EXECUTION MANAGEMENT RESULTS

As reported by Realization's clients

In the past six years, hundreds of managers have attended Realization's Project Flow conferences. From maintenance and repair to high-tech product development, they have implemented Critical Chain Execution Management to increase project speed, throughput and due-date performance.

We thank our clients for sharing their case studies, and have compiled here a summary of their results and lessons learned.

Celsa Group
ABB AG, Power Technologies Division
ABB Córdoba
USAF, Oklahoma City Air Logistics Center
ABB, Halle
Action Park Multiforma Grupo
Airgo Networks
Alcan Alesa Technologies
Alcatel-Lucent
Alna Software
US Naval Aviation Depot, Cherry Point
Amdocs
Army Fleet Support
BHP Billiton
Boeing Space & Intelligence Systems
C.N. Cofrentes (Iberdrola)
Central Nuclear Almaraz Trillo
Chrysler
Corpus Christi Army Depot
Danisco (Genencor International)
Delta Air Lines, Inc.
US Navy, Fleet Readiness Center Southeast, P-3
Dr. Reddy's Laboratories
e2v Semiconductors
USAF Operational Test & Evaluation Center
eircom
Erickson Air-Crane
French Air Force, SIAé Clermont Ferrand
Von Ardenne
Hamilton Beach Brands, Inc.
HP Digital Camera Group
LeTourneau Technologies, Inc.
LSI Logic
Marketing Architects
US Marine Corps Logistics Base, Barstow
Medtronic
Oregon Freeze Dry
Procter & Gamble Pharmaceuticals
Rapid Solutions Group
Skye Group
US Naval Shipyard, Pearl Harbor
TATA Steel
Valley Cabinet Works
TECNOBIT
ThyssenKrupp (Johann A. Krause, Inc.)
Medtronic, Europe
USAF, Ogden Air Logistics Center
USAF, Warner Robins Air Logistics Center
Votorantim

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	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.
Power Transformers, Engineer-to-Order ABB Córdoba	Engineering cycle time was 8 months. On-time delivery was 85%.	Engineering cycle time reduced to 3 months. On-time delivery improved to 95%. 16% increase in manufacturing throughput (revenues).
Transformer Repair and Overhaul ABB, Halle	42 projects completed in 2007. On-time delivery was 68%.	54 projects completed in 2008. On-time delivery improved to 83% .
Theme Park Design, Install and Commissioning Action Park Multiforma Grupo	121 projects completed in 2004.	142 projects completed in 2005. 153 projects completed in 2006.
Telecomm Switches Design, Development & Upgrades Alcatel-Lucent	300-400 active projects with 30+ deliveries a month. Lead times were long. On-time delivery was poor.	Throughput increased by 45% per person. Lead times shortened by 10-25%. On-time delivery improved to 90+%.
Customer Experience Systems – Customized SW Development for Telecommunications Amdocs	Market pressure to reduce cost and cycle time. 8 projects in crisis requiring CEO level attention in 2007.	14% increase in revenue/man-month. 20% reduction in cycle time. 0 project in crisis in 2008.
Iron Ore Asset Development Projects BHP Billiton	25,800 man-hours of engineering design work had to be completed in 8 months. Historical delays of 2 weeks and man-hour overruns of 20%.	Project finished 3 weeks early. Productivity increased by 25% with only 19,500 man-hours needed.
Satellite Design and Assembly Boeing Space & Intelligence Systems	Reflectors were the constraint in Antenna and Satellite delivery. Electronic units were late, delaying Satellite subsystems. Classified Government program was behind schedule and losing money. Operation was losing $200M a quarter.	Doubled Reflectors throughput and reduced cycle time by 28%, alleviating delivery constraint. Increased productivity in Antenna Assembly and Test by 64% and subsequently another 26%. Reduced cycle time for Electronic units, allowing subsystems to finish 30% faster. Stabilized schedule and returned money to Government 4 quarters in a row. Operation turned profitable.
Nuclear Power Engineering Central Nuclear Almaraz Trillo	19 design evaluation and modification projects were being completed per month.	Throughput increased by 25% to 24-30 projects per month.
Nuclear Power Engineering C.N. Cofrentes (Iberdrola)	Due-date performance was 60%.	Due-date performance increased to 95%. Throughput increased by 30%.
Processing of Purchase Requests A Department of Defense Procurement Organization	Long delays in processing requests. Long cycle times.	Delays reduced by 40%. 76% reduction in cycle time. 29% increase in throughput.
Oil & Gas Platform Design & Manufacturing LeTourneau Technologies, Inc.	Design Engineering took 15 months. Production Engineering took 9 months. Fabrication and Assembly took 8 months.	Design Engineering takes 9 months. Production Engineering takes 5 months. Fabrication and Assembly takes 5 months with 22% improvement in labor productivity.
Advertising Product Development Marketing Architects	Completed 7 projects in 2006.	Completed 7 projects in first 8 months of 2007.
Steel Plant Maintenance TATA Steel	Boiler Conversion projects took 300-500 days. Routine maintenance and upgrade took too long.	Boiler Conversion projects took 120-160 days. In 2007, 1st year of Critical Chain, reduced maintenance and upgrade cycle times by 10-33% (savings of $13.4 million). In 2008, achieved a further 5-33% reduction in cycle time.
Defense Products Design and Manufacturing TECNOBIT	Difficult to synchronize Design and Manufacturing. Long project cycle times with frequent delays.	Project cycle times reduced by 20%.
Automotive Assembly Systems, Engineer-to-Order ThyssenKrupp (Johann A. Krause, Inc.)	70% of projects were late. High overtime and outsourcing.	Lateness reduced by 50%. 63% gains in productivity. 15% more projects completed.
Custom Furniture Design and Manufacturing Valley Cabinet Works	Struggled to complete 200 projects per year. Revenues were flat, business was just breaking even.	Completed 334 projects in the first 9 months. Revenues increased by 88% and profits by 300%.
Equipment for Manufacturing Solar Panels, Engineer-to-Order Von Ardenne	Revenues of €130 M. Profits of €13 M. Cycle time was 17 weeks. On-time delivery was 80%.	Revenues of €170 M. Profits of €22 M. Cycle time reduced to 14 weeks. On-time delivery improved to 90%.

