

Results and Lessons Learned



FROM REALIZATION CUSTOMERS

Realization®

Results Through Project Execution™

MAINTENANCE, REPAIR AND OVERHAUL RESULTS

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	BEFORE	AFTER
ABB, Halle Transformer Repair and Overhaul	42 projects completed in 2007. On-time delivery was 68%.	54 projects completed in 2008. On-time delivery improved to 83%.
Army Fleet Support Helicopter Maintenance, Repair and Overhaul (For Flight Schools)	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 savings).
Delta Air Lines, Inc. Aircraft Engine Repair and Overhaul	476 engines produced per year. 4-8 weeks piece-part cycle time. 60 days landing gear turnaround time.	586 engines produced per year (23% increase). 30% reduction in engine turnaround time. 15 days piece-part cycle time (70% reduction). 25% increase in throughput. 30 days landing gear turnaround time (50% reduction). $60M monetized in assets from reduced turnaround time. **Ongoing improvement:** 10 days piece-part turnaround time (30% further reduction).
Erickson Air-Crane Helicopter Manufacturing and Maintenance	Only 33% projects completed on time.	On-time delivery increased to 83%.
French Air Force, SIAé Clermont Ferrand Transall Production Line Aircraft Upgrade and Repair	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.
US Air Force, Ogden Air Logistics Center 572nd AMXG, C130 Production Line Aircraft Maintenance, Repair and Overhaul	33 aircraft throughput in FY09. 36 aircraft on station.	44 aircraft throughput in FY10 (33% increase). 24 aircraft on station, 12 aircraft returned to Air Force.
US Air Force, Tinker Air Force Base 76th PMXG Aircraft Engine Repair and Overhaul	**Engine piece-part repair:** 137 days backshop cycle time. 260 parts/month backshop throughput. **Engines and Modules:** 45 modules/month throughput. 18 days cycle time.	**Engine piece-part repair:** 42 days backshop cycle time (69% reduction). 434 parts/month throughput (67% increase). **Engines and Modules:** 50 modules/month throughput (10% increase). 8 days cycle time (55% reduction).
US Air Force, Oklahoma City Air Logistics Center B-1 Production Line Aircraft Repair and Overhaul	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 (additional revenue potential $35M).
US Air Force, Oklahoma City Air Logistics Center B52 Production Line Aircraft Upgrade and Repair	Produced 11 aircraft a year. Cycle time of 225 days.	Produced 17 aircraft a year. Cycle time of 195 days.
US Air Force, Oklahoma City Air Logistics Center E3 Production Line Aircraft Upgrade and Repair	4 aircraft on base. Cycle time of 183 days.	2.6 aircraft on base on average. Cycle time of 155 days. 11% capacity released for additional workload.
US Air Force, Oklahoma City Air Logistics Center KC135 Production Line Aircraft Maintenance, Repair and Overhaul	Average turnaround time was 327 days.	Average turnaround time reduced to 146 days. 44% increase in throughput from Q4 2008 to Q4 2009.
US Air Force, Warner Robins Air Logistics Center C17 Production Line Aircraft Upgrade and Repair	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% reduction in overtime.
US Air Force, Warner Robins Air Logistics Center C5 Production Line Aircraft Repair and Overhaul	Turnaround time 240 days. 13 aircraft in repair cycle.	Turnaround time 160 days. 7 aircraft in repair cycle. 75% fewer defects.
US Army, Corpus Christi Army Depot Helicopter Maintenance, Repair and Overhaul	Throughput of 5.4 aircraft per month. Throughput for Black Hawk was much lower than required. Turnaround times were unacceptable. Work scope per aircraft was increasing.	Throughput increased to 6.3 aircraft per month. Black Hawk throughput increased by 40% in just 6 months. 50% reduction in Apache turnaround time. 15% reduction in CH47 turnaround time. 15% reduction in Pave Hawk turnaround time despite increased scope.
US Marine Corps Logistics Base, Barstow Army Vehicles Maintenance and Repair	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.

MAINTENANCE, REPAIR AND OVERHAUL RESULTS (cont.)

