Continuous Navy Ships Process Improvement: Six Sigma, Lean Thinking, and Theory of Constraints

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Abstract

Long waiting time in the equipment repair process in Norfolk Naval Shipyard is an actual problem. The main cause of this problem is the poor knowledge of the continuous process improvement techniques as Six Sigma, Lean Thinking, and Theory of Constraints. The actual equipment repair process steps were verified in an effort to reduce the time, cost and having a well organization, making NNSY a better workplace. The three methodologies were implemented and analyzed. This article will demonstrate that the best choices for this specific case were six sigma and lean thinking methodologies because of the culture of the organization. They both produced time saving in the equipment repair process, some costs saving and a better organization in the shipyard.

Problem

The actual NNSY equipment repair process takes about 31 days (1 month). This process starts when some problem occurs inside the ship with specific equipment. The sailors need to inform the situation to their superiors and they let the engineers know about it. The engineers go and visit the site, see the problem and, from then on, the written instructions are sent to the electricians and mechanics. The instructions begin with the disconnection and removing of the damaged item or equipment from the ship and finish with the reinstallation of it. The complete old equipment repair process steps presented in Table 1, indicating the time in days that each one takes. This time is unsatisfactory for the clients.

Tables & Figures

Table 1

Actual Equipment Repair Process

Process	Days
Remove Item or Equip	2
Test	1
Collection of Data	1
Transport	1
Inspection	1
Transport	1
Disassemble	2
Look in the inventory	1
Order	1
Waiting	10
Repair	3
Test	1
Collection of Data	1
Employees Motion	1
Transport	1
Installation	2
Inspection	1
Total	**31**

Table2

Equipment Repair Process Improved

Reduced Process	Days
Remove Item or Equip	2
Test	2
Collection of Data	2
Disassemble	2
Order	1
Repair	3
Installation	2
Total	**14**

Figure 1
Process Structure

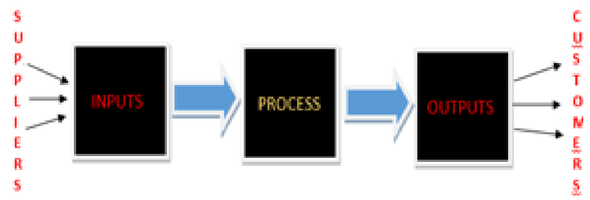

Figure 2
Six Sigma technique

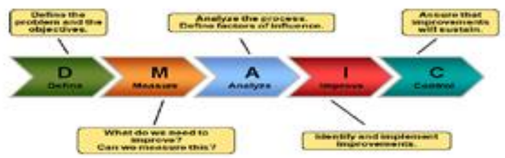

Figure 3
Lean Thinking technique

Figure 4
Theory Of Constraints technique

Methodologies

During the implementation of the first methodology, Six Sigma, the DMAIC technique ,Figure 2, was used and identified. Then the implementation of the second methodology, Lean Thinking, was applied finding and reducing the 4 existing wastes in the equipment repair process; transportation, inventory, motion, and waiting. Finally the 5s technique was just taken under consideration from the third methodology applied, theory of constraints, and was added in the improvement of the other two methodologies.

Results

After applying all the methodologies and techniques Table 2 shows the total days that the equipment repair process will take. After the wastes were eliminated the process was reduced from 31 days to 14. The difference in days is 16 days; two weeks of difference will be satisfactory for the client.

Conclusion

This article has demonstrated that the methodologies of Six Sigma and Lean Thinking were successful for the improvement of the NNSY equipment repair process, demonstrating a reduction of time and cost, making NNSY a better organization.

Six Sigma was implemented first and then in its fourth step (improving) Lean Thinking was implemented. During this methodology, in the elimination of waste motion, a technique of the third methodology (Theory of Constraints) was implemented, called 5S'.

The three process improvement methodologies make a few of the same assumptions. Each improvement methodology, when they were implemented, is set toward common tools and concepts. However, knowing that the organization values visual change and right now time, the focus was on waste and flow time. That is why six sigma and lean thinking were fully chosen with just a small technique of theory of constraints.