

Using Six Sigma in Software Development

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Each year at Lockheed Martin, corporate management challenges its Integrated Systems & Solutions business unit (IS&S) to reduce total costs. Each year, IS&S uses Six Sigma tools to make it happen.

“Six Sigma has resulted in significant cost savings,” said Lynn Penn, director of quality systems and process management at IS&S. “It’s a structured approach that provides more than a checklist—it shows you what’s coming next, lets you look at data from different views, and gives you a big picture of your practices for making decisions.”

Lockheed Martin is part of a growing number of organizations using Six Sigma to improve software quality and cycle time, reduce defects in products and services, and increase customer satisfaction. As Six Sigma evolves from an improvement framework for the manufacturing sector to one that can be applied across all levels of an enterprise, the SEI is looking at ways that Six Sigma has benefited software and systems development.

More Than a Metric

Six Sigma is an approach to business improvement that includes a philosophy, a set of metrics, and an improvement framework (also called a toolkit). Its philosophy is to improve customer satisfaction by eliminating and preventing defects, resulting in increased profitability. Sigma (σ) is the Greek symbol used to represent standard deviation, or the amount of variation in a process. Six Sigma (6σ) refers to a measure of process variation (six standard deviations) that translates into an error or defect rate of 3.4 parts per million, or 99.9997 percent. In Six Sigma, defects are defined as any product, service, or process variation that prevents the needs of the customer from being met.

During the 1980s, large manufacturing companies such as Motorola, General Electric, and Allied Signal first used Six Sigma processes to collect data, improve quality, lower costs, and virtually eliminate defects in fielded products. Using both statistical and non-statistical methods, the approach soon spread to several major service industries, and today software practitioners are exploring ways to apply Six Sigma techniques to improve software and systems development.

“Six Sigma is more than just a metric,” says Jeannine Siviyy, a leading Six Sigma practitioner at the SEI. “Maintaining vigilance about the philosophy, customer satisfaction, and business profitability is crucial to Six Sigma success. Using this philosophy, organizations can define sigma measures and thresholds in customer terms and then link these to engineering measures such as defect density, cost, and schedule performance.”

Northrop Grumman Mission Systems, for example, used Six Sigma to help in its move from Maturity Level 3 of the SEI CMMI models to Level 5 in just one year. Rick Hefner, director of

process initiatives, said all of their engineers and managers attend a two-week training course in Six Sigma and complete a six-month Six Sigma project. This work is augmented by additional training on the Quantitative Project Management and Causal Analysis and Resolution process areas of CMMI Maturity Levels 4 and 5.

“Six Sigma provided the tools and techniques to get to Level 5 more quickly,” said Hefner. “We were able to move from Level 3 to Level 5 in a year, which is directly attributable to the knowledge and culture established by Six Sigma. All the engineers and managers understand process and process variation, as well as the importance of business value, the voice of the customer, and many other Six Sigma tools and techniques. Now everyone is using Six Sigma as part of their everyday job; you hear the terminology at meetings ... and no one is shocked or surprised. That’s just the way we talk now.”

Accelerating Technology Adoption: Six Sigma and CMMI

Siviy leads a research team at the SEI examining how Six Sigma techniques have helped organizations such as Lockheed Martin and Northrop Grumman to adopt and institutionalize best engineering practices. Her team is concentrating on how Six Sigma accelerates the adoption of the CMMI models, as well as its applicability to software architecture practices, systems integration, information technology (IT) operations and security, and acquisition practices.

Accelerating technology adoption is important to many software and systems organizations, says Eileen Forrester, a member of Siviy’s SEI team. “We’re finding some great reports about faster results from new technologies if an organization is also adept at using Six Sigma. This may be because Six Sigma helps organizations to make better decisions about what to adopt given their business objectives and improves the chances that the adoption will be a success. Also—best of all—use of Six Sigma in tandem with a new technology is likely to produce credible data for evaluating that success.”

Because Six Sigma is new to the domains of software and systems development, many organizations, Siviy said, are struggling with implementation. Common questions from organizations include

- How does Six Sigma compare with other improvement approaches, and how does it fit with my organization’s other software process improvement initiatives?
- What evidence is there that Six Sigma is applicable to software and systems engineering?
- What will it take for me to implement Six Sigma in my organization, and how do I get started?
- How do I train software engineers in Six Sigma methods when Six Sigma training is largely focused on manufacturing?

Siviy's research aims to help organizations answer these questions. "Using our expertise in software process improvement, our goal is to collect tangible evidence and assets that can be used by other organizations who wish to approach things this way."

Tell Us About Your Six Sigma Experiences

The SEI is interested in your organization's experiences using Six Sigma. Please contact us.

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