

Six Sigma – A Quality Initiative

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What is Six Sigma?

“Six Sigma is not a secret society, a sorority or a cliché. It is a highly disciplined process that helps focus on developing and delivering near-perfect products and services”¹. The word “sigma” comes from a statistical term that measures how far a given process deviates from perfection. The idea behind Six Sigma is if you can measure how many defects there are in a process then you can figure out a way to eliminate them. The basic idea is self evident: the lower the number of errors the higher the quality. When people think of Six Sigma they picture implementing superior solutions for manufacturing concerns, but Six Sigma can also be applied in a service industry by, for example, quantifying the delays in delivery of products and procedures.

When did Six Sigma come about?

Motorola was the innovator of Six Sigma in 1988. Its contribution was to change the discussion of quality from one where quality levels were measured in percentages to a discussion of parts per million. “Their idea behind this logic was that modern technology was so complex that old ideas about acceptable quality levels were no longer acceptable”². The magic number according to Motorola was 3.4 defective parts per million (see **Appendix A**). Achieving this magic number would mean that the company was performing at its optimum level producing quality goods. This *magical* number of defects was derived from statistical distribution tables where one sigma means 68 percent is acceptable; three sigma means 99.7 percent is acceptable and so on. Six Sigma, which is the ultimate goal, requires 99.999997 percent products to be free of defects.

¹ General Electric, “Six Sigma - making customers feel quality”, *What is Six Sigma?*
<<http://www.ge.com/sixsigma/makingcustomers.html>>, (15 Sept 2002)

² Thomas Pyzdek, “The Complete Guide to the CQE”, 1996. Tucson: Quality Publishing Inc.
<<http://www.qualitydigest.com/dec97/html/motsix.html>>, (15 Sept 2002)

“Six Sigma became so popular that an entire industry of consultants specializing in the methodology was formed with many firms like Allied Signal and Texas Instruments adopting their own Six Sigma quality programs”³.

Why is it important to know about Six Sigma?

Six Sigma performances are fast becoming the standard of performance for world class companies. In today’s dynamic market environment companies want to reduce costs and attract more customers. This can only be possible by determining a strategy that will increase the value of the firm. Companies use Six Sigma to streamline their operations which, in turn, helps them achieve world-class quality, reduce process cycle times and produce higher profit levels.

Consultants can earn salaries in seven figures by helping companies implement Six Sigma solutions while CEO’s proclaim savings in billions.

Some examples of the savings from Six Sigma implementations are listed below:

- “When Motorola went from Four Sigma to Five-Point-Five Sigma in the early 90’s the company realized \$2.2 billion in savings.”⁴
- “General Electric introduced Six Sigma in 1995 and raised the company’s operating margins from 14.4% to 16.6%”⁵

These numbers above give a clear picture of the success companies have had implementing Six Sigma. It is expected that this success will encourage others to adopt it. The concept of *zero*

³ Robert Slater, “Live Quality – and Drive Cost and Speed for Competitive Advantage,” in *Jack Welch and the GE Way – Management Insights and Leadership Secrets of the Legendary CEO*, Pg 210

⁴ James Shaw, “Six Sigma” in *CQ Online*, <<http://www.cost-quality.com/restpast/v6i4a3.html>>, (Sept 19 2002)

⁵ Ibid.

defects is what drives organizations like GE and Motorola, as they strive towards achieving the highest level of quality possible.

How is Six Sigma different from other quality control processes?

Six Sigma is an *improvement* approach which seeks to find and eliminate mistakes or defects in business processes. One of the main reasons why Six Sigma has succeeded is because it is packaged in a way which makes it easy for a company to implement. Six Sigma specifies the roles to be played by people during implementation. It has the scope and duration of the project predetermined which makes it easier for companies to plan and undertake implementation. Six Sigma has a mentality of *preventing* problems rather than *find and fix* which was found in the earlier approaches. Ironically, Six Sigma is characterized as *Total Quality Management on steroids* by critics who think that it is nothing but repackaged quality principles and techniques. However there are four aspects present in Six Sigma methodology which were not emphasized in earlier quality improvement approaches. These aspects are critical to the better deployment of this quality program.

First, Six Sigma places a clear focus on getting bottom line results without which projects are not approved. When Jack Welch, Former CEO of GE implemented the Six Sigma program in the company worldwide he asked his managers to outline the benefits they would gain from the initiative. In their respective departmental responses his managers quantified the expected results specifically in terms of savings, employee training, and other benefits.

Second, Six Sigma builds on improvement methods which have been effective and integrates the

human and process elements of improvement which earlier programs did not do well. GE's example of tying employee compensation and training to their Six Sigma program serves as a good example. As employees underwent training they became passionately involved in improving quality thus earning higher salaries and promotions.