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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.
Material Handling Solutions, Engineer-to-Order Alcan Alesa Technologies	Completed an average of 6.9 projects per year.	Completed 10 projects in first 8 months of 2009. 31% increase in throughput-dollars.
Customized Software Development Alna Software	Growth was stagnating, becoming insufficient to secure market position.	Throughput increased by 14% in the first 6 months. Cycle time reduced by 25% and project completions increased 17% with over 90% on-time delivery.
IT Projects Celsa Group	15 SAP functionality projects were completed per month.	SAP functionality project completions increased by 30% to 20 projects a month.
Automotive Product Development Chrysler	Cycle time for prototype builds was 10 weeks.	Cycle time for prototype builds reduced to 8 weeks.
Biotechnology Plant Engineering Danisco (Genencor International)	20% projects on time.	87% projects on time. 15% immediate increase in throughput.
Pharmaceutical Product Development Dr. Reddy's Laboratories	In 12 weeks prior to Critical Chain, 6 projects were completed; 20% were on time.	In 12 weeks since Critical Chain was implemented, 11 projects completed; 80% on time.
Telecommunications Network Design & Installation eircom	On-time delivery was less than 75%. Average cycle time was 70 days.	Increased on-time delivery to 98+%. Average cycle time dropped to 30 days.
Semiconductor Design and Manufacturing e2v Semiconductors	Actual cycle time of projects was 38 months; 25% of projects were on time.	Actual cycle time reduced to 23 months; almost all projects are within the committed cycle time of 24 months.
Helicopter Manufacturing and Maintenance Erickson Air-Crane	Only 33% projects completed on time.	Projects completed on-time increased to 83%.
Home Appliances New Product Development Hamilton Beach Brands, Inc.	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 head count. 88% projects on time.
Digital Camera Product Development HP Digital Camera Group	6 cameras launched in 2004. 1 camera launched in spring window. 1 out of 6 cameras launched on time.	15 cameras launched in 2005. 7 cameras launched in 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 always late.	85% of small projects on time. Major tools released on time for three years in a row.
High Tech Medical Product Development Medtronic	1 software release every 6-9 months. Predictability was poor on device programs.	1 software release every 2 months. Schedule slips on device programs cut by 50%.
High Tech Medical Product Development Medtronic, Europe	Device projects took 18 months on average and were unpredictable.	Development cycle time reduced to 9 months. On-time delivery increased to 90%.
Food Preparation & Packaging Oregon Freeze Dry	72 sales projects completed per year.	171 sales projects completed per year. 52% increase in throughput-dollars.
Pharmaceutical Product Development Procter & Gamble Pharmaceuticals	In 2005, completion rate was 5 projects/quarter; 55% of projects delivered on time.	In 2008, completing 12 projects/quarter; 90% of them are on time, with the same number of resources.
Marketing/Publishing Support Rapid Solutions Group	Projects were always late. Lead times were not acceptable.	On-time delivery improved by 30%. Lead times reduced by 25%.
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	Long cycle times. Low utilization of resources. Poor visibility of project slips.	30% reduction in cycle time measured over 900 projects. 30% improvement in resource utilization. 88% on-time delivery performance.
Process Plant Turnaround (Nickel Smelting) Votorantim	Projects were late and over budget.	Project 1 delivered on time. Project 2 delivered 1 day earlier (with 10% extra scope). Actual cost was 96% of planned budget.

