

The Corning Journey to Performance Excellence: Innovation Spanning Three Centuries

by Mary Beth Buckman and James Buckman

At a Glance . . .

- For 160 years, Corning Incorporated, a company known for innovations in the development of glass products and glass- and ceramics-based applications, has had a commitment to manufacturing what it invents.
- In the 1980s, the company made enormous strides in performance using total quality management concepts, and it achieved a major milestone in 1995 when its telecommunications products division received the Malcolm Baldrige National Quality Award.
- Falling into a slump in the early 2000s after an uptick in globalization, Corning returned to profitability and reclaimed its stronghold by renewing its commitment to quality and adding rigor to its innovation process.
- Results include \$1.5 billion in savings over eight years and \$300 million in savings in one year using four improvement methodologies.
- Corning's culture of quality and homegrown scalable approach enables employees in all functions to participate in improvement activities. Every year, 100,000 individual improvement projects are completed across the company, an average of four per employee.

Part I

Corning Incorporated was founded in 1851—more than 160 years ago. It is today—and has been for its long history—a company providing solutions with glass. One of the first companies in the United States to institutionalize research and development as a key business strategy, Corning is known for innovations in the development of glass products and glass- and ceramics-based applications.

Many will be familiar with Corning because of Gorilla® Glass, a tough and damage-resistant application for touch screens on smartphones, tablets, slates, notebooks, and televisions. Corning also makes telecommunications products such as optical fiber and cable connections systems that link people and businesses worldwide. In addition, the company innovates and manufactures products for the health and environmental industries. Some of Corning's more specialized products have included mirrors for state-of-the-art telescopes, and windows used in NASA's space capsules and shuttles as well as the international space station. (See the Corning Innovation Timeline at <http://media.corning.com/flash/corporate/2011/timeline/index.html>.)

A commitment to manufacturing the products it invents has been a key part of Corning's approach to serving consumer and industrial markets throughout the world for the past 160-plus years. For example, Corning was the first producer of the electric light bulb while working with Thomas Edison, and later it became a manufacturer of the bulbs and cathode ray tubes that went into televisions.

The company was incorporated in 1936 and is listed on the New York Stock Exchange with a symbol of GLW, which refers to the company's former name of Corning Glass Works.

The Pursuit of Total Quality Begins

James (Jamie) R. Houghton, a descendant of Corning's founding family, served his first term as CEO from 1983 to 1996. During this time, he introduced the concept of total quality management to the company. Figure 1 provides a summary view of this quality journey that continues today.



A commitment to manufacturing the products it invents has been a key part of Corning's approach to serving consumer and industrial markets throughout the world for the past 160-plus years.

Figure 1—Heritage of quality

Phase 1 1983 to 1985	Phase 2 1986 to 1989	Phase 3 1990 to 1992	Phase 4 1993 to 1998	Phase 5 1999 to 2002	Phase 6 2003 to 2011	Phase 7 2012 to present
Start up	Break out	World-class quality	Quality integration	Baldrige road map to quality	Performance excellence values: execution and improvement	Performance excellence values: collaboration, execution, and improvement
Awareness Quality improvement teams Create corporate quality values	Quality skills training and tools Develop innovation process Establish customer and supplier partnerships	Introduce self-assessment process Realize greater customer satisfaction Improved financial performance Adopted ISO 9001	Quality built into business strategies Baldrige journey begins Telecommunications development	Performance excellence groundwork laid Relied on quality foundation through historic highs and lows	Leverage contributions of individuals and teams Rely on quality tools to meet corporate financial objectives Values to guide us Execution of excellence to differentiate us Improvement to sustain leadership	Accelerate use of collaboration and extend approach across global operations and businesses

In the early 1980s, Corning joined AT&T, Cargill, Ford, Milliken, Motorola, Xerox, and other pioneering businesses in the pursuit of quality methodology to increase value. While the methods and concepts varied from one organization to another, a few recurring concepts emerged:

- Attack on all fronts; everyone needs to be engaged. Quality has to be a total effort.
- Develop small teams that attack projects by fixing processes across company operations.
- Tools of quality—such as Pareto analysis, fishbone diagrams, and statistical control charts—are taught, learned, and used by many teams.
- Among early adopters, the “attack on a broad front” strategy, which is implicit in the phrase total quality, requires the complete support of the CEO.

