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Roadblocks in the Six-Sigma Process

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Abstract

Six-Sigma is a quality improvement program used by many major companies with varying degrees of success. This paper shows the Process Map for the Six-Sigma Process and identifies the most difficult steps. A survey is conducted to collect data from several companies to develop the Six-Sigma Process Map and determine the most critical steps. The results show that the following steps are the most difficult steps throughout the whole process:

- Develop project ideas
- Verify benefits
- Update database
- Receive Certification

I. Introduction

The Six Sigma Methodology was developed at Motorola during the mid-1980's as a new approach to Quality Assurance. While quality programs like TQM (Total Quality Management) or Kaizen a continuous improvement methodology were using similar tools (i.e. Capability Studies, Pareto Analysis, Designed Experiments) to improve quality, many companies found that they did not succeed. Where Six Sigma differs substantially from other programs is [1]:

- In-depth training in statistical analysis over a three-month period in conjunction with a training project for each student.
- Easy "point and click" software (Minitab) for statistical analysis available for the first time, and thorough training in how to use it.
- A measurement system that relates quality improvements to the language of management-that is, all results are tracked in terms of a Quality Capability Score and dollars saved by reducing the Cost of Failure.
- A program with specific quality-improvement projects identified and planned for specific implementation dates.

II. The Six-Sigma Methodology

Six-Sigma is a customer-driven approach that provides an overall framework for quality management [2]. In addition, the term Six-Sigma is a statistical measure expressing how close a product comes to a quality goal [3]. The Six-Sigma Methodology is new enough that, while much is written about its success or potential for success, only the four major steps of working a Six-Sigma project are thoroughly documented. These are a) Measure a process, b) Analyze the process, c) Improve it, and d) Control the process rigorously for consistency [4].

Fontenot, et al. [5] lists six items needed for successful introduction of a Six Sigma program:

- Management commitment & momentum
- Identify product or service provided
- Identify customers and what they consider important
- Identify what you provide that satisfies the customer
- Define the process for doing work
- Mistake-proof the process and eliminate wasted effort

III. The Six-Sigma Certification

There are three levels of certification. These are Green Belt, Black Belt, and Master Black Belt. The distinction between them is based on job activity. Green Belt is a term denoting someone who has been through Six-Sigma training, and uses the methodology to complete one to two "Six-Sigma projects" per year, in addition to normal job duties. Black Belt refers to a project engineer who runs "Six-Sigma projects" (quality improvement projects) as their primary job function. A Master Black Belt generally provides the training to other employees and mentors Green Belts and Black Belts as they work on their projects. The Master Black Belt oversees the Six-Sigma program at a site level [6].

IV. Data Collection

This project looked at Six Sigma programs for three companies: Roper Corporation in LaFayette, Georgia, Kwikset Corporation in Waynesboro, Georgia, and the Dixie Narco Company in Williston, South Carolina. Roper Corporation is a wholly owned subsidiary of General Electric Company, and manufactures electric and gas cooking ranges under brand names such as GE, Hotpoint, RCA, and Kenmore. Kwikset Corporation is part of Black and Decker, and manufactures residential grade doorknobs, deadbolts, and lever handlesets. Finally, Dixie Narco is owned by Maytag Corporation and manufactures vending machines.

The initial part of this study was to survey people who have been through Six-Sigma Training. The Six-Sigma program is in its infancy here (started in 2000) and currently about 50 employees have been through the Six Sigma training. The employees were engineers, shop floor supervisors and some managers who attended the 10-day "green belt course". Approximately 80% employees responded to the written survey that was handed out. The survey was designed to ask questions assessing the employees understanding of the certification process, and the rewards and

recognition provided by the certification.

The survey consisted of 27 questions designed in most cases to elicit descriptive responses rather than yes/no answers. 22 of the questions required more than a Yes or No response. 3 of the questions were background questions that did not ask about surveys, but whether the participant had been through training, whether he or she was working on a Six Sigma project, and what company they worked for.

V. The Six-Sigma Process Map

Exhibit 1 shows the process map of a Six-Sigma project. 50 employees trained in Six-Sigma were asked which steps were easy to complete and which were difficult to complete.

