

PROGRESS Report

Learn something about your Six Sigma program's maturity

by Zhen He

SIX SIGMA HAS been a hot topic discussed and implemented globally in the business world, nonprofit organizations and even governments. It has also been an important academic research area in recent years (see sidebar, "Six Sigma in Print," p. 26). There is comparatively less research, however, into how to assess the maturity of Six Sigma implementation.

In a recent article, Prasad Raje outlined the five levels of Six Sigma development: launch, early success, scale and replication, institutionalization and culture transformation.¹ He also described the characteristics of each level from viewpoints such as leadership support, training, people, project selection, financial impact and software.

In doing so, he established a general framework for Six Sigma maturity assessment, but not a detailed one. For example, the framework didn't provide a measuring system to evaluate Six Sigma maturity. Six Sigma deployment within a business is a complicated process, and a maturity assessment requires systematic design from overall business perspectives.

In 50 Words Or Less

- Six Sigma's use in a variety of industries has resulted in a focus on successful deployment.
- Assessing the maturity of program implementation, however, is often overlooked.
- By establishing assessment criteria, an organization can ensure continuous improvement.

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In 2006, I, along with other members of the School of Management at Tianjin University in China, surveyed 106 companies that implemented Six Sigma in China. We further investigated six companies that successfully implemented Six Sigma: Bao Steel, Taiyuan Iron & Steel Co. (TISCO), Haier, TCL Corp., Shanghai Hitachi Electrical Appliances Co. and Aviation Industry Corp. of China. We also conducted site visits to three foreign-invested companies and joint ventures: Motorola China, Dell China and Jiangling Motor (a joint venture with Ford).

As we analyzed the companies that used Six Sigma to achieve broad-based innovation and superior financial performance, we identified several distinguishing characteristics of their approaches that set them apart from those with a traditional operational improvement mind-set. Successful companies had:

- A strategic vision based on customer and market insights. Leaders crafted a compelling vision—not just from a Six Sigma perspective, but company-wide—based on a keen understanding of market demands and their own capabilities.
- Leadership committed to continuous improvement. Senior business leaders played active and enthusiastic roles.
- Alignment across the extended enterprise. The strategic vision was used as a unifying force to align strategic and operational goals and to influence supplier and customer relationships.

- Integration through the extended enterprise. Operations were characterized by processes that were repeatable and regularly evaluated for change and improvement in collaboration with other affected business units. Efficiencies across units were sought and achieved through analysis, innovation and sharing. Processes and measures tracked progress on key strategic and operational goals.

Based on the survey, analysis and face-to-face talks with Six Sigma Champions, Black Belts (BBs) and Green Belts (GBs), we discovered it's important to establish a set of Six Sigma maturity assessment criteria. That way, benchmarks can be created regarding where the company stands in terms of Six Sigma deployment, and strengths and weaknesses can be evaluated.

Finding a purpose

Like the Malcolm Baldrige National Quality Award criteria, the main purpose for an organization to establish Six Sigma maturity criteria is self-assessment. The program should be focused and collaborative to determine how best to integrate, align and deploy Six Sigma in an enterprise. As a result, it is an attractive tool for organizations looking to improve their performance over time and to continue the never-ending journey for performance excellence.

The maturity criteria can also provide an analysis of an enterprise's cultural transformation toward Six Sigma and help it:

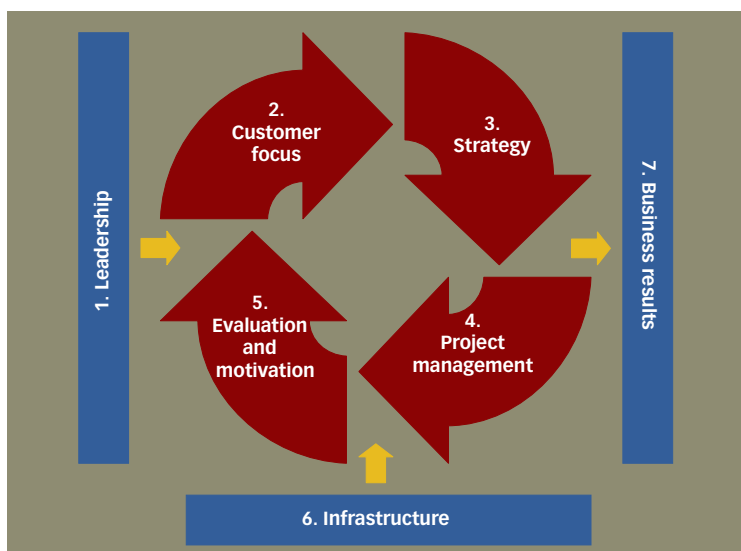
- Improve Six Sigma deployment performance by understanding the big picture of Six Sigma management from the strategic to the operational level.
- Benchmark best practices and clearly understand where the company stands.
- Locate areas for improvement through gap analysis.
- Pinpoint specific steps to close the gaps.
- Identify an organization's strengths and weaknesses.