Third, Six Sigma sequences and links the improvement tools into an overall approach. It uses two methodologies to tackle the issue of process improvement and variation reduction – DMAIC and DMADV. “The DMAIC (Define, Measure, Analyze, Improve, Control) methodology is used for existing processes which fall below specified standards and are looking towards improvement while the DMADV (Define, Measure, Analyze, Design, Verify) methodology is used to develop new products or processes at Six Sigma quality levels”⁶.

Fourth, Six Sigma creates an internal infrastructure of Champions, Master Black Belts, Black Belts and Green Belts. These are people possessing different levels of experience and training that lead or help in implementation of the quality program. This is very critical for the organization as these people are familiar with the organization. This makes the process changes easier and smoother to adapt which is where many problems are faced.

Results are what count in the business world and so far Six Sigma has been successful. While the tools used may be similar, the methodology used and the overall structure of the Six Sigma program – which integrates human and technical processes – distinguishes it from earlier approaches.

⁶ iSixSigma, “Six Sigma – What is Six Sigma”, < http://www.isixsigma.com/sixsigma/six_sigma.asp >, (15 Sept 2002)

A Road Map through Six Sigma – How do companies use Six Sigma?

The success of Six Sigma is the biggest challenge for itself. A new business concept starts out modestly and develops slowly bringing about success in incremental stages. When something like Six Sigma comes along and brings about huge savings for major companies, cover articles start appearing in magazines and consulting firms proclaim that it is the hottest thing around. Many companies decide that they want to try the *Six Sigma thing*. However many times management does not have a clear idea what it really is and what the outcomes would be from this initiative.

To avoid disaster, management should know that Six Sigma is not the universal answer to all business problems. It is just a useful tool for particular problems but not for all problems. If management decides that Six Sigma is the way to go then a road map is needed to provide a structured approach for implementation. The completed road map helps companies identify the initial amount of resources needed in terms of people and the initial cost to implement. It also sets up a timeline which will help the decision makers determine the program's return on investment.

The process of implementation starts with three major steps:

1. Educate the senior executives about Six Sigma,
2. Bring in an outside consultant which will assist with the project, and
3. Educate employees about the benefits sought through Six Sigma and how it will affect them – mutual benefit is very important for any program to succeed

The company's senior executives can complete the first step by attending a training session from professional organizations like American Society for Quality and Six Sigma Partnering, LLC which hold 4-5 day sessions for different levels of Six Sigma certification. These sessions teach them how the program should be structured and the tools available for implementation. The selection of an outside consultant is very crucial and the reputation of the consultant is important. There are many *Six Sigma gurus* around who preach but cannot practice, which ultimately leads to disaster for many companies. The company should be able to work well with the consultant and there should be an agreement between the two on what the company wants to accomplish.

Finally, employees should be educated about the program and should be asked to train themselves so they can work together in achieving the company's goal. Employees are, after all, human and resisting change is normal. However, if remuneration is linked to the changes, then employees will work towards desired change. "Jack Welch, Former CEO of GE tied forty percent of management employees' compensation to the Six Sigma effort in the company. This gave his employees an incentive to work hard for the success of the program. He also sent out memos to all the lower level employees asking them to undertake Green Belt and Black Belt training which are the first levels of training in Six Sigma and improve to higher levels of training without which they would not be eligible for promotions to middle and higher levels"⁷.

The steps above will allow a company to determine whether it is ready and can afford to implement the program. It will also ensure that the people in the company are ready to make necessary changes.

⁷ Robert Slater, "Make Quality the Job of every Employee," in *Jack Welch and the GE Way – Management Insights and Leadership Secrets of the Legendary CEO*, Pg 219

If the company decides to proceed with the implementation then these are the next steps:

1. A Six Sigma team should be formed which comprises of a Champion, Black Belts, Green Belts and Master Black Belts. The team should be committed to make Six Sigma a success.
 - a) A Champion is usually a senior executive who is responsible for the success of the project and getting an upper management champion guarantees, that the project will have a big impact on the company.
 - b) The project leader is called a Black Belt and is someone who has worked on multiple Six Sigma projects. They possess experience and a history of accomplishment.
 - c) Green Belts are the project team members who do not spend all their time on projects. Green Belts receive similar training to that of Black Belts but for a shorter period of time and they undergo training to participate in an important project for their business.
 - d) Master Black Belts are experienced Black Belts who have worked on many projects. They possess the general knowledge of advanced tools, training and teaching experience and are responsible to mentor new Black Belts in the organization.
2. The team needs to set some goals and objectives for the program. A timeline should be fixed preferably covering the details in both the short term and the long term. The roadmap needs to address training, required resources and tools besides performance goals for managers to control the overall process. The goals must be clear and

quantifiable for the company to achieve through the Six Sigma process and the first goal should be to achieve a Six Sigma quality level.

