Pairing CMMI and Six Sigma for Optimal Results

Leapfrog your competition by following these fool-proof strategies for accelerating process improvement. Discover how Six Sigma and CMMI can work together to bring about effective change within your organization.

By ExecutiveBrief Staff

Many organizations have tried to determine if it is to their advantage to use both CMMI and Six Sigma in their organizations to work cooperatively toward the same objectives, which include process improvement and greater profitability. Because they offer different approaches to process improvement, many organizations think using CMMI and Six Sigma is an either/or decision. Many wonder if there is any evidence Six Sigma works in software and systems engineering or IT. Some may think Six Sigma is only about advanced statistics, unsure how both methodologies would complement each other to make the organization better.

They don't visualize that by using both of them they have an opportunity to improve the organization at numerous levels. Although they both share a focus on quality and customer satisfaction, these technologies are designed to accomplish different things.

Six Sigma provides tactical improvement and analysis tools, as well as high level governance approaches for making improvements in an organization. It is enterprise-wise and not discipline specific–a neutral improvement methodology. Six Sigma can be considered a non-domain specific business improvement strategy, philosophy and change agent for an organization.

CMMI takes a discipline specific approach to organizational improvement – software and systems engineering, acquisition processes and service-providing guidance.. For example, CMMI for software and systems engineering focuses on process management, project management, engineering and support specific to the discipline of software and systems engineering.

How Do They Actually Work?
CMMI's discipline specific approach includes systems engineering, acquisition processes and service. All are related to the process infrastructure needed for providing the process backbone for an organization to be success. CMMI makes sure Process Management, Project Management, Engineering and Support are in place so the business organization can meet specific goals. By contrast, Six Sigma diagnoses and characterizes a problem, and then determines how to improve processes analytically and quantitatively.

"The two technologies work really well together," says Jeannine Siviy, senior member of the technical staff at the Carnegie Mellon Software Engineering Institute. "Six Sigma wants you to map out your processes (Process Mapping), but it doesn't actually tell you what the processes should be. CMMI determines the right processes for an organization to start. However, an organization may have to tailor it or add to it to make it work for them. CMMI provides the process backbone that Six Sigma needs."

CMMI has five maturity levels. As an organization progresses through each level, they become defined, repeatable, predictable and quantitatively managed and optimized. As CMMI matures, there is a natural fit with Six Sigma, which focuses on quantitative management. Six Sigma's strength is its ability to define, measure, analyze, improve and control costs.
For example, if an auto maker is developing a new car, there is quite a bit of software in the car to support everything from basic driving functionality to state-of-the-art entertainment systems. To make that car, a manufacturer needs software systems engineers, mechanical and electrical engineers, as well as the manufacturing production line. Employees designing the software and systems engineering for that car might favor CMMI because it provides good guidance on the type of processes they should be executing.

Conversely, Six Sigma provides analytic tools such as control charts and evaluates the quality of measurement to determine if one process is better than another. Six Sigma provides tactical guidance to fit inside the CMMI process. Six Sigma prioritizes a project with specific improvements that need to be made in an engineering process. "Six Sigma will point out the biggest problem spots in the organization and states what will add value to the bottom line," Siviy says.

Case Studies
In March 2008, the Carnegie Mellon Software Engineering Institute wrote a white paper entitled: *Maximizing*

Your Process Improvement R.O.I. Through Harmonization. This white paper briefly mentions several organizations that achieved positive results by using CMMI as well as Six Sigma along with other methodologies.

Locked Martin IS&GS
With their "Program Process Standard" the company has reported productivity gains of more than 50% and cost reductions of nearly 25%. In order to achieve these goals, the company established process architecture, a required development process scheme, updated industry standards and received certifications when it was desired.

Northrop Grumman Mission Systems
Northrop Grumman Mission Systems reports Six Sigma resulted in a culture change by leveraging multiple models and significantly reducing cycle, Six Sigma provided a way to connect process improvement and business value.

The University of Pittsburgh Medical Center
The University of Pittsburgh Medical Center used a collaborative model effort to prioritize and align processes to implement, leading them to become the first non-profit medical system in the United States to be certified compliant with the most stringent provisions of Sarbanes-Oxley.

While most companies consider their approaches to joint CMMI and Six Sigma implementation to be proprietary and provide competitive advantage, these and other companies have begun to publish excerpts of their strategy and results. Among the references collected by the Software Engineering Institute (SEI) and listed in a comprehensive bibliography in the book CMMI & Six Sigma: Partners in Process Improvement are publications and presentations from Dell, Raytheon, JP Morgan Chase, and The Gates Rubber Company.

Six Important Strategies to Know:
Based on Siviy's case studies and research, she has developed six different strategies for bringing CMMI and Six Sigma together. These strategies may be used at any CMMI maturity level. However, before an organization can decide which strategy works best, it must look at what it has at the start. The organization also has to determine its particular problem as well as its mission. Then, it is recommended the organization selects, implements and leverages a strategy so the best of both methodologies work to the organization's advantage.

Strategy Number 1 - Implement CMMI-based Processes as Six Sigma Projects
With this strategy, the organization uses the governance mechanisms of CMMI-based process implementation projects and then uses Six Sigma's problem solving and project approach to implement them. Six Sigma makes sure all the CMMI processes are adding value by linking them to problems or opportunities. Six Sigma also determines performance requirements and assists with defining the specific characteristics and stakeholder needs for each process.