Establishing your values

To set up a Six Sigma maturity assessment model, it's important to clarify the management philosophy of Six Sigma. Previous studies show that what sets Six Sigma apart from prior quality management approaches isn't the underlying philosophy or the quality tools and techniques employed, but rather the manner of organizational implementation.²

Six Sigma is far more than a quality improvement program; it is a continuous improvement strategy and

Assessment infrastructure / FIGURE 1



an integration of contemporary management ideas, principles and tools. Its goal is to achieve continuous improvement by conducting Six Sigma projects that result in improved customer satisfaction, bottom-line costs or profits.

Six Sigma adopts the key principles and philosophies of ISO 9000, total quality management and the Baldrige criteria. It reflects the following core values, which should be fully understood by the executives of the organization that implements Six Sigma:

Commitment from high-level management. Six Sigma deployment is a top-down process. To deploy Six Sigma successfully within a company, management executives should have a long-term vision and must set up the needed infrastructure. SWOT (strengths, weaknesses, opportunities and threats) analysis and balanced scorecards can be used to align business strategy with Six Sigma and identify opportunities or critical areas for business improvement.

Customer-driven decisions and improved customer satisfaction. The ultimate objective for pursuing Six Sigma is not just to reach a high-level quality goal, but also to meet customer requirements. Organizations must go beyond customer satisfaction to customer delight via breakthrough business process improvement. Focusing on the voice of the customer (VOC) is a major tenet of Six Sigma, which requires that all business processes be customer-driven.

Organizational learning. Six Sigma is an effective way to push organizational learning. The action-learning process of Six Sigma combines classroom training with projects and aligns employee learning, performance improvement, knowledge management and organizational learning.

Management by facts and data. Six Sigma methods focus on rigid data analysis. The processes of define, measure, analyze, improve and control (DMAIC) and define, measure, analyze, design, optimize and verify (DMADOV) are data-driven problem-solving processes. A business culture of data-based decisions can be cultivated through deployment of Six Sigma.

Cross-functional teamwork and breakthrough improvement. In general, Six Sigma breakthrough improvement can be achieved only if the project team is cross-functional. Traditional functional and organizational structure encourages people and departments to function alone, without collaboration. The fact is, most key business processes flow across many functional

departments, and total business process optimization requires collaboration.

Focusing business results and value creation. The reason many companies invest money in Six Sigma is that its return on investment (ROI) is very high—Motorola University claims it ranges between 10:1 and 50:1.³ But most people believe the prevailing reason for an organization to implement Six Sigma is to cut costs or boost profits. Even though bottom-line profit or cost savings is very important for Six Sigma deployment, the benefits go beyond those areas to include customer satisfaction, human resource development, internal business process and supply chain improvements, and corporate culture transformation.

Building a framework

When drafting the criteria for Six Sigma maturity assessment, we adopted the Baldrige criteria and Motorola corporate quality system review (QSR) guidelines.⁴ A team of 24 people (including Six Sigma Champions, Master Black Belts and BBs) from industry and academia joined the meetings to discuss the framework, reached consensus and categorized the core values of Six Sigma:

1. Leadership.
2. Strategy.
3. Customer focus.
4. Infrastructure.
5. Project management.
6. Evaluation and motivation.
7. Business results.

Figure 1 depicts the framework and how the categories relate to one another. Leadership is the most important input for a successful Six Sigma deployment, and business results are the output.

Because Six Sigma is a customer-focused continuous improvement program, strategy is based on a customer focus. Using that strategy, the organization implements a project. Through the project review, evaluation and motivation system, the organization maintains the momentum of the program and continuously finds new opportunities for improvement. At the bottom is infrastructure, which provides systematic assurance of long-term success.

Exploring the criteria

The criteria consist of seven categories, 26 items and 47 areas for assessment, all of which contribute to a

1,000-point scale (see Table 1). Companies are divided into four categories: poor (a score less than 400), marginally qualified (400 to 600), qualified (600 to 800) and excellent (more than 800).

To facilitate the assessment process, we posed a question regarding how each area was evaluated. Then, we presented detailed considerations about the question.

For each question, the assessment team scored the result from 0 to 5—very poor (0), poor (1), fair (2), marginally qualified (3), qualified (4) and excellent (5)—followed by specific descriptions. The results were categorized as strengths or opportunities for improvement, and a total maturity score was obtained.