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	BEFORE	AFTER
US Naval Aviation Depot, Cherry Point Aircraft Repair and Overhaul	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.
US Naval Shipyard, Pearl Harbor Submarine Maintenance and Repair	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.
US Navy, Fleet Readiness Center Southeast, P-3 Aircraft Maintenance and Upgrades	Produced 6 aircraft in 2008.	Produced 9 aircraft in the first 9 months of 2009.
Votorantim Process Plant Turnaround (Nickel Smelting)	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.

NEW PRODUCT DEVELOPMENT RESULTS

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	BEFORE	AFTER
Chrysler Automotive Product Development	Cycle time for prototype builds was 10 weeks.	Cycle time for prototype builds reduced to 8 weeks.
Danisco (Genencor International) Biotechnology Plant Engineering	20% projects on time.	87% projects on time. 15% immediate increase in throughput.
Dr. Reddy's Laboratories Pharmaceutical New Product Development	6 projects completed in the first 12 weeks. 20% projects on time in 12 weeks. 85 global generics and PSAI filings in 2009. 85 product launches in 2009. 915 days cycle time for full development in 2008.	11 projects completed (83% increase). 80% projects on time (60% increase). 110 filings in 2010 (30% increase). 149 launches in 2010 (75% increase). 563 days cycle time for development in 2010 (40% faster).
e2v Semiconductors Semiconductor Design and Manufacturing	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.
Hamilton Beach Brands, Inc. New Product Development For Home Appliances	34 new products per year. 74% projects on time.	Increased throughput to 52 new products in the 1st year, and to 70+ in the 2nd year, with no increase in head count. 88% projects on time.
Heineken, Spain CPG New Product Development	150 projects per year. 90% on-time delivery.	20% faster time-to-market. 98% on-time delivery. 10% of projects finished ahead of schedule.
HP Digital Camera Group Digital Camera Product Development	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.
LSI Logic ASIC Design Technology Development	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.
Marketing Architects Advertising Product Development	Completed 7 projects in 2006.	Completed 7 projects in the first 8 months of 2007.
Medtronic High Tech Medical Product Development	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%.
Medtronic, Europe High Tech Medical Product Development	Device projects took 18 months on average and were unpredictable.	Development cycle time reduced to 9 months. On-time delivery increased to 90%.
Procter & Gamble Pharmaceuticals Pharmaceutical Product Development	In 2005, completion rate was 5 projects/quarter. 55% of projects delivered on time.	In 2008, completed 12 projects/quarter. 90% on time, with same number of resources.
Skye Group Garment Design	Product ranges were late to market.	100% due-date performance. 30% reduction in lead times and sampling costs.

ENGINEER-TO-ORDER RESULTS

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	BEFORE	AFTER
ABB AG, Power Technologies Division Electrical Power Transmission, Engineer-to-Order	Throughput was 300 bays per year.	Throughput increased to 430 bays per year.
ABB Córdoba Power Transformers, Engineer-to-Order	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).
Alcan Alesa Technologies Material Handling Solutions, Engineer-to-Order	Completed an average of 6.9 projects per year.	Completed 10 projects in first 8 months of 2009. 31% increase in throughput-dollars.
Boeing Space & Intelligence Systems Satellite Design and Assembly	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.
Ismeca Semiconductor Engineer-to-Order	84 days overall cycle time. 24 days production cycle time. 15 machines in 8 months was highest throughput ever.	64 days overall cycle time (25% reduction). 10 days production cycle time (60% reduction). 22 machines in 5 months (47% higher throughput). 22% improvement in EBIT.
LeTourneau Technologies, Inc. Oil & Gas Platform Design & Manufacturing	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.
Škoda Power Engineered-to-Order Steam Generators	20 casings per year. 60% on-time delivery.	27 casings per year (30% increase). 90% on-time delivery. 20-30% faster cycle time.
TECNOBIT Defense Products Design and Manufacturing	Long project cycle times with frequent delays. Difficult to synchronize Design and Manufacturing.	Project cycle times reduced by 20%.
ThyssenKrupp (Johann A. Krause, Inc.) Automotive Assembly Systems, Engineer-to-Order	70% of projects were late. High overtime and outsourcing.	Lateness reduced by 50%. 63% gains in productivity. 15% more projects completed.
Valley Cabinet Works Custom Furniture Design and Manufacturing	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%.
Von Ardenne Equipment for Manufacturing Solar Panels, Engineer-to-Order	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%.

