

Replicating the Gains of Six Sigma and Lean

CONSORTIUM LEARNING FORUM
BEST-PRACTICE REPORT

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STATEMENT OF PURPOSE

The purpose of publishing this report is to provide a reference point for and insight into the processes and practices associated with certain issues. It should be used as an educational learning tool and is not a “recipe” or step-by-step procedure to be copied or duplicated in any way. This report may not represent current organizational processes, policies, or practices because changes may have occurred since the completion of the study.

Contents of Study Report

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Sponsor Organizations

Sponsor Organizations

American Standard Companies Inc.

Bank of America Corp.

BHP Billiton Ltd.

Citigroup Inc.

Ford Motor Co. *

GRUPO Imsa, S.A. de C.V.

**Headquarters, Air Force Materiel
Command**

Johnson & Johnson

J.P. Morgan Chase & Co.

Northrop Grumman Corp.

Siemens OSRAM SYLVANIA

Washington Mutual Inc.

** This organization also participated as a best-practice organization.*

Partner Organizations

Air Products & Chemicals Inc. **

DuPont Global Services Business

Ford Motor Co.

Intuit Inc.

Johns Manville Corp.

Noranda Inc. **

Praxair Inc. **

Raytheon Co.

***These three organizations participated as data-only partners.*

Executive Summary

Normal engines create power by closely controlling explosions of precise mixtures of fuel and air. Normal Six Sigma/Lean programs create savings by closely controlling variables and tweaking processes to achieve optimal process performance. Car manufacturers can derive greater power from the same size engine by employing forced induction tools like superchargers to increase the density of the fuel/air mixture. However, slapping a supercharger on an engine, unchanged, will result in engine failure and breakdowns. Success requires a change in process and machinery. For engines, this may be a lowered compression ratio, strengthened internal parts, and different components. In Six Sigma/Lean programs, best-practice organizations have figured out how to coax greater performance from their existing Six Sigma/Lean programs by supercharging them with knowledge management (KM) components and the accompanying processes that make greater improvement possible.

Six Sigma/Lean programs drive process improvement, data-driven decisions, and a common continuous improvement language into organizations. Knowledge management tools and processes help organizations apply knowledge at the right time and place to improve and evolve business processes. Used together, organizations with multiple plants, locations, and operations can realize supercharged multiples of savings from Six Sigma/Lean projects by replicating best practices and lessons learned. Imagine the power and savings that can result from reusing and improving the organization's best process enhancements.

This report examines how eight best-practice organizations supercharged their continuous improvement programs with effective knowledge capture, sharing, and replication processes. Using their insights, coupled with APQC's previous knowledge management research, this benchmarking study offers suggestions, models, and tools for organizations that wish to improve the output of their Six Sigma/Lean continuous improvement programs.

— Wesley Vestal, subject matter expert

APQC'S BACKGROUND IN QUALITY

This study marks the sixth consortium benchmarking study on quality and continuous improvement conducted by the American Productivity & Quality Center (APQC). Other APQC publications on quality and continuous improvement include:

- *Deploying Six Sigma to Bolster Business Processes and the Bottom Line* (2002),
- *Performance Measurement: Implementing the Balanced Scorecard* (2001),
- *Innovative Approaches to Organizational Success in the New Economy: Proceedings from APQC's 2001 Organizational Effectiveness Conference* (2001),
- *Quality Approaches for the New Millennium* (2000),
- *Measure What Matters: Aligning Performance Measures with Business Strategy* (2000), and
- *Baldrige-Based Self-Assessments* (1999).

ORGANIZATION OF REPORT

This report is organized into five chapters.