In addition, we developed an Excel worksheet with macros to help the assessment process. For example, for area 4.1.b (project selection procedure), the question, considerations and performance levels were described as follows:

Question: Does the organization have a well-defined systematic and documented Six Sigma project selection procedure?

Considerations:

- There exists a well-defined systematic Six Sigma project selection procedure based on improvement opportunities.
- Improvement opportunity is determined through analysis of VOC or voice of the business.
- Six Sigma project selection is a top-down process involving the organization's executives or champions.
- The scope of the Six Sigma project is in line with SMART (specific, measurable, achievable, relevant, time-bound) objectives.

Performance levels:

- Very poor (0): There is no systematic Six Sigma project selection procedure. Six Sigma projects are selected by BBs or GBs without involvement of management executives or champions. Most of the project failures are due to poor project selection.
- Poor (1): There is no systematic Six Sigma project selection procedure. Six Sigma projects are selected by BBs or GBs. Projects are approved by management executives or Champions, but some are not closely aligned with organization strategy. Some project failures are due to poor project selection.
- Fair (2): There is a documented Six Sigma project selection procedure. Six Sigma projects are top-down and are selected with some involvement of management executives or champions. VOC and voice of the business are partly used in project selection. Inadequate management participation in Six Sigma project selection leads to inappropriate project scope or objectives.
- Marginally qualified (3): There is a documented Six Sigma project selection procedure. Six Sigma projects are top-down and are selected from business strategy with involvement of management executives or champions. VOC and voice of the business are utilized in project selection.
- Qualified (4): There is a well-defined and documented Six Sigma project selection procedure. Six Sigma projects are top-down and are selected based on business strategy, with strong involvement of management executives or Champions. VOC and voice of the business are fully used in project selection. Most Six Sigma projects are in line with SMART objectives.

SIX SIGMA IN PRINT

The Six Sigma body of knowledge grows by the day. For more information on Six Sigma deployment, check out the following:

- Mikel Harry and Recharad Schoeder, *Six Sigma: The Breakthrough Management Strategy Revolutionizing the World's Top Corporations*, Currency, 2000.
- Forrest W. Breyfogle III, James M. Cupello and Becki Meadows, *Managing Six Sigma*, John Wiley and Sons, 2001.
- Bill Robinson, "Build a Management System Based on Six Sigma," *Six Sigma Forum Magazine*, November 2005, pp. 28-33.
- Hefin Rowlands, "Six Sigma: A New Philosophy or Repackaging of Old Ideas," *Engineering Management*, April/May 2003, pp. 18-21.
- Sung H. Park, *Six Sigma for Quality and Productivity Promotion*, Asian Productivity Organization, 2003.
- Zhen He and Che Jianguo, "Lean Six Sigma: The Source of New Competitive Advantage," *Journal of Tianjin University (Social Sciences)*, Vol. 7, No. 5, 2005, pp. 321-325.
- Joseph G. Voelkel, "What Makes a Six Sigma Project Successful," *Quality Progress*, May 2005, pp. 66-68.
- Mark Goldstein, "Six Sigma Success Factors," *Six Sigma Forum Magazine*, November 2001, pp. 36-39.
- Jiju Antony and Ricardo Banuelas, "Key Ingredients for the Effective Implementation of Six Sigma Program," *Measuring Business Excellence*, Vol. 6, No. 4, 2002, pp. 20-27.
- Charles R. Gowen III, "How to Implement Six Sigma for Maximum Benefit," *Six Sigma Forum Magazine*, February 2002, pp. 27-31.