ENGINEERING, SOFTWARE AND IT RESULTS

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	BEFORE	AFTER
Alcatel-Lucent Telecomm Switches Design, Development & Upgrades	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+%.
Alna Software Customized Software Development	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.
Airgo Networks (Qualcomm) Next Generation Wireless Technology Product Development	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.

ENGINEERING, SOFTWARE AND IT RESULTS (cont.)

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	BEFORE	AFTER
Amdocs Customer Experience Systems Customized SW Development for Telecommunications	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 projects in crisis in 2008.
C.N. Cofrentes (Iberdrola) Nuclear Power Engineering	Due-date performance was 60%.	Due-date performance increased to 95%. Throughput increased by 30%.
Celsa Group IT Projects	15 SAP functionality projects were completed per month.	SAP functionality project completions increased by 30% to 20 projects a month.
Central Nuclear Almaraz Trillo Nuclear Power Engineering	19 design evaluation and modification projects were being completed per month.	Throughput increased by 25% to 24-30 projects per month.
Oregon Freeze Dry Food Preparation & Packaging	72 sales projects completed per year.	171 sales projects completed per year. 52% increase in throughput-dollars.
Owens-Illinois Process Manufacturing Plant Engineering	6 months cycle time for furnace design. 45 projects/year engineering throughput.	2.5 months cycle time (58% faster). 60 projects/year throughput (33% increase).
Railcare Wolverton, UK Train Maintenance, Repair and Overhaul Engineering	16 months delay in delivery of last order. 1 order executed at a time.	100% on-time delivery on all orders. 3 orders executed in the same timeframe.
Siemens Generator Engineering Electric Generator Engineering	110 projects completed in 11 months. Low overall throughput.	128 projects completed in 11 months. 30% increase in overall throughput. 44% increase in non-project throughput.
Spirit Aerosystems Aircraft Engineering	12 months was best case engineering cycle time.	On track to finish pylon project in 7 months.

CONSTRUCTION AND OTHER RESULTS

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	BEFORE	AFTER
Action Park Multiforma Grupo Theme Park Design, Install and Commissioning	121 projects completed in 2004.	142 projects completed in 2005. 153 projects completed in 2006.
BHP Billiton Iron Ore Asset Development Projects	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.
eircom Telecommunications Network Design & Installation	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.
emcocables Manufacturing Plant Construction	11 months industry standard project duration.	7 months to project completion. (55% additional revenue 4 months earlier).
Emesa TGV Station Construction	6 months left to deliver, and project was 5 months late.	Completed 11 months of work in 6 months. Project on time (€5 M penalty avoided).
Rapid Solutions Group Marketing/Publishing Support	Projects were always late. Lead times were not acceptable.	On-time delivery improved by 30%. Lead times reduced by 25%.
Tata Steel Plant Maintenance and Upgrade	300-500 days for boiler conversion. Routine maintenance took too long. 11 days planned for shutdown. $2M revenue generated per day.	120-160 days completion time (68% faster). 10-33% reduction in 2007 cycle time. 5-33% additional reduction in 2008 cycle time. 8.8 days shutdown achieved. $4M revenue gained. *Set net operating hours industry record (6690 hours per year).*
US Department of Defense Procurement Organization Processing of Purchase Requests	Long delays in processing requests. Long cycle times.	Delays reduced by 40%. 76% reduction in cycle time. 29% increase in throughput.
US Air Force Operational Test & Evaluation Center Warfighter Systems Testing	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.

LESSONS LEARNED: A POSTSCRIPT TO PROJECT FLOW 2010

Since 2004, Realization's clients have been presenting their implementations at Project Flow conferences. The collective financial benefit of all these implementations to date exceeds $2.5B.