Foundations of Greatness

For more on how these concepts helped form the “Foundations of Greatness” for total quality management companies of the 1980s, see the accompanying instructors’ materials at <http://asq.org/knowledge-center/case-studies-corning-instructor-materials.html>.

At Corning, Houghton designated Forrest Behm as the top quality executive to run the program. Highly regarded by his peers and a year away from retirement, Behm analyzed the task ahead and offered two recommendations:

- Because implementing a total quality approach would likely take longer than Corning’s executives had expected, Behm would postpone his retirement and plan on a three-year commitment to the quality initiative.
- As CEO, Jamie Houghton would have to devote a great deal of his own time to the quality initiative. (In fact, a review of Houghton’s calendar in the early 1980s would reveal that more than 25 percent of his long hours were devoted to quality. “It was one of the hardest things I ever did,” he said. ¹)

During the early to mid-1980s, Corning made enormous strides in quality and company performance. The company achieved a milestone in 1995 when its telecommunications products division received the Malcolm Baldrige National Quality Award.

To earn the Baldrige distinction, organizations must demonstrate not only excellence in quality processes, but also strong customer preference in the marketplace, and superior process excellence in cost efficiency, yield, reliability, and other performance measures. Organizations must also demonstrate integration and alignment between, and among, different units and functions. They must, in other words, become role models for others.

From the late 1990s through the early part of the 21st century, Corning went through a boom period, exceeding market expectations while balancing opportunities and challenges. For instance, the tech bubble of the time contributed to an upward swing for several product lines, particularly fiber optics. However, that opportunity then turned into a challenge when the fiber optics market became more saturated. Additionally, Corning’s quality advantage had become outdated, no longer providing the competitive edge of cost and speed necessary to continue prospering from innovations alone.

Over time, many organizations encounter these types of market forces and influences. The great companies overcome the obstacles, and the poor companies fall by the wayside. This case is an examination of the renewal of Corning in the decade since 2002. It is a story of quality, innovation, operating excellence, and renewal, but above all, it is a story of leadership.

Decline of Market Dominance

Market stagnation and saturation in worldwide fiber optics in the early 2000s created some difficulties for Corning in terms of competitiveness, sales opportunities, and cash flow. There were no huge innovation hits on the horizon. In general, this was a maturing company without a defining cash-producing opportunity ahead. In light of these market conditions, the Corning Board of Directors asked Houghton to return as CEO in 2002.

Houghton felt it necessary to re-examine the fundamentals of Corning: its values, strategy, culture, and leadership.² The primary strategy of Corning for more than a century and a half had been invention and innovation, and from its range of glass products, including light bulbs, cookware, insulation, television tubes, fiber optic cable, liquid crystal displays, and ceramic environmental air filters, the company had gained a wealth of diversified manufacturing experience. Houghton not only decided that this strategy was sound, but he re-emphasized it. In difficult financial times for the company, he invested 11 percent of revenues back into research and development.³



A Corning researcher demonstrating the flexibility of Gorilla Glass.

Corning's history was one of inventing products, but the company would eventually stop manufacturing those products as the items lost market share to lower-cost competitors. In a globally integrated world, this problem was likely to worsen over time.

In his rigorous review of Corning's weaknesses, Houghton asked, "Given all that we've invented, why are we not the top manufacturing company in the U.S.?"⁴ In other words, how was Corning losing globally despite its many inventions?

Houghton asked Corning executives to analyze the company's expressed values and compare them to the current reality of practices, operations, and culture. At least one of the values—quality—was no longer a top priority. As evidence of its diminishing role, the quality office reported to a low level in the company hierarchy as the legendary quality advantage dissipated.

As Houghton undertook this analysis, he also searched for new leaders to fill a number of positions, including that of a quality leader. Houghton specified that the quality leader would report frequently and personally to him, the chairman and chief executive officer who also was a member of the company's founding family. No clearer message about the primacy of quality renewal could be sent.

Forrest Behm, his former champion who had built the quality foundation leading to the Baldrige Award, had already retired. In finding a new leader for what would become known as performance excellence at Corning, the CEO turned to his senior team for advice. The name that kept surfacing was that of Don McCabe. Jim Steiner, senior vice president of specialty materials, had recently attended a conference in Minnesota regarding quality renewal and believed that McCabe had the knowledge, conviction,

leadership reputation, and vision that the performance excellence job would demand.

