



Managing Quality in Architecture

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Integrating BIM, Risk & Design Process

TQM / Six Sigma Overview

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Chapter Reference 4.4

See also MQIA Now >
**Background: Catching
the Next Big Wave** for
additional information
on the history of the
quality movement.

"I put this flow diagram and this chain reaction on the blackboard at every conference with top management that first hot summer. I taught hundreds of engineers statistical methods and a lot of other methods ... It took fire right away. All top management came. Not just part of it, all of it. The twenty-one top dogs. And they came again. And they stayed with it. It was spread all over in less than four years. Prairie fire. Not that they knew all of what to do. Certainly not. But they were on their way. In four years, manufacturers the world over were screaming for protection." - *Dr. W. Edwards Deming, on his 1950 lectures in Japan.*

Quality: Two streams of thinking

There are two main streams in quality thinking, which, for convenience, I will call the TQM stream and the ISO stream.

The focus of the TQM stream is on manufacturing management, using statistical methods for incremental quality improvement, together with improvement of working conditions and management/staff relationships

The focus of the ISO stream is on the structuring or organization of quality improvement, and the demonstration of proficiency through documentation and certification.

These two streams are not mutually exclusive: It is quite possible to use any combination of TQM techniques in a ISO 9001 quality program. It is equally possible to have a quality system that relies on TQM theory only, or on ISO structure only.

Origins of the quality movement

The quality movement had its origins in the aftermath of WWII. In England, engineers knew that there were significant differences in the way that aircraft engines held up, and they set about trying to develop a methodology to achieve greater reliability and long-term performance, building a base for the development of European quality standards. ISO was formed in February, 1947, following a meeting of standards representatives from 25 countries in London in 1946. Its first international standard was published in 1951.

(ISO is the International Organization for Standardization, a worldwide federation of national standards bodies, representing the peak standards bodies around the world. Yes, the acronym seems illogical. There is a logical explanation, but it isn't important here.)

Meanwhile, the Supreme Command for the Allied Powers in 1947 recruited Dr. W. Edwards Deming to go Japan to help organize the 1951 census of Japan. Deming was an expert in statistical sampling methods and founding member of the American Society for Quality Control.

His previous efforts to introduce statistical quality control into US manufacturing had been largely ignored.

Deming was deeply impressed by the plight of the Japanese after the war, and when, through an unusual set of events, he was invited back in 1950 to give lectures on quality control, he offered his help without remuneration.

To make a long story short, his methods were followed closely by the Japanese, leading rapidly (as Deming notes in the quotation opening this Section) to their world dominance in manufacturing quality. In the process, Deming became widely regarded as the founder of the worldwide quality management system.ⁱ

There were many gurus who followed the path blazed by Deming, most notably Dr. Joseph M. Juran and Philip Crosby.

The theories of these three, and a number of other leaders in quality systems thinking, are collectively termed "total quality management" or TQM.

The beginnings of ISO 9001

Parallel with the rise of the TQM gurus and their followers, national standards bodies around the world began working on ways to find the common denominators in the various quality methodologies.

The typical model for most standards bodies is a collegiate committee system, with state and national committees formed of industry leaders. It is the direct opposite of the guru-with-followers model, because the committees have to essentially agree before a standard is published. Publication as an international standard requires approval by at least 75% of the member bodies casting a vote.

ISO has three categories of membership representing 140 countries, including "member bodies", organizations representing 93 countries that are entitled to vote on proposed standards.

Canada was one of the first (in 1978) to publish national standards for quality, with a series of small documents outlining four levels (inspection, verification, control and assurance) of quality compliance, called Z.299. Here was a clean break away from the idea of quality having to be "total". In this model, something like a power plant would require the highest level of quality management, whereas, say, a small maintenance company could do quite well with the simplest level. You selected a model appropriate to the sensitivity of your output to variations in quality.

I first came across the Canadian standards in 1984, in Australia. The power utility in Victoria used these standards in construction of its coal-fired electricity generators, and I worked with a contractor building these plants to develop quality systems that would meet the owners' quality requirements.

Shortly thereafter, Standards Australia published its first set of quality standards, adapted from the Canadian standard, even using the numbers – AS 2990: *Quality systems for engineering and construction projects*.

This standard reduced the Canadian four levels to three, applicable to (a) design, supply and installation, (b) supply and installation only, and (c) installation only.

At that point, both state and federal governments in Australia were moving to require quality management programs for their procurement programs, and there was considerable pressure for guidelines in the design and construction industry.

Responding to this need, Standards Australia produced extensive guidelines for adaptation of the AS 2990 standard to design and construction – as far as I know, the first such document.

The first international quality standards were published in 1987 by the International Organization for Standardization (ISO), using a three level system similar to the Australian model. A revision was published in 1994, and a major revision in 2000. In the US, ISO 9000 series review and recommendation was carried out by an American Society for Quality (ASQ) committee reporting to ANSI.

ISO now has over 13,500 international standards, another 4,400 in committee, and 500 full-time staff at its Geneva headquarters. Every day, an average of 12 meetings take place somewhere in the world, working on international standards.

The ISO/TC 176 committee is responsible for ongoing development of ISO 9001. At this writing, the Secretariat for this committee is based in Ontario, Canada, held by the Standards Council of Canada and administered by Canadian Standards Association.

Overall, these standards represent the direct or indirect input of thousands of quality professionals around the world, and increasingly, are global standards, used in almost all countries.

Six Sigma

The TQM stream: It appears, to me, that most of the TQM models are coming together under the Six Sigma banner. Motorola began developing the Six Sigma concept in 1986 and used it as its vehicle to (successfully) win the first Malcolm Baldrige Award for manufacturing in 1988. Motorola owns the Six Sigma concept, although it is increasingly used throughout the manufacturing world. General Electric, Walmart and Johnson & Johnson, among others, have used its principles to great success.

Six Sigma is a set of statistical and management tools and methodologies with the goal of increasing customer satisfaction, productivity and shareholder value. It is based on improving process "targeting" and reducing variations in business processes.

There are thousands of sources on the Internet for information on Six Sigma. I have selected one that both describes the origins of Six Sigma, and offers an easy-to-grasp synopsis of the method; an article by Matt Barney of Motorola that was published in the May 2002 issue of Six Sigma Forum Magazine (American Society for Quality). You can download the article from www.asq.org/pub/sixsigma/past/vol1_issue3/index.html, or by clicking on *2.4d Motorola's Second Generation* on the mqia.com site.

Conclusions

Without joining the globalization debate, globalization is a fact of life, and not about to disappear. As the world shrinks, some kinds of globalization, at least, make consummate good sense, and none more than the business of standards.

Regardless of where it is manufactured in the world, it makes sense that a piece of particleboard, or a sack of cement, or a tube of caulking, is manufactured to the same standard. That is beginning to be the case, even in developing countries. Increasingly, architects, project managers, and contractors are working across national boundaries.

It makes just as much sense that all of them are working to the same global standards of quality, risk management, knowledge management, and other methods of communicating with each other.