Many of Realization's clients have also been recognized in the industry for their success, winning top honors such as the 2006 Franz Edelman award, the 2006 Shingo Gold, the 2007 Chief of Staff award, and the 2007, 2008 and 2009 Robert E. Fox awards.

Project Flow 2010 speakers affirmed that a step jump in performance can be achieved by reengineering project execution. They also discussed their strategies for getting the most out of an implementation. Three points emerged as key to maximizing the impact of Critical Chain on the bottom line, on the speed of implementation and on the sustainment of results.

1 TARGET BUSINESS BENEFITS, NOT JUST OPERATIONAL IMPROVEMENTS.

Speakers noted that operational improvements and business results, though connected, are distinct. To illustrate:

- In captive aircraft Maintenance, Repair and Overhaul (MRO), the business goal could be to minimize flight cancellation charges while the operational goals could be to improve asset availability and to shorten repair times.
- For MRO operators and Engineer-to-Order (ETO) manufacturers, the business goal might be to increase sales and profits. The corresponding operational targets are to increase the number of projects with the same resources or less overtime.
- For Engineering, Procurement and Construction (EPC) contractors, the business issue is the realization of revenues in a timely manner and the avoidance of late penalties. A corresponding operational challenge is to complete the full scope of engineering before starting installation.
- Similarly, in New Product Development (NPD), the business goal could be market share or life cycle revenues, while the operational metric could be time-to-market.

Whereas operational metrics are required to drive actions on the ground, business goals not only help establish meaningful operational metrics in the first place but are also instrumental in galvanizing the organization into action.

Ram Charan, author of "Execution: The Discipline of Getting Things Done", was keynote speaker at the conference. According to Mr. Charan, the five key metrics that CEOs pay attention to are: revenues, margins, cash velocity, cash balance, and market share. To engage top management, he advised setting implementation goals that are connected to one or more of these numbers.

2 DESIGN AND IMPLEMENT TOTAL SOLUTIONS, NOT PIECEMEAL FIXES.

Instead of delivering quick victories, piecemeal fixes prolong implementations and compromise results. Conversely, companies implementing total solutions not only enjoy stronger results but also get there faster. Following are the reasons:

- **Multiple departments share responsibility for project delivery.** Improving execution in one department exposes the need for improving execution in other departments. Delta Air Lines explained how engine maintenance lines have a tight dependency on component repair shops (a.k.a. the backshops). Therefore instead of implementing Realization's Rules of Execution first in the engine lines and then in backshops, they tackled them all together. As a result, they saw the overall throughput increase by 23% within 8 months.
- **Critical Chain might be the core but often requires supporting solutions.** Using the same Delta example, the main engine production line performs project work. However, the backshops perform more repetitive work on component repair requiring a Drum-Buffer-Rope (DBR) solution. In another example, Siemens spoke about sales and field support tasks in engineering which also require DBR alongside the Critical Chain solution for projects.
- **Implementations might not even be feasible in one department** if their activities are tightly linked or routinely share some critical resources with others. At Corpus Christi Army Depot, while each aircraft maintenance line had dedicated production resources, various support resources such as engineering and materials were shared. Since these shared resources require a common set of execution priorities, the implementation had to be undertaken simultaneously across all the lines.

3 DON'T COMPROMISE THE CHANGE MANAGEMENT STEPS.

The solution for synchronizing execution is simple and can produce quick results. However, implementations struggle if organizations skip key change management steps.

- **Management buy-in.** When senior managers do not agree up front with the changes or accept aggressive improvement goals, implementations struggle to even take off.
- **Metrics alignment.** Existing metrics often get in the way of completing projects faster and more efficiently. These metrics must be changed.
- **Institutionalization.** If the new, higher levels of performance and enabling rules are not reinforced through management policies and controls, implementations don't survive personnel changes and sooner or later the organization returns to the old ways with the old results.

Škoda Power and Ogden Air Logistics Center illustrated how following (or not following) these key change management steps had an impact on their implementations.

In summary, by linking operational improvements to business needs, implementing total solutions rather than piecemeal fixes, and adhering to the change management steps, business and government organizations can get the most out of their reengineering efforts and enjoy marked success.

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