After an interviewing process that included a tour of Corning operations and key customers in Europe and detailed discussions of how to move Corning forward, Houghton offered McCabe the job.

Several imperatives would be guidelines in this performance excellence initiative:

- Concentrate on cost advantage.
- Preserve and enhance the historic culture of innovation that had been the guiding light of everything the company accomplished.
- Ensure that the continuous improvement system was the best in its class. Corning

would use common quality tools such as Six Sigma, lean, and *kaizen*, and customize them for a unique approach to quality improvement. This approach would have to be imbedded in Corning's vast global operations.

Part II

Quality Renewal

Quality implementation was a 25-year progression at Corning. As within many companies, "quality" initially meant focusing on product quality. But as a strategic imperative, it became a process to position the company as a leader in innovation, manufacturing, and commercialization of products, and as a driver to greater profitability. This continual improvement approach was achieved by setting bold goals and expectations, using cross-functional teams to leverage outcomes, and expanding the term "quality" to "performance excellence," indicating the comprehensive inclusion of all business practices.

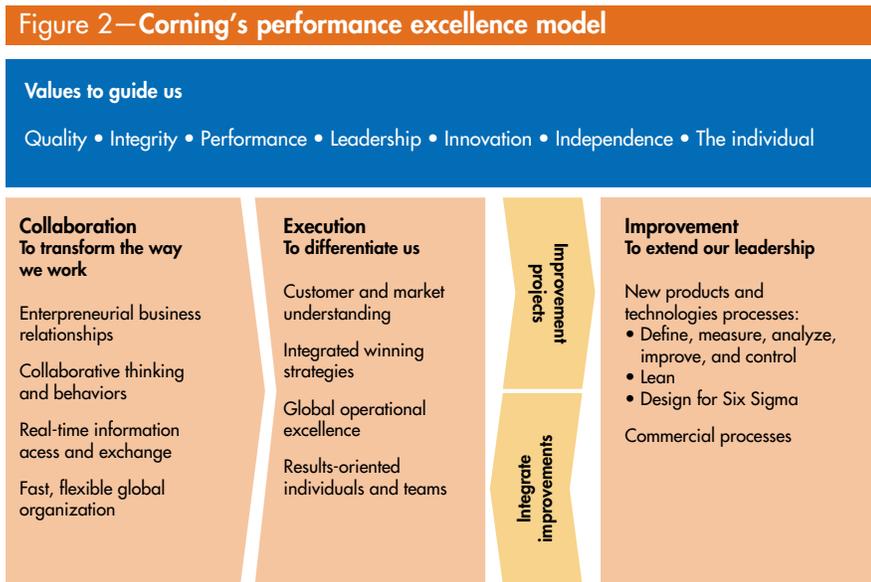


Corning's headquarters in Corning, NY. The organization employs 29,000 people globally.

Once the essential strategy was determined, it became evident there were resources already in place, and McCabe, as the company’s new quality leader, would have to build on that expertise across the organization to provide a collection of performance excellence tools. With a modest-sized staff, McCabe oversaw the customization and expansion of the company’s Six Sigma training programs. New offerings would cover more subject matter and would be available for more personnel at all levels of the organization.

Eventually, materials were uploaded to the company intranet website and translated into eight languages for use across the globe.

The Corning performance excellence model, shown in Figure 2, supported the customization of quality tools and employee training within the new strategy. Deploying the model demanded a great deal of effort and resources, but it was imperative in maintaining the company’s innovation culture.



Implementing Performance Excellence

The strategic imperatives of cost advantage and innovation were at the forefront of the next phase of the Corning journey. This phase would emphasize values, execution, and improvement to meet corporate financial objectives.

Globally, 70 percent of Corning’s resources—both in manpower and expenditures—are devoted to manufacturing. One of the first tasks facing McCabe, whose title was senior vice president of manufacturing and performance excellence, was to transform manufacturing operations using the following methods:

- **Define, measure, analyze, improve, and control (DMAIC)**, a rigorous, data-driven method for improving and stabilizing business practices. Corning customized DMAIC tools for both operational and deep process improvement knowledge. When a Corning team works through the steps, tollgates at the end of each phase track progress. The company also maintains a database of completed projects that every employee can access.
- **Individual DMAIC (iDMAIC)**, an online offering allowing one person to learn and apply Six Sigma methods to a personal project, as opposed to the more common practice of three- to 10-person project teams. Enabling one-

person projects not only provides for far more learning, it also avoids the temptation of project and meeting proliferation, and promotes Six Sigma certification.