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Helicopter Maintenance, Repair and Overhaul (For Flight Schools) Army Fleet Support	Maintenance workload increased by 37% and turnaround times were long, leading to helicopter shortages.	32% reduction in CH-47 turnaround time. 52% reduction in UH-60 turnaround time. 8 aircraft returned to customer ($90M in cost avoidance). 18,000 sq ft of hangar space freed up ($2M in cost avoidance).
Helicopter Maintenance, Repair and Overhaul Corpus Christi Army Depot	Throughput of 5.4 aircraft per month. Work scope per aircraft was increasing. Turnaround times were unacceptable.	Throughput increased to 6.3 aircraft per month. 50% reduction in Apache turnaround time. 15% reduction in CH47 turnaround time. 15% reduction in Pavehawk turnaround time.
Engine Repair and Overhaul Delta Air Lines, Inc.	Produced 40 engines per month. 4 weeks piece-part cycle time.	Increased production to 50+ engines per month, with 16%-26% reduction in engine turnaround time. 2.5 weeks piece-part cycle time, with 25% increase in throughput.
Aircraft Upgrade and Repair French Air Force, SIAé Clermont Ferrand Transall Production Line	5 aircraft on station. Cycle time of 165 days.	3 aircraft on station, 2 aircraft returned to Air Force, a replacement value of €300 M. 15% cycle time reduction, 15% increase in output with 13% fewer resources; 22% reduction in support shops' cycle time.
Aircraft Repair and Overhaul US Air Force, Ogden Air Logistics Center C130 Production Line	21-24 aircraft on station.	Reduced to 18 aircraft on station. 25 out of 26 aircraft delivered on time or early (191 days of aggregate early delivery in 6 months).
Aircraft Repair and Overhaul US Air Force, Oklahoma City Air Logistics Center B-1 Production Line	Turnaround time 162 days. 7 aircraft in repair cycle.	Turnaround time reduced to 115 days. 4 aircraft in repair cycle (3 returned to customer). Production output increased from 185 hours/day to 273. 1 ½ dock spaces freed up.
Aircraft Upgrade and Repair US Air Force, Oklahoma City Air Logistics Center B52 Production Line	Produced 11 aircraft a year. Cycle time of 225 days.	Produced 17 aircraft a year. Cycle time of 195 days.
Aircraft Upgrade and Repair US Air Force, Oklahoma City Air Logistics Center E3 Production Line	4 aircraft on base. Cycle time of 183 days.	On average 2.6 aircraft on base. Cycle time of 155 days. 11% capacity released for additional workload.
Aircraft Maintenance, Repair and Overhaul US Air Force, Oklahoma City Air Logistics Center KC135 Production Line	Average turnaround time was 327 days.	Average turnaround time reduced to 146 days. 44% increase in throughput from Q4 2008 to Q4 2009.
Aircraft Repair and Overhaul US Air Force, Warner Robins Air Logistics Center C5 Production Line	Turnaround time 240 days. 13 aircraft in repair cycle.	Turnaround time 160 days. 7 aircraft in repair cycle. 75% fewer defects.
Aircraft Upgrade and Repair US Air Force, Warner Robins Air Logistics Center C17 Production Line	Throughput of 178 hours per aircraft per day. Turnaround time 46-180 days. Mechanic output was 3.6 hours per day.	25% increase in throughput. Turnaround time reduced to 37-121 days. Mechanic output increased to 4.75 hours per day. 40% overtime reduction.
Army Vehicles Maintenance and Repair US Marine Corps Logistics Base, Barstow	Repair cycle time for MK48 was 168 days. Repair cycle time for LAV25 was 180 days. Repair cycle time for MK14 was 152 days. Repair cycle time for LAVAT was 182 days.	Repair cycle time for MK48 reduced to 82 days. Repair cycle time for LAV25 reduced to 124 days. Repair cycle time for MK14 reduced to 59 days. Repair cycle time for LAVAT reduced to 122 days.
Aircraft Repair and Overhaul US Naval Aviation Depot, Cherry Point	Average turnaround time for H-46 was 225 days. Average turnaround time for H-53 was 310 days. Throughput was 23 aircraft per year.	Reduced H-46 turnaround time to 167 days, while work scope was increasing. Reduced H-53 turnaround time to 180 days. Delivered 23 aircraft in the first 6 months. Throughput increased to 46 aircraft per year.
Submarine Maintenance and Repair US Naval Shipyard, Pearl Harbor	Job completion rate was 94%. On-time delivery was 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. Overtime dropped by 49%, a $9M saving in the first year.
Aircraft Maintenance and Upgrades US Navy, Fleet Readiness Center Southeast, P-3	Produced 6 aircraft in 2008.	Produced 9 aircraft in the first 9 months of 2009.