- **Chapter 1: Replicating the Gains from Six Sigma and Lean**—Chapter 1 provides a brief overview of the Six Sigma/Lean program for each of the participating partner organizations in this study. It also discusses the strategic replication model for Six Sigma/Lean Programs and the replication process model, with a brief description of the major components in the models.
- **Chapter 2: Strategic Enablers for Knowledge Capture and Transfer**—Chapter 2 focuses on the strategic enablers for knowledge capture and transfer and discusses key elements such as leadership support, aligning the process with core business processes, accountability, and the importance of linking Six Sigma/Lean programs with knowledge management programs.
- **Chapter 3: Methodologies for Replication**—Chapter 3 discusses: how best-practice organizations build knowledge capture and transfer capabilities into their Six Sigma/Lean methodologies, a framework for replication, tools and roles for replication; and leveraging internal networks and communities for replication success.
- **Chapter 4: Creating a Knowledge-sharing Business Environment**—Chapter 4 describes how a business environment (i.e., culture) that is supportive of knowledge capture and transfer is necessary for replication success. It details how best-practice organizations tailor their knowledge capture and transfer processes to fit the organizational culture by overcoming barriers to knowledge capture and transfer, avoiding reinventing the wheel, emphasizing the importance of communication, and leveraging knowledge through effective training.
- **Chapter 5: Measurement of Replication and Recognition of Its Impact**—Chapter 5 concludes the study findings section with a discussion on how best-practice organizations measure for replication, what their indicators for success are, and what recognition and rewards are given for replication.

APQC's Benchmarking Model: The Four-phased Methodology



Following the chapters are five case studies based on the organizations that hosted site visits.

BENCHMARKING METHODOLOGY

The APQC consortium benchmarking study methodology was developed in 1993 and serves as one of the premier methods for successful benchmarking in the world. It was recognized by the European Center for Total Quality Management in 1995 as first among 10 leading benchmarking organizations' models. It is an extremely powerful tool for identifying best and innovative practices and for facilitating the actual transfer of these practices.

Phase 1: Plan

The planning phase of the study began in the spring of 2003. During that period, secondary research conducted by APQC was used to help identify innovative organizations to participate as best-practice partners. In addition to this research, APQC staff members and the subject matter experts identified potential participants based on their own firsthand experiences, research, and sponsor recommendations. Each recognized organization was invited to participate in a screening process. Based on the results of the screening process, as well as organization capacity or willingness to participate in the study, a final list of 10 potential partner candidates was developed.

A kickoff meeting was held in June 2003, during which the sponsors refined the study scope, gave input on the data collection tools, and indicated their preferences for site visits to partner organizations. Five organizations were selected for site visits from the original list, and another three were asked to participate as data-only partners (i.e., they completed the detailed questionnaire and participated in the knowledge transfer session).

Finalizing the data collection tools and piloting it within the sponsor group concluded the planning phase.

Phase 2: Collect

Three tools were used to collect information for this study:

1. **screening questionnaire**—qualitative and quantitative questions designed to identify best practices within the partner organizations;
2. **detailed questionnaire**—quantitative questions designed to collect objective, quantitative data across all participating organizations; and
3. **site visit guide**—qualitative questions that parallel the areas of inquiry in the detailed questionnaire, which serves as the structured discussion framework for all site visits.

The eight partner organizations selected for continued participation in the study responded to the screening questionnaire as well as the detailed questionnaire. Eleven of the 12 sponsors completed the detailed questionnaire. Quantitative data for the one organization that participated as both a sponsor and partner are reported along with other partners.) Additionally, five of the partner organizations hosted day-long site visits attended by sponsors, other partners, and members of the study team. The APQC study team prepared written reports (case studies) of each site visit and submitted it to the partner organization for approval or clarification.

Phase 3: Analyze

The subject matter experts and APQC analyzed both the quantitative and qualitative information gained from the data collection tools. The analysis concentrated on examining the challenges organizations face in the four study focus areas.

1. Connect people to people and people to information.
2. Build knowledge capture and transfer steps and behaviors into improvement methodologies and training.
3. Address cultural and behavioral issues.
4. Identify indicators and measures for success.

The analysis of the data, as well as case examples based on the site visits, is contained in this report.