Categories, items and areas for assessment / TABLE 1

Categories (with score)	Items (with score)	Areas (with score)
1. Six Sigma Leadership (100)	1.1 Organization vision and core values (20)	a. Vision (10) b. Core values (10)
	1.2 Executive leadership (80)	a. Visible resource support (40) b. Participation in Six Sigma (40)
2. Customer focus (80)	2.1 Voice of the customer (VOC) and organization's response to customer requirements (40)	a. VOC and organization's response to customer's requirements (40)
	2.2 Customer satisfaction (40)	a. Customer satisfaction metrics (20) b. Customer satisfaction measurement (20)
3. Six Sigma strategy (80)	3.1 Six Sigma strategy development (40)	a. Strategy development process (20) b. Six Sigma and organization strategy alignment (20)
	3.2 Six Sigma strategy deployment (40)	a. Deployment process (20) b. Key performance metrics (20)
4. Six Sigma project management (170)	4.1 Project selection (30)	a. Opportunity identification (15) b. Project selection procedure (15)
	4.2 Project team (30)	a. Team building (15) b. Teamwork (15)
	4.3 Problem-solving procedure and tools (40)	a. Problem-solving procedure (20) b. Problem-solving tools (20)
	4.4 Project plan and execution (40)	a. Project plan (20) b. Project process review (20)
	4.5 Project evaluation (30)	a. Project evaluation (30)
5. Evaluation and motivation (100)	5.1 Performance evaluation system (40)	a. Team performance assessment (30) b. Performance of people in charge of Six Sigma deployment (10)
	5.2 Motivation (60)	a. Award and recognition (30) b. Career development (30)
6. Six Sigma infrastructure (230)	6.1 Six Sigma deployment structure (40)	a. Structure (20) b. Objectives, responsibilities and resource allocation (20)
	6.2 Six Sigma management system and procedures (40)	a. Six Sigma management system and procedures (40)
	6.3 Six Sigma training system (30)	a. Training system and management (10) b. Body of knowledge (10) c. Contribution of training to Six Sigma projects (10)
	6.4 Communication and employee involvement (30)	a. Communication (5) b. Exchanging with outside organization (5) c. Employee involvement (20)
	6.5 Data management (30)	a. Quality and availability of data (20) b. Data-processing system (10)
	6.6 Information system and sharing (30)	a. Support of information system (10) b. Knowledge management and sharing (20)
	6.7 Six Sigma in supply chain (30)	a. Deployment in supply chain (20) b. Deployment with strategic partners (10)
7. Business results (240)	7.1 Customer satisfaction results (40)	a. Customer satisfaction results (40)
	7.2 Financial results (60)	a. Financial results (60)
	7.3 Human resource development (40)	a. Talent cultivation (20) b. Employee satisfaction (20)
	7.4 Internal business process improvement results (40)	a. Internal business process improvement results (40)
	7.5 Supply chain improvement results (30)	a. Supply chain improvement results (30)
	7.6 Corporate culture transformation results (30)	a. Corporate culture transformation results (20) b. Corporate social responsibility results (10)

Maturity assessment scores / TABLE 2

Category									
Company	1	2	3	4	5	6	7	Total	Number of years since implementing Six Sigma
A	82	72	60	124	74	152	164	728	3.5
B	76	80	68	148	76	199	202	849	6
C	80	52	68	128	66	158	162	714	3
D	82	52	52	134	70	140	162	692	2.5
E	68	64	48	129	76	152	138	675	2.5
F	78	48	40	125	80	142	132	645	2
G	80	64	52	136	64	174	188	758	5
Average (a)	78	61.7	55.4	132	72.3	159.6	164	723	
Full score (b)	100	80	80	170	100	230	240	1000	
Percentage (a/b)*100	78	77.1	69.3	77.6	72.3	69.4	68.3	72.3	

- Excellent (5): There is a well-defined and documented Six Sigma project selection procedure. Evidence shows the procedure is followed, with continuous improvement. Six Sigma projects are top-down and are selected in a team environment, with very strong involvement of management executives or champions. VOC and voice of the business are fully utilized in project selection. Six Sigma projects' scopes are in line with SMART objectives.

The scoring method for each area is very straightforward. For example, the full score of area 4.1.b is 15. If the performance level for 4.1.b is level 4 (qualified), then the final score of 4.1.b is (4/5) * 15 = 12.

Time to apply

From 2007 to 2008, seven Chinese state-owned enterprises were assessed using the criteria. These enterprises are leading companies in their industries, including iron and steel, home appliance, mining and aviation.

The companies, which had at least two years of experience implementing Six Sigma, asked the China Association for Quality (CAQ) to conduct field assessments to find strengths and opportunities for improvement. The field assessment process included face-to-face talks with high-level management, Champions,

BBs, GBs and frontline workers; project review; and a review of the relevant Six Sigma documents, including training materials and Six Sigma project management files.

The assessors provided results and documented feedback about the companies' strengths and opportunities. The total scores and category scores for each company are in Table 2. From the results, you can see Company B scored "excellent," while the others were "qualified." The maturity level was positively correlated with the number of years since implementing Six Sigma.

Based on the current state of Six Sigma deployment in China, we propose a set of Six Sigma maturity assessment criteria that adopts facets of the Baldrige award and Motorola QSR. The criteria can be used for self-assessment and third-party assessment of Six Sigma deployment maturity. The ROI for conducting the assessment will be the result of improving the process of Six Sigma deployment.

Currently, more than 20 Chinese companies have adopted the criteria for self-assessment. Some companies also set up their own self-assessment criteria based on the criteria we proposed. A book about the criteria was published by Standards Press of China in 2007.⁵ That same year, the CAQ began to use the criteria to award businesses exhibiting Six Sigma excellence. **QP**

ACKNOWLEDGEMENT

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MODEL OF MATURITY

Let us know how your organization tracks the development of its Six Sigma projects (or whether it does) by logging on to www.qualityprogress.com and using the comment tool on this article's page.



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