Critical Chain Execution Management:

Not a Panacea, Just a Silver Bullet

Fifty years of failed promise

Since project management was invented in 1950's, it has created a multi-billion dollar industry worldwide. The Gartner Group estimates that companies spend more than $1 billion per year on project management software alone. Even with so much investment, it is regrettable that most projects, regardless of industry or type, are delivered late, over budget and under scope:

- Over 83 percent of IT projects are delivered late/over-budget. Projects completed from large companies have only 42 percent of the originally designed features and functions (Standish Group Report – Chaos, 2000).
- Over 85 percent of engineering projects in the semiconductor industry finish late (2001 survey by Numetrics, Inc., a semiconductor productivity research company).
- On average, high-tech projects are late by 100 percent, despite the use of project management software and traditional tools (University of California at Berkeley).
- Eighty percent of all embedded systems are delivered late (The Gansale Group, 2001).
- Most defense projects take too long/cost too much. Seven of the 10 largest smart procurement projects are late/over budget (National Audit Office, UK, Dec 2002).

In addition, organizations encounter strong resistance internally to project management:

- Rigorous project plans quickly degenerate into a series of artificial milestones.
- Project participants stubbornly refuse to provide timely updates on project progress.
- Executives often ignore resource availability during portfolio selection and prioritization.

As if 'customers' are the problem

The simultaneous presence of weak results and strong internal resistance leads many observers to, most incorrectly, conclude that there is a causal relationship: improvements do not materialize because there is a strong resistance to change. Therefore, they stress that the answer lies in educating the organization on benefits of discipline, grounding project managers in the discipline, and getting executives to enforce such discipline.

The alternative explanation – a flawed solution

There is a contrary opinion. Lack of improvements and resistance to change, others say, arise from the same root cause: traditional project management is useless for its 'customers'. Since the product does not serve their needs, failure and resistance are natural.

So, what is wrong with traditional project management?

Traditional project management assumes a perfect world, one that does not exist. The theory is that you create a good plan, track, and projects will get done. In reality, many uncertainties strike you in execution:

- Requirements change
- Technology fails
- Vendors do not deliver
- Work materializes slower than expected
- Approvals do not come on time
- Priorities change

The extent of uncertainties is what makes projects unique. These "unplannable" uncertainties account for more than 30% of a project's work. As uncertainties strike, plans go haywire, especially in multi-project situations. People are constantly pulled from one project to fix other projects' problems. Priorities become unclear and people start multitasking. Delays compound. Managers are continually surprised by schedule slips. Focus shifts from delivering projects to explaining delays.

The next time, people are forced to create a more meticulous plan. Of course, that only means they now have even more details to track and explain. Managers at every level, wary of all uncertainties and delays from their previous experience, begin hiding safeties in their commitments before sending the plan upwards. Finally, everyone gives up on project planning. Dictating commitments and "managing on the fly" looks more attractive.

Is it really rational to expect people to embrace project management, knowing that it will bring no benefits and, possibly make their life worse? Why force them to create project plans that will become obsolete before execution begins or issue a report status that is misleading?

The silver bullet

Critical Chain is the silver bullet that delivers results and lowers the resistance to change because of its unique ability to accommodate and manage uncertainties.

For the first time, managers can make project plans and execute them knowing they reflect the reality of their uncertain world. Of course, they still need basics like creating project plans, getting timely updates, and paying attention to resource availability. The difference is that by providing a means to accommodate and manage uncertainties, Critical Chain makes doing these activities practical and purposeful. For example:

1. **No detailed planning upfront:** Only high-level requirements and activities are needed during planning. Detailed project specifications are added as they become available in execution.

2. **No more re-planning cycles:** Even as uncertainties strike, project plans and due-dates remain valid. The burden of constant re-planning is removed.

3. **No need to hide local safeties:** Explicit buffers are available to absorb and lessen the shocks of uncertainties. Furthermore, Critical Chain even provides measurements that encourage people to give up local safeties.

4. **Simple, meaningful updates:** Project participants only report how much more time they need to finish what they are working on.

5. **Utility for project participants:** For the first time, project plans and progress updates can be used to dynamically synchronize priorities within and across projects.

6. **Early warning signals:** Managers do not have to manage on the fly.

7. **Resource balancing:** As resource estimates become more real, executives become eager to properly balance projects and resources instead of dictating commitments.