Phase 4: Adapt

Adaptation and improvement stemming from identified best practices occur after the sponsors apply key findings to their own operations. APQC staff members are available to help sponsors create action plans appropriate for the organization based on the study.

PARTICIPANT INFORMATION

Figure 1 depicts the industry breakdown for the 19 organizations participating in this study. The “other” category includes automotive, computer software, metals and mining, and energy industries.

Fifty-eight percent of these organizations operate worldwide, with another 32 percent operating primarily in North America. Other geographical areas of operation include South America and Europe.

Sixty-three percent of the organizations responding to the detailed questionnaire did so on behalf of the entire organization. The remaining 37 percent responded on behalf of a single division or business unit, such as process excellence, financial services, and integrated systems.

Industry Categories	Industry Representation
Manufacturing	21%
Banks/Financial	21%
Other	21%
Aerospace and Defense	16%
Chemicals/Petroleum	16%

Annual revenues of the eight partner organizations include 38 percent reporting 2002 annual revenues of more than \$10 billion. The partner organizations reported a median number of 21,105 employees per organization, with a maximum of 350,000 employees and a minimum of 6,700 employees.

Sixty-three percent of the partner organizations have had a Six Sigma program in place for three to four years (Figure 2). Only two partner organizations have had a Six Sigma program for more than four years. Additionally, four of seven partner organizations with Six Sigma programs more than three years old also have mature Lean programs in place.

One hundred percent of the partner organizations. This office most often resides at the corporate level within the organization.

Eighty-eight percent of the partners also have a centralized knowledge management program within their organizations. Again, the partners report that this office resides at the corporate level within the organization.

FIGURE 2: Maturity of Six Sigma, Lean, and Knowledge Capture and Transfer In Partner Organizations

	P1	P2	P3	P4	P5	P6	P7	P8
Six Sigma								
<1 year								
1–2 years			X					
3–4 years	X			X	X	X		X
5–10 years		X					X	
>10 years								
Lean				Not applicable	Not applicable			
<1 year								
1–2 years			X					X
3–4 years								
5–10 years	X	X					X	
>10 years						X		
Knowledge Capture and Transfer Process								
<1 year								
1–2 years			X		X			X
3–4 years		X		X		X	X	
5–10 years	X							
>10 years								

P = partner organization

SUBJECT MATTER EXPERTS**Greg Brue, president and CEO, Six Sigma Consultants Inc.**

Greg Brue, a senior Master Black Belt, served as a subject matter expert for this study. He has implemented Six Sigma methodologies for some of the world's most recognized companies since 1994. A regular speaker at major business events and quality conferences, he also conducts Six Sigma seminars and monthly executive boot camps and supports numerous corporate Six Sigma implementations by maintaining direct contact with Black Belts, Master Black Belts, champions, and senior managers. Previously, Brue founded and served as CEO and copresident of Six Sigma International. He was also part of the original pioneer team that assisted in the implementation of Six Sigma at numerous companies, including AlliedSignal, the Black & Decker Corp., and General Electric. Brue's most recent book, *Six Sigma for Managers* (McGraw-Hill Trade, 2002), is now in its third printing.

Wesley Vestal, senior knowledge management consultant, APQC

Wesley Vestal, a senior knowledge management consultant for APQC's knowledge management practice area, also served as a subject matter expert for this study. Since 1999, Vestal has worked extensively in designing and implementing knowledge management strategies, solutions, training courses, and systems for organizations such as ExxonMobil Chemical Co., Best Buy Co. Inc., Schlumberger Ltd., the Army Medical Division, and the American Cancer Society Inc. Vestal speaks at knowledge management conferences across the United States, South America, and Europe and is also an APQC-certified trainer on knowledge management and benchmarking skills. He recently published an article titled "Ten Traits of Successful Communities of Practice" in the January 2003 edition of the *Knowledge Management Review* and has written several articles on KM in APQC's *CenterView* newsletter. Additionally, he has managed numerous process and metric benchmarking studies.