Strategy Number 2 -Use Six Sigma's Define-Measure-Analyze-Improve-Control as a tactical engine to improve all processes
This strategy uses Six Sigma to provide tactical knowledge for measuring, monitoring and reporting the capability of processes, which belong to CMMI. Using project management performance as an example, every project gets measured for a certain cost on a certain time line.

Reality is that companies sometimes finish projects under, as well as over budget. The same is true of schedules. As an organization is more mature, Six Sigma provides the means and tactics to improve performance for these and other variables. This strategy can be employed to improve product quality as well as other processes.

Strategy Number 3 -Embed Six Sigma's Design for Six Sigma (DFSS) as a tactical contributor to CMMI's engineering process
This strategy is a variant of the second strategy in that it involves using Six Sigma as a tactical engine within CMMI. This strategy has a focus on products and specifically leverages design for Six Sigma (DFSS) - a variant of Six Sigma used for designing or redesigning products and processes so they achieve a desired performance. In this strategy, the methodologies and tools of DFSS are built into CMMI-based engineering processes as specific tactics.

Strategy Number 4 -Apply Six Sigma to improve an organization's improvement process
An organization uses this strategy by applying Six Sigma in the process of deploying CMMI. CMMI has a

comprehensive suite of processes vital to the success of an engineering organization. It takes resources to roll these processes out-from defining the processes, to training people to use them, to appraising/auditing for compliance. Six Sigma can be applied to any aspect of these functions to make the processes more efficient. A potentially high value application of this strategy is to make CMMI's appraisal processes as efficient as possible. This allows the organization's manufacturing activities to be lean, efficient and value added.

Strategy Number 5 - Institutionalize Six Sigma results using CMMI practices
CMMI is distinct from many other improvement methodologies with the strength of its institutionalization practices. In essence, it has built-in practices that don't just support organizational change management, but ensure these practices are well-defined as part of the organizational infrastructure. In this strategy, this aspect of CMMI helps Six Sigma by providing the means to ensure learning from each Six Sigma project are properly shared and institutionalized across the organization.

Strategy Number 6 - Integrate models/technologies/standards into an internal process standard
This is the ultimate CMMI and Six Sigma integration strategy. In this strategy, organizations develop the process architecture and descriptions appropriate for their business and mission. As part of this process development, organizations define all features of all the technologies they are concerned with and want to use to reach their goals. Most organizations are using other methodologies besides CMMI and Six Sigma. And because the mix of methodologies changes over time, the process architecture developed in this strategy becomes a means for the organization to efficiently adapt the additions and changes over time.

"There is a proliferation of models, technologies and standards at different levels-some are governance, some are tactical and some are about process. This last strategy is based on real case studies. This is one of the most difficult strategies for managers to accomplish," Siviy says.

Benefits
Those that have participated in the SEI's case study research have observed that if organizations only use CMMI without Six Sigma, essentially they invent Six Sigma anyway. And vice versa. If organizations apply Six Sigma in software or systems engineering without the benefit of CMMI and other guidance for process infrastructure in this discipline, they risk having to build from scratch what already has been codified by the community.

The reality is these organizations will spend a lot of time inventing what already exist. "It's like reinventing the wheel," Siviy says.

Although it may take time learning Six Sigma, Siviy believes it will make an organization more efficient and effective. Experts have studied this technology and know how it can be practical and useful.

A variety of benefits can be achieved when an organization decides to use both CMMI and Six Sigma. According to the research done at Carnegie Mellon University, Six Sigma has been shown to be feasible as an enabler of the adoption of software, systems and IT improvement models and practices.

The earlier mentioned examples cite specific performance benefits realized by some organizations. In a more general sense, the following can be achieved with an effective joint implementation of CMMI and Six Sigma:

- Sustained or even improved performance during reorganizations and organizational acquisitions by leveraging Six Sigma's enabling characteristics.
- Accelerated achievement of improvement objectives, with some case studies having shown cycle times twice as fast.
- Cost reductions via accelerated results, using existing guidance rather than reinventing or improving efficiency, such as audits.
- Business focus rather than model focus.
- Cultural change related to establishment of enterprise processes, measurement systems and more.
- In the context of the strategy to create a process standard: process robustness to an ever evolving and dynamic world of models and regulations.

These benefits underlie many organizations using CMMI and Six Sigma consider their joint use of CMMI and Six Sigma to provide them a "competitive edge" with respect to software and systems development.

Conclusions

In the past few years, manufacturing, banking and the IT service industry have discovered how to make CMMI and Six Sigma work well together to provide a competitive advantage within the marketplace. Now, organizations are working on ways to make them work even better together, modeling their efforts on shared strategies and successful outcomes.

“There isn’t any downside to using both systems,” Siviy says. “The combination can help the organization reach objectives. The most important point is to leverage the right parts of these two methodologies to achieve your objectives faster to achieve that competitive advantage.”

Always included in an organization’s objectives is to improve processes to get products and services to the customer as efficiently and profitably as possible, making sure customers recognize value. In order to accomplish this objective, an organization must focus on eliminating waste and shortening cycle time. An organization that can achieve these goals will be among the stronger companies in today’s worldwide marketplace.

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