



Departments - Expert Opinion
Managing your process
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It can often take many weeks to a few years to totally dismantle, repair and remanufacture a helicopter or design and build a satellite. The business benefit of cutting down the time it takes to do such projects can be substantial. Not only would it accelerate the availability of the satellite or turbine to their operators, but it also frees up engineering and manufacturing capacity earlier to start the next project or to take on more projects in the same time.

It is being done all over the world for such project-based entities. Project Execution Management, leveraging Dr. Eli Goldratt's Critical Chain method, has been adopted by engineering organizations and project manufacturers around the world to shorten delivery times by 20% to 30% and increase productivity by 15% to 25%. While not a panacea, it can dramatically increase profits, improve asset utilization, and accelerate cash flow for all participants in the respective value chains.

That is the experience of Boeing Space & Intelligence Systems in making satellites for government and commercial customers.

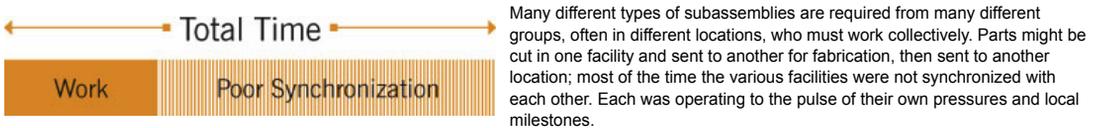
Boeing met their goals by managing execution so that activities and resources stay synchronized within and across projects, allowing resources to be concentrated on the right tasks at the right time. They reduced cycle times on the one hand and increased efficiencies on the other.

Increased Productivity 64%

Employing 4,000 people, Boeing's Satellite Development Center faces the same problems as many other ETO organizations. Since every program and every mission is different, the final product produced is different. Recurring business is very low. In many respects, the organization is building prototypes as typically only two to three spacecraft are needed for each program. Since they are expensive to launch, Boeing must make them light. Since they have limited power and space, Boeing must make them efficient. Contrary to most products, these final assemblies cannot be serviced.

On the government side of the business, bidding and performance are incredibly competitive. As ominous on the commercial side, if Boeing does not deliver on time, they lose the entire contract. Therefore, Boeing has minimal wiggle room.

That is what Darrel Uchima, deputy manager of Boeing's El Segundo, CA, Satellite factory loses sleep over. About five years ago, Uchima's group was having difficulties in meeting their schedules. The constraint was the reflectors for the satellite antennas. Achieving synchronization in execution was the major difficulty in accelerating the delivery of these units.



At a detailed level, parts must be ordered to create the new order's subassembly, yet there are always part shortages and some parts have long lead times. Adjustments (work-arounds) must be made when vendors do not deliver as planned. Customer approvals needed at various completion points might add to the delays, forcing fabrication or design to wait.

Since there is also a contention for resources, people are pulled in multiple directions. As a result, everyone is working hard but on different priorities. An extreme effect of being pulled in multiple directions is multitasking – which hurts quality and causes rework.

Finally, customer specifications might change during execution and technical problems are often found. These uncertainties cause further loss of synchronization, completely disrupting original schedules.

The net effect is that the time taken to do the work is only a fraction of the total time taken to build reflectors – the rest of the time is lost to poor synchronization.

To accelerate the delivery of reflectors, Boeing did three things:

1. They sequenced and released reflector projects into execution based on satellite due-dates and priorities. This immediately caused resources to get synchronized and cut down multitasking.
2. They did away with operations-level schedules and moved safeties hidden in individual tasks into explicit buffers where they would do the most good – protect the longest path. The longest path is that series of tasks – from start to finish – taking into account task as well as resource dependencies. This ensured that the overall project kept moving despite local delays. Moreover, collective buffers are more efficient than safeties built into all individual tasks.
3. They synchronized execution based on how much buffer was remaining. Tasks with the lowest buffer ahead of them got the highest priority. Since everyone is looking at the same buffers, priorities are automatically synchronized. Therefore, if buffers in a project are running too low, project managers and executives now have the early warning signals to take corrective actions.

According to Uchima, "We pipelined and sequenced the reflectors. Within the year, we doubled throughput and were able to deliver both of our programs in the same time that it used to take to deliver one program. We had a 28% improvement in delivery of our antennas as a result. We broke the constraint to where something else became the program constraint. We decided that we should take this process from beyond the antennas out to the whole organization."

The antennas group now had more time so they took on the additional duties of managing the payload projects, without adding any more people. On the government side of the business, the antenna and payload projects were not only holding costs but also returning money quarter after quarter back to the customer, the government.

"We showed a 64% improvement on the next satellite and a 26% improvement on the one after that," Uchima reports.

On June 7, 2009, Boeing Integrated Defense Systems, of which Space & Intelligence Systems is a part at the El Segundo Satellite Development Center, received an achievement award. The award was for its demonstrated longevity in the successful use of Theory of Constraints (TOC) tools and significant contribution to the TOC community from the Theory of Constraints International Certification Organization (TOCICO) at its North American Conference in Tacoma, WA.

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