- **DESGN**, an advanced Design for Six Sigma tool to create new and innovative business processes. Corning customized Design for Six Sigma and applies this method when a new process is needed or when a process is so broken that it needs to be replaced.
- **Lean**, a process of eliminating waste without affecting customer value. Corning used lean to reduce waste and improve business process flow.
- **Innovation**, a process to support new product and technology development. As Figure 3 shows, Corning’s innovation process included five stages, from building initial knowledge to life-cycle management.
- **Commercialization applications**, the implementation of Six Sigma and other continuous improvement tools to the skills of sales and marketing. Many organizations struggle when it comes to applying Six Sigma outside the manufacturing, research and development (R&D) settings that it was designed to address. Corning has found, cataloged, documented, and published best practices for more than 50 common processes related to sales calls, proposals, market analyses, and forecasts. These tools help marketing performance by allowing employees to participate in improvement without being compelled to use ill-fitting tools.

Corning’s initial concentration on streamlining manufacturing processes using lean, Six Sigma, DMAIC, and DESGN produced dramatic results: high-quality products and low-cost production.

Figure 3—Corning’s innovation process

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Build knowledge	Determine feasibility	Test practicality	Prove profitability	Manage life cycle

Reaching Beyond Manufacturing

McCabe’s next challenge was to drive performance excellence across all disciplines to achieve corporate goals. With the full commitment of senior management, he organized a small team

that acted as a catalyst of information and made best practice techniques widely available.

In keeping with the strategic nature of the initiative, the team's primary focus was to embed performance excellence practices across the broad spectrum of the multidivision, global company. The team provided training, conducted benchmarking, launched Six Sigma projects, and supported teams dedicated to process improvement.

A three-pronged approach that championed innovation, manufacturing excellence, and communication was used. This flexible approach then took into account the underlying culture of Corning, as well as the corporate vision and values, while the growth elements of innovation, investment, and business variability could still be achieved.

One key component would be to build flexibility into the system. The team knew they would use the Six Sigma DMAIC approach and customize additional Six Sigma tools to arrive at a process management system that fit the company's culture and values.

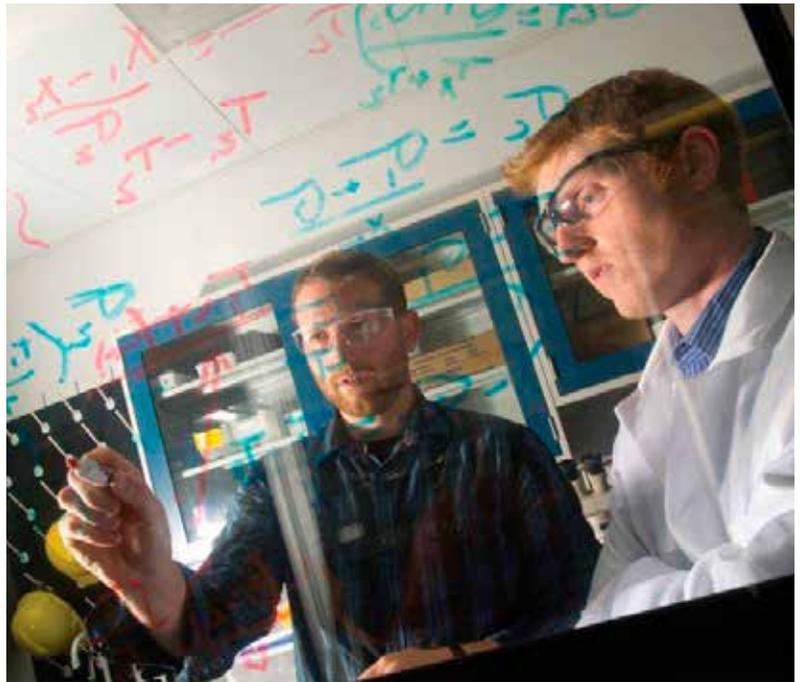
Performance excellence advocates at Corning also knew that not all problems needed the same tools. The organization created a software package with templates, fact-driven examples, and easy process steps to accomplish what an individual may need to achieve performance excellence. Instead of impeding innovation and creativity, the company found standardization enhanced it.

