PROJECT *FLOW* 2005

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September 8-9, Chicago, IL

IMPLEMENTING CRITICAL CHAIN

Results and Lessons Learned

Over 120 delegates from leading organizations attended the 2nd Project Flow conference held in Chicago (USA) on September 8 and 9, 2005. From maintenance and repair to high-tech product development, they have implemented Critical Chain to increase project speed, throughput and due-date performance.

We thank the following organizations for sharing their case studies at the conference, and have compiled a summary of their results and lessons learned in this document.

Airgo Networks

Bosch CCTV

Computerised Business Solutions

DaimlerChrysler

HP Digital Camera Group

Oregon Freeze Dry

US Marine Corps

Warner Robins Air Logistics Center

RESULTS REPORTED IN PROJECT FLOW 2004 AND 2005

	BEFORE	AFTER
Next Generation Wireless Technology Product Development Airgo Networks	Cycle time from first silicon to production for 1st generation was 19 months.	Cycle time from first silicon to production for 2nd generation was 8 months.
Automotive Product Development DaimlerChrysler	Cycle time for prototype builds was 10 weeks.	Cycle time for prototype builds is 8 weeks. Delivery date performance increased by 83% with much less fire fighting.
Telecommunications Network Design and Installation eircom, Ireland	On-time delivery less than 75%. Average cycle time was 70 days.	Increased on-time delivery to 98+%. Average cycle time dropped to 30 days.
Biotechnology Plant Engineering Genencor	20% projects on time.	87% projects slated to complete on time, with approximately 15% immediate increase in throughput.
Home Appliances New Product Development Hamilton Beach/ Proctor-Silex	34 new products per year. 74% projects on time.	Increased throughput to 52 new products in 1st year, and to 70+ in 2nd year, with no increase in headcount. 88% projects on time.
High Tech New Product Development HP Digital Camera Group	6 cameras launched in 2004. 1 camera launched in the spring window. 1 out of 6 cameras launched on time.	15 cameras launched in 2005, with 25% lower R&D expenses. 7 cameras launched in the spring window. All 15 cameras launched on time.
ASIC Design Technology Development LSI Logic	74% projects on time for small projects; major tool releases were late.	Due-date performance increased to 85% projects on time; major tools released on time for three years in a row.
Telecomm Switches Design, Development and Upgrades Lucent Technologies		300 to 400 active projects with 30+ deliveries a month. Cycle times are 10 to 25% shorter while throughput per person higher by 45%.
High Tech Medical Product Development Medtronic	1 software release every 6-9 months. Predictability was poor on device programs.	1 software release every two months. Substantial improvement in delivering device programs on time.

	BEFORE	AFTER
Electrical Power Transmission, Engineer-to-Order ABB AG, Power Technologies Division	Throughput was 300 bays per year.	Throughput increased to 430 bays per year.
Food Preparation and Packaging Oregon Freeze Dry	72 sales projects completed per year.	171 sales projects completed per year. 52% increase in throughput dollars.
Garment Design Skye Group	Product ranges were late to market.	100% due-date performance. 30% reduction in lead times and sampling costs.
Warfighter Systems Testing US Air Force Operational Test & Evaluation Center	18 projects in six months. On time delivery unknown.	26 projects in six months. 75% projects on time; 30% reduction in cycle time.
Aircraft Repair & Overhaul US Air Force, Warner Robins Air Logistics Center, C5 Production Line	Turn around time (TAT) 240 days. 13 aircrafts in repair cycle.	Turn around time (TAT) 160 days. 7 aircrafts in repair cycle.
Aircraft Repair & Overhaul US Marine Corps Logistics Base, Barstow, CA	Repair cycle time (RCT) for MK48 was 168 days. RCT for LAV25 was 180 days. RCT for MK14 was 152 days. RCT for LAVAT was 182 days.	Repair cycle time (RCT) for MK48 is 82 days. RCT for LAV25 is 124 days. RCT for MK14 is 59 days. RCT for LAVAT is 122 days.
Aircraft Repair and Overhaul US Naval Aviation Depot, Cherry Point	Average turnaround time (TAT) for H-46 aircrafts was 225 days. Average turnaround time (TAT) for H-53 aircrafts was 310 days; throughput was 23 per year.	Reduced TAT to 167 days, a 25% reduction while work scope was increasing. Reduced TAT to 180 days, a 41% reduction; delivered 23 aircrafts in six months (throughput of 46 per year). 70% reduction in backshop backlog due to better synchronization on aircraft lines.
Submarine Maintenance and Repair US Naval Shipyard, Pearl Harbor	Job Completion Rate = 94%. On-time delivery less than 60%. Cost per job was $5,043.	Job Completion Rate increased to 98%. Increased on-time delivery to 95+%. Reduced cost per job to $3,355, a 33% reduction; manning dropped by 25%. Overtime reduced by 49%, a $9M saving in first year.

