields over 13,000,000 "hits" for kaizen. The most important global standard for quality, the ISO 9000 series, "mandates" continuous improvement. Yet, there is widespread support in the literature for the idea that continuous improvement is often lacking even in quality systems registered to external standards such as ISO. "Our results show that the impact of internal organizational processes that are based on ISO 9000 principles on operating performance is not significant." (Singh, Power and Chuong, 2011, p. 31). Whereas ISO is seen as a means of detecting nonconformance and facilitating trade, it has been judged to lack the improvement component present in other standards such as the Baldrige Award. "Perhaps a winning strategy could be to try to integrate more fully in their efforts to seek certification, important Baldrige criteria strategies such as customer-focus, continuous improvement, and competitiveness through improved overall performance." (Kartha, 2004, p.339).

The pharmaceutical industry in the US is highly regulated by the US Food and Drug Administration (FDA). Speaking of that industry, Breggar, 2009 suggests "that overall quality of product is improved through this focus on prevention rather than detection. Even in these more proactive environments, however, there is still an assumption the compliance is a "cost of doing business", impacting the culture of the organization." (Breggar, 2009; p.10). The title of Breggar's article: "How to Shift from Reactive Compliance to Strategic Quality Management" is a rare instance in the literature of suggesting how to leverage the need for compliance into real, sustainable improvement. It is interesting to note that Breggar is a practitioner, not an academic researcher. As will be seen, this is a common thread in practitioners' view: how can complying with the mandatory external standard be extended or converted into a system of continuous improvement?

## 4 DATA COLLECTION AND ANALYSIS

Some 100 quality professionals participated in a survey accessed (anonymously) via online graduate classes. Participants were almost entirely mid-career professionals from a variety of economic sectors including: retail, automotive, health care, medical device, military, information technology, quality system auditor/registrar, insurance, home appliance manufacture, and pharmaceutical. Their responses were organized into short synopses. Data was collected over a two year period, 2014 and 2015, and from 6 different online classes. The authors employed simple textual analysis as per Fairclough, (2003) to create synopses for the survey responses. In the survey responses, common words, phrases, and

concepts were amalgamated into two or three sentence synopses for each question.

Participant practitioners were asked the question: Throughout this course there is an underlying theme that quality systems involve compliance to some quality system external standard such as ISO, TS, or FDA (or internal such as TPS). And, many of these internal or external standards "mandate" continuous improvement. Based on your experience (and please indicate which industry/economic sector in which you have work experience), how do compliance and improvement relate?

The authors used textual analysis via two strategies: (1) word searches were employed to identify commonly used words in the synopses and (2) the synopses were scrutinized for common phrases not easily identified by the literal word searches. Tabulations of these words and phrases yielded some overarching themes from the responses. These are:

1) Compliance to an external quality standard is almost always a response to demands by government or customers.
2) Compliance is generally viewed as a "necessary evil" to stay in business but only infrequently includes CI efforts.
3) Compliance is useful in preventing non-conformances in products and services.
4) While continuous improvement (CI) may be "mandated" in the standard such as ISO 9000 series and TS 16949, it is rare that an external audit approval will actually be jeopardized by weak or absent CI procedures or documentation.
5) "Potemkin Village" CI is common to pass the audit. That is, a temporary CI effort will be made to show to the auditor, but the CI team is not given a critical problem to solve or continued after registration is achieved.
6) Quality professionals have great faith in the advantages of institutionalized CI but are often prevented by their managers from allocating resources to actually implement permanent CI.
7) Compliance is particularly onerous and demanding with direct government oversight and auditing leaving little or no time for improvement.
8) A small number of "best practice" firms are thoroughly imbued with CI at all levels.
9) It appears that the higher the level of competition in companies registered to an external quality standard, the more likely that CI will be employed albeit in a sporadic, non-institutionalized manner.

## 5 CONCLUSION

Nearly all quality professionals queried in this study agree that compliance to an external quality standard such as ISO is mandatory for their organizations. However, there is a wide range of opinions as to whether or not compliance with the continuous improvement proviso in most quality standards is actually implemented and working.

Compliance is a lagging indicator and reactive - the best outcome is to fix what was wrong. CI is proactive as "improvement" indicates does not just "right wrongs" but sets new standards for excellence. Compliance is generally staff work and improvement requires proactive management support and enthusiasm which is often absent. Some companies do change their approach and become proactive within the culture of compliance in which they exist. A very few companies have continuous improvement "in their DNA".

The authors contend that the challenge for the next phase of the quality movement, both for practitioners and academic researchers, is to determine how to operationalize the promise of continuous improvement, not just to pass an external audit, but to enhance competitiveness and achieve true excellence.

Much of the promise of the quality movement has not yet been realized. A much larger study incorporating working quality professionals in the global private and public sectors, academic researchers, and registration organizations, especially ISO, could boost the contribution of quality thinking to more widespread economic prosperity and concomitant world peace.

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