As of 2011, 3,000 employees had been trained in Six Sigma, and performance excellence champions were embedded in each division and manufacturing facility globally. Nearly 1,000 formal improvement projects were completed in 2011. Every year, Corning employees complete 100,000 personal improvement projects. On average, each employee uses performance excellence tools four times annually.

One of the most telling examples demonstrating the integration of performance excellence into the culture at Corning involves an hourly maintenance worker. She used the iDMAIC online application to rearrange cleaning carts for greater efficiency and effectiveness, saving time in her tasks, and fostering pride in her work.

Another 160 Years

Is it possible to take a successful 160 years of innovation accomplishments and improve on them?



For 160 years, Corning has operated within a culture of innovation and was one of the first organizations to use R&D as a key business strategy.

In the past five years, Corning has generated more profit than the previous 155 years combined. It is evident Corning's ultimate goal is to be around for another 160 years. Chasing short-term profitability at the risk of long-term success is simply not how Corning operates.

Corning's renewed commitment to quality and the addition of rigor to its hallmark innovation process allows the company to better manage the life cycles of its inventions and improve profitability and sustainability. The performance excellence program provides a competitive advantage so that Corning is a low-cost producer across its product lines on a global basis. Over an eight-year period, performance excellence saved Corning \$1.5 billion.

When Houghton took the helm of a fine old company in 1983, he used total quality to create great advantages for Corning. In the last decade, the Corning performance excellence effort has reshaped the company and redefined quality as value creation. The value creation machine has served Corning investors, employees, and stakeholders well.

References

1. Interview with James Houghton, former CEO, Corning, by James Buckman in 1999.
2. Ibid.
3. Corning Incorporated, "Balance: Corning Annual Report 2002," 2003, http://files.shareholder.com/downloads/GLW/0x0x61639/23497DB7-2CCA-4BF3-BA8E-B72A92B1B40A/ARsummary_2002.pdf.
4. James Houghton to Don McCabe, as described by McCabe in an interview with the authors in 2011.

Editor's Note

This article was based on interviews conducted with James Houghton in 2002 and with the following Corning executives in 2011: Don McCabe, former senior vice president, manufacturing and performance excellence; James Steiner, senior vice president and general manager, specialty materials; Kristine Dale, director, performance excellence; and Roger Ackerman Jr., performance excellence facilitator.

All photos courtesy of Corning.

For More Information

- Visit <http://asq.org/knowledge-center/case-studies-corning.html> to find more resources on Corning, including a video presentation, instructor materials for using this case study, and recommendations for further reading.
- This is the second installment of the authors' "Next Generation Quality Leadership" series that seeks to explore the relationship between leadership and quality. Read the first article about the Mayo Clinic titled "Journey to Perfect: Mayo Clinic and the Path to Quality," available at <http://asq.org/knowledge-center/case-studies-mayo-clinic.html>.

About the Authors

James Buckman

Jim has been consulting, writing, and working on leadership issues related to quality since the mid-1970s. He was named the founding president of the Minnesota Council for Quality, where he served from 1989 to 1993. He then accepted a position at the University of Minnesota, where he established the Joseph Juran Center for Leadership in Quality and learned from some of the greatest quality thinkers in U.S. history, including Joseph M. Juran; A. Blanton Godfrey; Bob Galvin, Motorola; Paul O'Neill, Alcoa; Don Petersen, Bill Ford, and Alan Mulally, Ford Motor Co.; Jamie Houghton, Corning Inc.; and Roger Milliken, Milliken Co. Since retiring in 2009, he has worked to advance the ideas that underpin quality leadership into U.S. institutions for higher education, healthcare, and infrastructure systems, especially electricity.

Mary Beth Buckman, MBA

After ending a 28-year corporate career in marketing, new business development, and strategic management with three Fortune 500 companies, Mary Beth taught business management courses at the college level. Currently, she works with her husband, Jim, in documenting corporate quality transformations from the last decade.