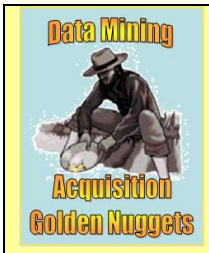

Note: The information provided is for reference purposes only. Although the information provided was accurate and current when first created, it may now be dated. The "Born-on-Date" is when the document was first created. Please contact the originator for updates. Please review the DAU Legal Notice at the bottom of the AKSS homepage for additional guidance. **Keywords** are highlighted in bold.

Problem: You are in charge of providing cost-wise readiness and dominant maritime combat power to the Navy and Marine Corps. How do you best implement that?

Solution: In 1999, NAVAIR implemented the first of three AIRSpeed programs as a way to reduce the cost of doing business, improve productivity and increase customer (warfighter) satisfaction with Depot AIRSpeed. This was followed by Enterprise AIRSpeed in 2003 and NAVAIR AIRSpeed in 2004. All three programs seed to increase productivity by implementing a common set of industry proven tools:

- Lean
- Six Sigma
- Theory of Constraints eliminates process constraints (bottlenecks) so the workforce can focus on efficient operations.

The Cherry Point Depot used TOC on its H-46 program to reduce turnaround time from 200+ days to 135 days, and reduced aircraft in work from 28 to 14.

Title: Using **Theory of Constraints (TOC)** to Improve **Quality**, Cost and Productivity.

Value Statement: To make money you must improve throughput and productivity, and closely control resources (inventory and other expenses). TOC helps you to identify the constraints in a process so that you can minimize the impact.

Born-on-Date: 15June 2004

Background: In the mid-80's, Dr. Eliyahu Goldratt, developed TOC. This management tool focuses on reducing costs and improving productivity by identifying and removing "constraints" in a system. A constraint is a factor that limits an organizations ability to achieve its goal. Further refinement of TOC has resulted in a body of knowledge, techniques and practices that have come to be known as synchronous manufacturing, which includes TOC.

Discussion: In order to identify and manage constraints, TOC employs five Thinking Process tools (taxonomies) that support the change process:
Current Reality Tree: Using experienced and involved individuals, it identifies the root causes of a problem (what to change).
Evaporating Cloud: Identifies a solution to the core problem and

uncovers the factors that caused the problem in the first place.
Future Reality Tree: Identifies what is missing from the proposed solution before you implement changes (what to change to).
Prerequisite Tree: Identifies the intermediate steps and obstacles that need to be taken to reach your new goal or process (how to cause change).
Transition Tree: Identifies the actions (implementation plan) you need to take, given the current situation, to achieve your intermediate goals (as identified in the Prerequisite Tree).

The output of a plant (or process) is dictated by the bottleneck. In TOC terms the bottleneck is called the "drum" and it paces the plant. "Buffer" is the inventory in front of the bottleneck that is there to ensure that the bottleneck is never idle. The "rope" is the communication system used to communicate the inventory needs of the bottleneck back to the material release point. Control the bottleneck and you control production. Improving non-bottlenecks is a waste of time and resources

TOC Process Steps:

Step 1: Identify the constraint.
Step 2: Focus on how to get more production at that constraint within the existing capacity limitations.
Step 3: Keep materials needed next from sitting idle in a queue at a non-constrained resource.
Step 4: If, after fully exploiting this process and you still cannot produce enough product to meet the demand, find other ways to increase capacity (e.g. second shift, more machines/manpower, etc.)
Step 5: Go back to step 1.

Results:

TOC has been successfully applied on many DoD programs, often in conjunction with other continuous improvement tools, for example:

- USMC Maintenance Center Barstow used TOC to layout a better refurbishment schedule for the M1150 series tractor.
- The Navy on the Harry S. Truman (CVN 75) is using Lean-Pathways, TOC and Six Sigma to streamline production processes.
- The Global Power Fighter Combined Task Force at Edwards AFB is using TOC to better manage its test projects.
- Ford Motor Company used TOC to cut the lead time from release of material to shipping from 10.6 days to 2.2 days.
- The Harris Corporation cut it's time to ramp up to production from 18 months to 21 days!

Benefits:

The application of Theory of Constraints to a weapon system program in production can result in significant reductions in cost and cycle times, and major improvements in quality, responsiveness and performance.

Application to other programs:

This practice is applicable on any program in which a new high-technology product is being designed, developed, produced and/or maintained.

Key words: TOC, Theory of Constraints, Drum, Buffer, Rope, Constraint

(keywords are used to support improved search capabilities in the information repository):

Additional Resources:
http://www.goldratt.com/ link to the Goldratt Institute
http://www.eas.asu.edu/~cse566/toc1.htm good tutorial
http://acc.dau.mil/simplify/ev_en.php click on the Production, Quality and Manufacturing Special Interest Area for additional information

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