Implementation of Critical Chain

Given that it is still leading-edge, there are many myths surrounding Critical Chain. Some of these myths and corresponding realities are:

- **En masse cultural change myth:** One widespread myth is that en masse changes in organizational culture and individual behaviors are needed. You have to discard old, sinful behaviors and embrace new, holy behaviors. Extensive sermons by consultants are proposed. Reality proves that changes in organizational culture and individual behaviors are an effect of, not a prerequisite for, implementing Critical Chain.

- **Need for accurate data myth:** the second popular myth is that one needs to collect precise data on task uncertainties. Significant literature is devoted to the science and art of collecting such data. Reality shows that Critical Chain is powerful because uncertainties, by definition, cannot be precisely known.

- **Basic project management first myth:** In many quarters, there is also a belief that you need to do basic project management first - and then embark on Critical Chain. As discussed before, in reality, so-called basics stand no chance of success. Furthermore, these basics are actually more complicated to implement without the common sense of Critical Chain.

One might ask, "Where is the catch?" It is unrealistic to assume that nothing will have to change in order to reap the benefits of Critical Chain. So, here is the real scoop. Properly done, Critical Chain implementations rely on very few, but powerful, changes, brought about in a systematic manner.

Five changes that drive success

1. **Task Manager responsibility and measurement:** Task managers are closest to where projects are executed. Making them responsible for execution (define task details, ensure priorities are followed, and provide progress updates), and rewarding them accordingly gets you maximum bang for the buck.

2. **Master Scheduler role:** A senior person is made responsible for ensuring that project due-dates are capacity tested.

3. **Buffering Policy guidelines:** Executives specify the minimum buffers that projects should have to be considered for execution.

4. **Project templates:** A set of templates that anyone can customize/ fine-tune for their projects, without having to master the art of defining networks, are created. There are usually about half a dozen types of projects in any organization, small or large.

5. **Aggressive estimates at the task level to accommodate buffer:** Explicit buffers in projects also means that safeties should be reduced from individual task estimates. There are three ways to do so and managers decide on how they would do it in their organization.

Option A – Just do it:
Start with the due-date, put in the buffer and then shrink task durations to fit the available time. Half of the practitioners use this approach.

Option B – Take estimates from management:
Experienced managers usually know how long it takes to finish a task. Around one third of practitioners use this approach.

Option C – Ask rank and file:
They can provide estimates, assuming they will be working on only one task and they will not be penalized for exceeding the estimates.

With these five changes in place, a good information system takes care of the rest. It automates data collection, does the calculations, and provides appropriate reports to all managers so that they can measure performance and make decisions.

Fifty years after the advent of project management, it is finally possible to make projects finish on time, on budget and at scope. Successful operations know this and embrace Execution Management. Others languish in the land of fear and myths.

EXECUTION MANAGEMENT RESULTS

	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.
Transformer Repair and Overhaul ABB, Halle	42 projects completed January-December 2007. On-time delivery of 68%.	54 projects completed January-December 2008. On-time delivery of 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 was higher by 45% per person. Lead times are 10-25% shorter. 90+% on-time delivery.
Customer Experience Systems – Customized SW Development for Telecommunications Amdocs	8 projects in crisis requiring CEO level attention in 2007. Market pressures to reduce cost and cycle time of projects.	0 projects in crisis in 2008. Project cycle time decreased by 20%. Increase of 14% in revenue/man-month across 4,000 people.
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	Antenna Assembly and Test was the constraint in Satellite delivery.	Antenna Assembly and Test was no longer the constraint in Satellite delivery. Productivity increased by 64% on the next Satellite and a further 26% on the subsequent Satellite.
Nuclear Power Engineering Central Nuclear Almaraz Trillo	19 design evaluation and modification projects were 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%.
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 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%–saving 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 were 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% productivity gain. 15% more projects completed.
Custom Furniture Design and Manufacturing Valley Cabinet Works	Struggled to complete 200 custom furniture projects per year. Revenues were flat, business was just breaking even. A lot of firefighting in execution.	Completed 334 projects in 9 months. Revenues increased 88% and profits increased by 300% in the first year. Firefighting and thrashing eliminated.
Equipment for Manufacturing Solar Panels, Engineer-to-Order Von Ardenne	Revenues of €130 M. Profits of €13 M. Cycle time 17 weeks. On-time delivery of 80%.	Revenues of €170 M. Profits of €22 M. Cycle time 14 weeks. On-time delivery of 90%.

