

*million opportunities, or a Six Sigma level. Our people coined the term and it stuck. It was shorthand for people to understand that if you can control the variation, you can achieve remarkable results.*³

Interview with Robert W. Galvin, Chairman Emeritus of Motorola, Inc.

In the mid-1980s, Motorola, under the leadership of Robert W. Galvin, was the initial developer of Six Sigma. Most credit the late Bill Smith for inventing Six Sigma; Smith, a senior engineer and scientist within Motorola's Communications Division, had noted that its final product tests had not predicted the high level of system failure rates Motorola was experiencing. He suggested that the increasing level of complexity of the system and the resulting high number of opportunities for failure could be possible causes for this. He came to the conclusion that Motorola needed to require a higher level of internal quality, and he brought this idea to then-CEO Bob Galvin's attention, persuading him that Six Sigma should be set as a quality goal. This high goal for quality was new, as was Smith's way of viewing reliability of a whole process (as measured by mean time to failure) and quality (as measured by process variability and defect rates).

Motorola had always been a pioneer in the areas of productivity and quality. In the 1980s, Motorola had been the site for presentations of quality and productivity improvement programs by a number of experts, including Joseph M. Juran, Dorian Shainin (our colleague at Rath & Strong), Genichi Taguchi, and Eliyahu Goldratt. Mikel Harry, now president of the Six Sigma Academy and coauthor of *Six Sigma: The Breakthrough Management Strategy Revolutionizing the World's Top Corporations*, was an attendee of some of these programs; inspired in part by their thinking, he developed a program for the Government Electronics Division of Motorola that included Juran's quality journey, Statistical Process Control (SPC), and Shainin's advanced diagnostic tools (ADT) and planned experimentation (PE).

Harry then worked with Smith on the Six Sigma initiative. Harry led Motorola's Six Sigma Institute and later formed his own firm specializing in the subject. Smith and Harry's initial Six Sigma umbrella included SPC, ADT, and PE. Later, they added Design for Manufacturability (product capability and product complexity), accomplishing quality through projects and linking quality to business performance.⁴

Meeting the challenge Galvin had set in 1981 to improve quality by tenfold and developing Six Sigma helped Motorola to win the first Malcolm Baldrige National Quality Award in 1989. In line with Galvin's policy of openness and in response to the interest generated by the Baldrige Award, Motorola shared the details of its Six Sigma framework widely.

In the mid-1990s, AlliedSignal's Larry Bossidy and GE's Jack Welch saw in Six Sigma a way to lead their organizations' cultural change through Six Sigma initiatives and also achieve significant cost savings. In 1998, *Business Week* reported that GE had saved \$330 million through Six Sigma, double

Was Six Sigma Part of the Natural Progression of Quality, or Was It a Totally New Event and a New Thrust?

BOB GALVIN: *I think it was both. You could lean either way in terms of the natural intelligence that finally emerged. Was it a great discovery or just remarkably good mathematics and common sense? You can interpret it either way.⁹*

MIKEL HARRY: *I think Six Sigma is now squarely focused on quality of business, where TQM is concerned with the business of quality. That is, when you adopt TQM, you become involved in the business of doing quality, and when you adopt Six Sigma, you're concerned about the quality of business. In a nutshell, TQM is a defect-focused quality improvement initiative, whereas Six Sigma is an economics-based strategic business management system. Didn't start off that way, but it has evolved that way.*

So I see Six Sigma as a vector change. As I look across the history of quality from the era of craftsmanship, it's fairly continuous; each step is a logical continuance of the preceding step, built off the same fundamental core beliefs and principles, whereas Six Sigma represents a radical departure from that continuum. It's actually a reassessment of quality from a whole new perspective and frame of reference. It's a reinvention of the history, if you will, but it's a birth of a new history, and that's the way to say it. It's been the evolution of a business management revolution.¹⁰

1900 to 1920s: Scientific Management and Statistics

Taylor and Scientific Management. Frederick W. Taylor's techniques, which became known as *scientific management*, made work tangible and measurable through analyzing manufacturing processes and turning them into a set of tasks that could be standardized and made repetitive. With work fragmented into a multitude of tasks, a managerial system was then required to control work. The concept of the separation of planning and execution was central to Taylor's system. Taylor advocated planning departments staffed by engineers with the following responsibilities:

- Developing scientific methods for doing work
- Establishing goals for productivity
- Establishing systems of rewards for meeting the goals
- Training the personnel in how to use the methods and thereby meet the goals