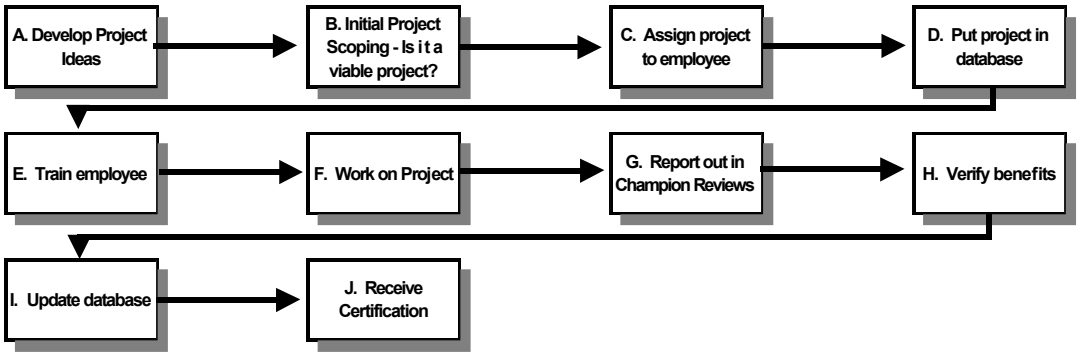

Exhibit 1. Six-Sigma Process Map

Out of these steps, the following steps were identified by employees as being the most difficult to complete during the Six-Sigma process:

- A. Develop Project Ideas- Employees brainstormed to develop projects. This enabled organizations to find projects that were the "lowest hanging fruit"- the most obvious problems and opportunities in the plant. This evolved over time and eventually made use of "playbooks"- data culled from yield, scrap, rework, uptime, deviations/substitutions, supplier PPM, and available in one central computer file that can be accessed from any desk- although not rolled out to entire plant yet.

- H. Verify Benefits- To prove the benefits exist, the employee has to monitor the process for a month after completing the project. Other events can offset anticipated benefits (i.e. Benefits from a yield improvement may be obscured in the data by some other new problem).

- I. Update Database- The database is very slow, very user-unfriendly, and poor training is provided.

- J. Receive Certification- Certification goals do not match how projects are assigned.

Some projects don't allow a Black Belt (BB) or Green Belt (GB) to demonstrate competency with all the required tools.

VI. The Certification

Why do the companies offer certification as a Six-Sigma "Black Belt" or "Green Belt", or "Master Black Belt?" A list of reasons includes:

- Meeting company COF (cost of failure) reduction goals
- Improving quality
- Changing the company culture
- Reward and recognize employees for good behavior
- Identify employees with needed skill-sets for further promotion opportunities

The requirements vary from company to company. Companies like Motorola certify employees upon completion of training. Kwikset's intention is to offer certification after completing two projects that reduce defects by 90% and display a "mastery" of the tools taught in Six-Sigma training. General Electric originally asked for a submission packet with examples of tools used, along with requiring completion of two projects with 80% defect reduction.

VII. Conclusion

Below list shows the survey result that has been conducted among 50 employees, engineers, shop floor supervisors and some managers, who have been through the Six Sigma training:

- No respondents knew what the process was for applying and receiving certification.
- 83% were unaware that there was any form of reward and recognition associated with achieving certification.
- 42% felt that certification provided recognition. Still the majority of people remained unaware that there were benefits associated with achieving certification.
- The benefits of the program in general are understood by people, although the understanding that certification is a motivational tool is not expressed or acknowledged.

The results showed that company goals can be achieved if the certification acts as a motivator for employees. There is a lack of understanding of the certification process; it's requirements, and the rewards and recognition that go with it. By improving communication about certification, the company goals and certification can be aligned. Therefore, the following actions are recommended:

- Develop a method of communicating about Six-Sigma certification. This needs to explain why the certification is offered, what rewards and recognitions are offered, and the procedure for attaining certification.

- A web site could be designed where an individual could:
  - Track number of projects completed.
  - Number of lean events they have led.

- Track dollar savings attached to each project or event.
- Track Six-Sigma and Lean "tool" use in a manner to help the certification review process.
- Where Black Belts are required to "mentor" Green Belts, projects could be tied together to show who mentored or advised on projects.
- A checklist to keep track of tools used in projects.
- Where Black Belts are required to be able to train Green Belt modules, these training classes can be documented with any information required by the certification review board.

References

1. Tadikamalla, P (1994) *The confusion over six sigma quality*, Quality Progress, Vol. 27, Issue 11, pp 83-85
2. McFadden, F (1993) *Six sigma quality programs*, Quality Progress, Vol. 26, Issue 6, pp 37-42
3. Dambolena, I and Rao, A (1994) *What is six sigma quality anyway?*, Quality, Vol. 33, Issue 11, p 10
4. Welch, J (1996) *Quality 2000*, Executive Excellence, Vol. 13, Issue 9, pp 4-5
5. Fontenot, G and Behari, R and Gresham, A (1994) *Six sigma in customer satisfaction*, Quality Progress, Vol. 27, Issue 12, pp 73-76
6. Bowman, R., *Best Practices: The Joy of Six-Sigma*, Distribution, Vol. 96, Issue 9, (1997), pp 62-67.

Bibliography

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