EXECUTION MANAGEMENT RESULTS

	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.
Customized Software Development Alna Software	Growth was stagnating, becoming insufficient to secure market position.	Throughput increased by 14% in 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 is 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 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.
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 of 5 projects/Quarter; 55% of projects delivered on time.	In 2008, completing 12 projects/Quarter; 90% of the projects 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 were 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.

EXECUTION MANAGEMENT RESULTS

	BEFORE	AFTER
Engine Repair & Overhaul Delta Air Lines, Inc.	Produced 40 engines per month. 4 weeks piece part cycle time.	Increased production to 50+ engines per month, 16%-26% reduction in engine turnaround time. 2.5 weeks piece part cycle time, 25% increase in piece part throughput.
Helicopter Manufacturing and Maintenance Erickson Air-Crane	Only 33% projects completed on time.	Projects completed on time increased to 83%.
Aircraft Upgrade and Repair French Air Force, SIAé Clermont Ferrand Transall Production Line	5 aircrafts on station. Cycle time of 165 days.	3 aircrafts on station, 2 aircrafts returned to Air Force, replacement value of €300 M. 15% cycle time reduction, 15% increase in output with 13% fewer resources; 22% reduction in support shops' cycle time.
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.
Aircraft Repair & Overhaul US Air Force, Ogden Air Logistics Center, C130 Production Line	21-24 aircrafts on station.	Reduced to 18 aircrafts on station. 25 out of 26 aircrafts delivered on-time or early. (Accumulated 191 days of early delivery in 6 months total).
Aircraft Repair & Overhaul US Air Force, Oklahoma City Air Logistics Center, B-1 Bomber Line	Turnaround time 162 days. 7 aircrafts in repair cycle.	Turnaround time reduced to 115 days. 4 aircrafts in repair cycle (3 returned to customer). Production output increased from 185 hours/day to 273. 1 1/2 dock spaces freed up.
Aircraft Upgrade and Repair US Air Force, Oklahoma City Air Logistics Center, B52 Production Line	Produced 11 aircrafts a year. Cycle time of 225 days.	Produced 17 aircrafts a year. Cycle time of 195 days.
Aircraft Upgrade and Repair US Air Force, Oklahoma City Air Logistics Center, E3 Production Line	4 aircrafts on base. Cycle time of 183 days.	On average 2.6 aircrafts on base. Cycle time of 155 days. 11% capacity released for additional workload.
Aircraft Repair & Overhaul US Air Force, Warner Robins Air Logistics Center, C5 Production Line	Turnaround time 240 days. 13 aircrafts in repair cycle.	Turnaround time 160 days. 7 aircrafts in repair cycle. 75% fewer defects.
Aircraft Upgrade & 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 & 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 is 82 days. Repair cycle time for LAV25 is 124 days. Repair cycle time for MK14 is 59 days. Repair cycle time for LAVAT is 122 days.
Aircraft Repair & Overhaul US Naval Aviation Depot, Cherry Point	Average turnaround time for H-46 aircrafts was 225 days. Average turnaround time for H-53 aircrafts was 310 days. Throughput was 23 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 aircrafts in 6 months. Throughput increased to 46 per year.
Submarine Maintenance & 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 1st year.

The Votes Are Also in

Attendees at the 2004 Project World held in October in Washington, voted, by an impressive majority of 92 percent, not to continue to throw more software at project management software problems. The consensus was that whether it's called 'project portfolio management,' 'enterprise project management' or 'collaborative project management,' they simply get more reports, more graphs, and more useless data. Yet, their projects are still delivered late, over budget and under scope.

"Execution Management is an extraordinarily powerful method which aligns business priorities and product pipeline execution," affirms Medtronic's Steve Schwister. "It provides us with improved pipeline velocity and increased productivity."

Like Schwister, today's executives know that their organizations have to deliver more projects faster, sometimes with fewer resources. Now they no longer need to feel stymied by the limitations of traditional project management, and increase project flow to meet the needs of business.

Is Execution Management right for your organization?

- Is your organization project-driven? Does increasing project speed or throughput translate into higher sales, competitive advantage and customer satisfaction?
- Do your projects require coordination of more than a handful of people and a few tasks? Are resources shared among multiple projects and contention for resources frequent?
- Are your project teams constantly rewriting project plans? Is project administration consuming excessive overhead?

If your answers to the above questions are "yes", contact us at info@realization.com.