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LESSONS LEARNED

Practitioners at both the 2004 and 2005 conferences have shown that significant gains are possible with Critical Chain. They also stressed that implementation must be swift.

Once you decide to implement Critical Chain, it is important to forge the new system while the iron is hot. If you don't start getting results in two to three months, the implementation will become difficult.

Below are the key lessons in implementing Critical Chain.

LESSON: IMPLEMENT THE THREE RULES, NO MORE NO LESS!

All the implementation challenges fall under either achieving buy-in or establishing robust mechanics. It is very easy to spend a lot of energy in those areas by educating everyone thoroughly, tweaking data endlessly, customizing reports etc.

To not get overwhelmed, we must remind ourselves that Critical Chain is about implementing its three rules:

1. **Pipelining**: Stagger project starts
2. **Buffering:** Shorten cycle times, include 50% buffers
3. **Buffer Management:** Follow task priorities, don't waste buffers

It is impossible to implement these rules piecemeal. All three have to be implemented from the get-go, without compromise. Any concession will only show up as resistance to change or cumbersome mechanics. For example:

- Organizations doing large projects tend to implement Critical Chain one project at a time. They compromise the PIPELINING rule. When projects are not staggered, resource conflicts are bound to arise. Buffers get consumed and commitments are missed. Project Managers do not cut cycle times. Task Managers cannot follow task priorities. Very quickly, faith in the new system is lost.
- Many times organizations initially aim to just deliver projects on time without increasing speed and throughput. They compromise the BUFFERING rule (cycle times are not cut, but buffers are added). When cycle times are not cut, PIPELINING rule also has to be compromised because staggering the projects would cause all due-dates to be pushed far out. When projects are not pipelined, BUFFER MANAGEMENT cannot be done. The entire system falls apart.
- Some managers compromise the BUFFER MANAGEMENT rule because they feel it is "micromanagement". In reality, without management, buffers get wasted which creates a feeling that shorter cycle times are unrealistic. Sooner or later the organization reverts to its old ways (not staggering project starts; hiding safeties in project plans, and setting priorities *ad hoc* in execution).

Instead of reacting to symptoms when we hit roadblocks, it is better to diagnose which of the rules has been compromised.

LESSON: IMPLEMENT IN EIGHT SIMPLE STEPS

The following eight simple steps keep everyone focused on the three rules, while achieving buy-in's and establishing robust mechanics:

1. **Create management consensus on business needs:** Do not pursue Critical Chain for the sake of adopting a "best practice". Use business needs to drive the implementation.
2. **Get buy-in on improvement potential:** Managers have to be convinced about the waste before they will adopt new rules. A useful technique is to enumerate and quantify the losses from Interruptions and Parkinson's Law.
3. **Get buy-in on the 3 rules and set ambitious targets:** To ensure that managers are not just paying lip service to the three rules but are committed, *they* should be asked to set ambitious improvement targets.
4. **Design the solution:** Mechanics cannot be perfect in the beginning, but a few items must be figured out up-front: roles of master scheduler, project managers and task managers; project architecture; and policy-type changes. Everything else can be adjusted later on.
5. **Create pipeline plan and validate it:** Check that the overall pipeline plan meets throughput targets. If it does not, re-evaluate the targets or cut cycle times across-the-board.
6. **Establish Task Management:** Task Management is the cornerstone of Buffer Management in multi-project environments. Task Management is monitoring remaining duration; and allowing tasks to be executed with minimal interruptions and in the right order of priority.
7. **Establish surrounding processes**: Put in place the pipeline, project and resource management processes.
8. ***Use Buffer Diagnostics (and TOC's 5 Focusing Steps) to continue improving:*** Only ongoing improvement can guarantee sustainment. Use Buffer Diagnostics to guide local improvements, and the Five Focusing Steps to guide business-level improvements.

LESSON: TOP MANAGEMENT MUST PLAY AN ACTIVE ROLE

Sponsorship is not enough. Even though the top managers' role is to set policies and make planning-time decisions (execution is delegated to middle mangers and frontline managers), in successful implementations the top managers play a more active role for the first 6 to 12 months by:

- **Setting Aggressive Goals:** Only when aggressive goals are set that substantial improvements happen. An organization is more easily galvanized around ambitious goals than incremental improvements. For example, though people were overloaded and projects running behind, HP Digital Camera group set an audacious target of going from 6 new cameras in a year to 15. They actually achieved their target, delivering all projects on time with an implementation that went live in six weeks.
- **Creating a Habit of Managing Buffers:** Close oversight by top management is necessary until Buffer Management becomes second nature. For example, the senior leadership in Warner Robins ALC go on daily rounds and personally get involved in resolving issues.
- **Not Delegating the Implementation Until Transition is Complete:** Only top management can proactively identify and eliminate policy obstacles. For example, John Quigley, VP of Engineering at the rapidly growing Airgo Networks, stays involved in pipelining, task management and even training new managers.

By implementing the three rules in eight simple steps, with top management playing an active role, it is possible to achieve success swiftly and surely.