LESSONS LEARNED

OVERDUE and OVER BUDGET is what comes to mind when one mentions "projects." An equally depressing image is one of long hours, firefighting and chaos. It is against this backdrop that Critical Chain was introduced in 1997, to gain control over Project Execution.

Since 1997, Critical Chain has been deployed in a number of organizations. Many of them have reported impressive results – whether they are in the private sector or public; engaged in blue sky R&D or industrial projects; or large or small. Some of them have won top honors including the 2006 Franz Edelman award, the 2006 Shingo Gold, the 2007 Chief of Staff award, and the 2009 TOCICO Achievement award. Following are the key lessons and observations from those implementations.

NOT PLANNING AND TRACKING, BUT SYNCHRONIZED EXECUTION

Uncertainties are intrinsic to projects. Even the most carefully prepared plans become obsolete within days. Task priorities become unclear (which tasks to do first) and unsynchronized (every department, every person starts prioritizing their tasks differently). Consequently a project is mostly waiting for one thing or another, leading to significant loss of time and capacity.

The key to doing more projects faster is not precise planning or tighter tracking, but synchronizing execution efforts. It is vital to avoid the following traps in implementing Critical Chain:

- Believe that commitments are not met because they are unrealistic; and that Critical Chain helps by level-loading the resources and adding buffers;
- Capture all the data and variables so that we can optimize the project plans and provide precise instructions in execution; and
- Use buffer reports to mainly enhance visibility for top management.

Successful managers stress that Critical Chain is about managing execution effectively:

- Significant time and capacity are wasted due to poor synchronization. Critical Chain improves synchronization with its 3 Rules;
- Reflect only key variables in project plans because uncertainties will cause even the most meticulous plans to go awry in execution; and
- Use buffer-based priorities to synchronize the entire organization—resources doing the tasks; support departments; vendors; managers and experts.

CULTURE AND BEHAVIORS ARE AN EFFECT, NOT A PREREQUISITE

Organizational culture and people's behaviors under Critical Chain are undeniably different from traditional culture and behaviors. However, culture and behaviors cannot change before results happen.

In addition, culture and behaviors are broad and nebulous terms; if not careful, they can become a smokescreen to hide real implementation issues.

Most importantly, culture and behaviors stem from how you manage. Change the management rules and associated policies and measurements, and the culture and behaviors will also begin to change! Results that come from new Rules will only accelerate those changes!!

HOW TOP MANAGEMENT CAN PLAY AN ACTIVE ROLE

Mere sponsorship by top managers is not enough. In successful implementations the top managers take on a more active role for the first few months by:

- **Setting Aggressive Goals:** Only when aggressive goals are set do substantial improvements happen. Moreover, an organization is more easily galvanized around ambitious goals than incremental improvements.
- **Removing Policy Obstacles:** Middle managers and frontline managers encounter policy obstacles that they cannot remove. Only senior managers can identify and eliminate such obstacles.

  For example, middle managers frequently assume that project starts cannot be staggered because clients will not agree. However when the matter is brought up to top management, they are often willing to explain personally to their clients the benefits of pipelining projects. (The CEO of one medium-sized manufacturer of industrial equipment even undertook a tour of their customers around the world to explain pipelining and get their buy-in.)
- **Creating a Habit of Managing Buffers:** Close oversight by top management is necessary until managing buffers becomes second nature. In all successful implementations the top managers review priority reports and get involved in resolving issues for the first few weeks.

THE 3 RULES CAN ALSO BE APPLIED TO NON-PROJECT WORK

Project work is often supported by higher volume non-project work. Examples include component repair shops that feed aircraft and ship maintenance projects; testing and bug fixing in software development projects; and sales and field support that accompany engineering projects.

There are also high volume environments like claims processing; administrative work; and high volume production where execution is a problem.

Whereas in projects the effort and the cycle time are the same order of magnitude, in non-project work cycle times are an order of magnitude bigger than the effort. Can the 3 Rules for managing project execution also be applied to non-project work? The answer is yes.

The 3 Rules have been applied to repair shops in an MRO (Delta Air Lines) and purchase request processing (DSCR) with similar success. Both organizations experienced 25+% increase in throughput and 50+% reduction in cycle time and lateness.

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