3. After the team has clearly defined the goals of the program then it should start planning for the implementation phase of the roadmap which outlines in detail about training issues, data collection methods and managing the program.

Training

Training issues should be addressed by the *Six Sigma Team* as part of the roadmap development at this early stage, as it helps the company assess its requirements from its people and what skills will best serve its purpose. The training section of the roadmap addresses the logistics for conducting the training, selection of candidates for different levels of training and their projects to progress to higher levels of Six Sigma certification.

- Green Belt – The person works with the Black Belt and has statistical training on applying the tools and techniques of Six Sigma. The person has applied the Six Sigma techniques in a project before being certified as a Green Belt.
- Black Belt – The person is a working level project leader who has applied the tools and techniques of Six Sigma in two projects before being certified as a Black Belt.
- Master Black Belt – The person is the leader of the Six Sigma process and has both advanced statistical training and experience in applying Six Sigma techniques. The Master Black Belt is different from the Champion. The latter provides top level support and resources while the Master Black Belt is a hands on leader in implementation.

The *Six Sigma Team* should decide who is going to do the training, how the training is going to be conducted, what materials will be used and when the training will be conducted. There are many professional organizations which conduct training for companies. One such company is “Six Sigma Partnering, LLC”⁸. This firm conducts its training through live classroom and distance learning methods.

Data Collection Methods

Six Sigma programs need continuous analysis of data which in turn require efficient data collection methods. Companies that lack adequate data collection methods can become very frustrated and lack of relevant data will impede the use of Six Sigma tools to analyze their processes. During the initial analysis, which is the crucial time, the usefulness of the existing system will be assessed. If found lacking, there are many data collection systems in the market which can fulfill the needs of the company.

Service organizations begin by quantifying errors in their processes. This may not be easy as it is in manufacturing operations as it involves collecting data on defects per thousand parts produced. The next step is to determine the total number “defect opportunities which are critical characteristics of a sampled entity that could either meet or fail consumer expectations. An example of this would be grammatical errors in a book.”⁹ Defect opportunities are ultimately combined with the other data collected to form an equation of the company’s sigma level.

⁸ Six Sigma – Black Belt Training – certification, <<http://www.sixsigmapartnering.net/Home.html>>, (18 Sept 2002)

⁹ John M. Gross, “A roadmap to six sigma quality”, *Quality Progress; Milwaukee*(Nov 2001), Available: ProQuest; ADDRESS: <http://proquest.umi.com/> (Sept 18 2002)

Managing the Program

This is the final part in the program and requires appropriate planning from the company to ensure success of the program. Companies usually expect newly trained people to start working on a project and save millions of dollars for them. People in the project should be continuously trained as it will add to their existing knowledge and will be applied back into the program. This also helps in building an informal network in the company and ensures that people work well together. The whole company benefits from the resulting synergy.

What lessons have organizations learnt so far?

Many organizations embrace programs like Six Sigma, believing that the immediate savings are attainable through such programs. Change is a long term effort, and there is no magic formula for quick results. The following point out the lessons learnt by organizations through the implementation of Six Sigma programs:

- “Achieving Six Sigma performances requires careful planning and commitment from the whole organization.”¹⁰
- A system which rewards leadership and co-ownership of the program leads to greater employee acceptance and adds to the bottom line.
- “Employees need to be selected and trained early on in the process to achieve the desired level of effort.”¹¹
- “Six Sigma Quality should be considered an integral part of business, and continuous investments should be made to reap benefits in the long run.”¹²

¹⁰ Soren Bisgaard et al., “Improving Business Processes with Six Sigma”, *Annual Quality Congress Proceedings; Milwaukee(2002)*, Available: ProQuest; ADDRESS: <http://proquest.umi.com/> (Sept 18 2002)

¹¹ Ibid.

¹² Ibid.

- Communication is very critical between all stakeholders – management, employees, customers and suppliers. All stakeholders should be integrated into the program
- “Performance should be checked regularly and discussed within the team.”¹³

Change can be a painful process but if a company studies Six Sigma implementations by other companies and does proper planning then it should perform well. General Electric studied what companies like Motorola and Allied Signal did in their Six Sigma initiatives before undertaking its own quality program and has done remarkably well.

Six Sigma certifications for consultants

The American Society for Quality (ASQ) certifies individuals who demonstrate knowledge of quality theory and techniques. There are different types of certifications available in the area of quality ranging from product and service evaluations to quality controls for mechanical instruments. The Six Sigma certification depends on the level to be certified. “The requirements to get certified are completion of an exam and completion of project/s. A *Body of Knowledge* for Six Sigma is available to candidates to prepare for the exam”¹⁴ or he/she can undergo training in a professional institute specializing in training individuals for the certification.

Certifications are very important for workers today. A certification demonstrates that the individual has the knowledge and experience to provide quality solutions for a company. Finally, a certification may also lead to a higher compensation and recognition among peers for the worker.