APQC RESOURCES IN KNOWLEDGE MANAGEMENT AND SIX SIGMA

An internationally recognized resource for process and performance improvement, APQC helps organizations adapt to rapidly changing environments, build new and better ways to work, and succeed in a competitive marketplace. With a focus on productivity, knowledge management, benchmarking, and quality improvement initiatives, APQC works with organizations to identify best practices, discover effective methods of improvement, broadly disseminate findings, and connect individuals with one another and with the knowledge, training, and tools they need to succeed. Founded in 1977, APQC is a nonprofit institution serving organizations around the world in all sectors of business, education, and government.

APQC provides many resources for knowledge management and continuous improvement practitioners.

1. **Annual knowledge management conferences**—Conducted at least once a year, APQC’s knowledge management conferences present fresh cases and tools for knowledge management practitioners.
2. **Best-practice consortium benchmarking studies**—APQC has developed an award-winning methodology for its consortium benchmarking studies. Participants have saved millions of dollars by implementing best practices. APQC’s research to date includes 11 major consortium benchmarking studies on knowledge management. The results are available in the following Best-practice Reports:
 1. *Knowledge Management* (1996)
 2. *Using Information Technology to Support Knowledge Management* (1997)
 3. *Expanding Knowledge Management Externally: Putting Knowledge to Work for Customers* (1998)
 4. *Knowledge Management and the Learning Organisation: A European Perspective* (1998)
 5. *Creating a Knowledge-Sharing Culture* (1999)
 6. *Successfully Implementing Knowledge Management* (2000)
 7. *Building and Sustaining Communities of Practice* (2001)
 8. *Managing Content and Knowledge* (2001)
 9. *Retaining Valuable Knowledge: Proactive Strategies to Deal With a Shifting Work Force* (2002)
 10. *Using Knowledge Management to Drive Innovation* (2002)
 11. *Measuring the Impact of Knowledge Management* (2003)
3. **Training**—APQC offers knowledge management and other training and learning opportunities designed to increase your awareness of knowledge management issues and options. Knowledge management training courses include:
 - Knowledge Management 101: A Knowledge Management Overview,
 - Building and Sustaining Communities of Practice,
 - Knowledge Management: Strategies and Tactics for Business Results,
 - Establishing Performance Measures,
 - Knowledge Mapping, and
 - Content and Knowledge Management Systems.

4. **Individually sponsored research and training**—Applying 25 years of researching, identifying, and implementing best practices, APQC works with individual organizations to transfer recognized methods for obtaining results and achieving success. By sponsoring an APQC project, organizations get hands-on support for knowledge management, benchmarking, and quality improvement initiatives. In turn, APQC can provide a forum for the practical implementation, refinement, and dissemination of APQC research findings among members.
5. **Publications**—APQC offers a wide range of publications that can help organizations break out of conventional thinking and excel with best practices. Our diverse publications include the following:
 - APQC’s Passport to Success series: *Communities of Practice* (2001)
 - APQC’s Passport to Success series: *Content Management* (2003)
 - APQC’s Passport to Success series: *Knowledge Management* (2000)
 - APQC’s Passport to Success series: *Stages of Implementation* (2000)
 - *Capturing Critical Knowledge from a Shifting Work Force* (2003)
 - *Knowledge Management: Lessons from the Leading Edge* (1998)
 - *Next-generation Knowledge Management* (2001)
 - *Showcasing Successful Knowledge Management Implementation* (2000)
 - *Taking Knowledge and Best Practices to the Bottom Line* (2001)

In addition to these publications, APQC also offers the results from a consortium benchmarking effort in Six Sigma in the Best-practice Report *Deploying Six Sigma to Bolster Business and the Bottom Line* (2001).

If you have questions or would like to learn more about what APQC offers call 800-776-9676 (1-713-681-4020 outside the United States) or visit our Web site at www.apqc.org.

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