Conclusion

¹³ Soren Bisgaard et al., “Improving Business Processes with Six Sigma”, *Annual Quality Congress Proceedings; Milwaukee(2002)*, Available: ProQuest; ADDRESS: <http://proquest.umi.com/> (Sept 18 2002)

¹⁴ American Society for Quality, “ASQ: Certification”, < <http://www.asq.org/cert/signup/>>, (19 Sept 2002)

Six Sigma is a powerful weapon for organizations who know how to use it, and a potential lost opportunity for those who jump on board hastily and implement poorly. Life-long learning is emphasized in all spheres of life for an individual; with global competition in the marketplace, this also applies to an organization.

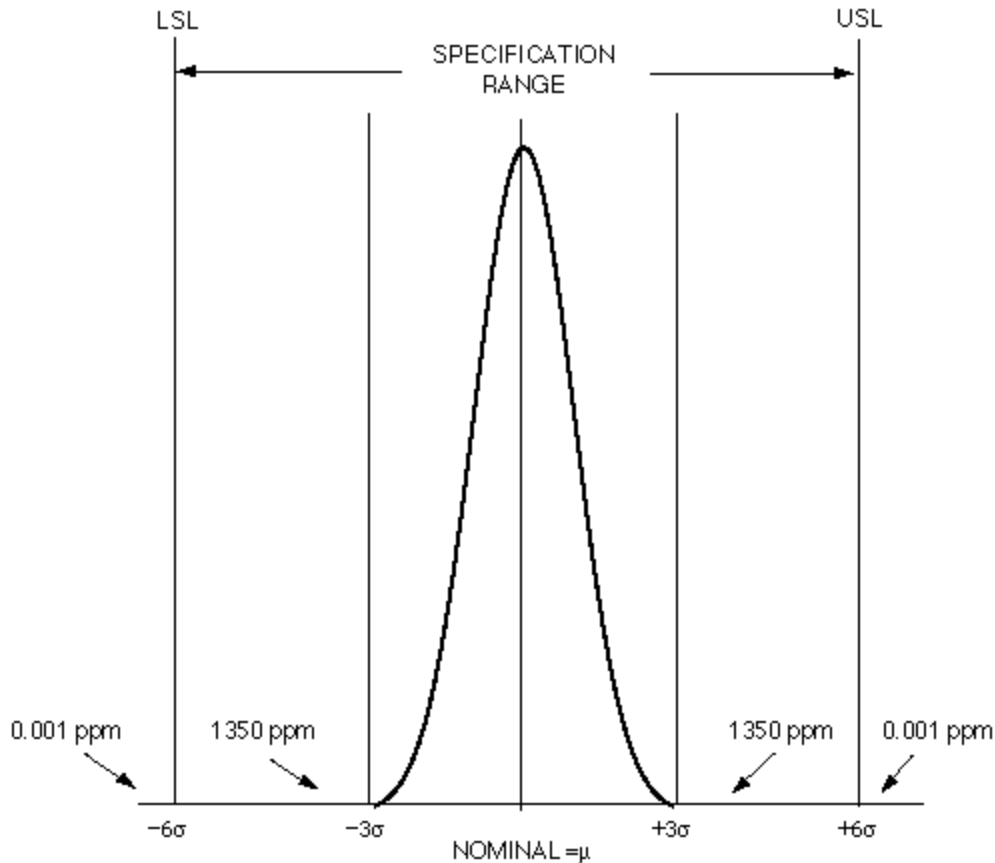
The most important aspects of the Six Sigma program are management buy-in and comprehension, and constant communication between management and employees. The employees should be informed about the program and its benefits. This communication of mutual benefit will ensure program commitment. The management must be committed themselves, and know the steps to take to ensure success in order to achieve the most coveted *Six Sigma Quality* level.

A quote by Jack Welch, Former CEO of GE sums up the benefits of a well thought out and planned Six Sigma initiative; “It is about seven thousand million times bigger and faster; better than my wildest dreams”¹⁵

¹⁵ Robert Slater, “To Achieve Quality: Measure, Analyze, Improve and Control,” in *Jack Welch and the GE Way – Management Insights and Leadership Secrets of the Legendary CEO*, Pg 210

Appendix – A

Six Sigma “magic number” of defects



Source: Excerpted from *The Complete Guide to the CQE* by Thomas Pyzdek. 1996. Tucson: Quality Publishing Inc.

Explanation:

Motorola suggested that to achieve Six Sigma organizations should have 3.4 defective parts per million. However if a normal distribution table is referred to one finds that the expected deviations are 0.002 parts per million. The difference occurs because Motorola presumes that mean will drift 1.5 sigma in either direction and the area of normal distribution beyond 4.5 sigma from the mean is indeed 3.4million.

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