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Theory of Constraints

All about Goldratt's Theory of Constraints, applications, stories, successes and challenges, and open dialogue on this powerful methodology for improving almost any kind of system. Particular focus on applications in Project Management, Manufacturing and Distribution.

THURSDAY, JUNE 14, 2007

[TOC Stories: Accelerating Projects](#)

The remarkable success of Goldratt's business novel [The Goal](#) demonstrated the power of using a story to communicate business concepts. While this concept is not new, it had not been widely applied to business principles before Goldratt did it in 1984. More than 20 years later the book is still selling annually quantities most business authors would be happy to see in a lifetime of book sales.

Following this model I have created a number of stories based on real experiences we have had with organizations applying TOC. The following story is true and the results are real, though I have fictionalized the company name and blurred some details so as not to expose any proprietary information. I hope that you will find this format an interesting vehicle for learning more about TOC and the potential to be gained from its application.

The Story

“Big Pharma” develops, produces, and sells pharmaceuticals. They had a big fish on the line, a blockbuster drug with sales expected to be in the billions per year. And they were in a race. A competitor was working on a very similar product and the first company to get their product to market would secure the large pent up demand for the new drug. Arriving second would mean having to displace the other company's product, a much slower, more expensive proposition. Being first to the market was easily worth billions in the first year alone.

One can imagine that with so much at stake, money was flowing freely in both companies. But outsourcing and adding staff didn't always accelerate the process. As one executive said, “I know we need more people but I don't know where and how many. Every time I have done that in the past all it did was increase my costs.”

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The first need the company had was to understand exactly where the constraint was in their development cycle. As the drug was late in the development process, where most of the investment and effort is in the clinical trials to test the effectiveness of the drug, this was the area of most concern. When they used TOC to analyze their flow and understand where the bottlenecks were it became apparent that the real constraint was in an unlikely place, the clinical pharmacy. The clinical pharmacy supplies the drugs, and the placebos, that are used in the clinical trials conducted by doctors in their hospitals around the world. Doctors enroll patients and then need precisely prepared supplies of the drug and placebos (to insure the scientific validity of the trials) according to a pre-planned timeline. Missing the timeline would mean the loss of the test patients delaying the completion of the needed scientific data to get the drug approved.

The Obstacles

At this point in the drug approval process there are large volumes of clinical trials that need to be done and the weight of the workload had brought the clinical pharmacy to its knees. The planned preparation time for delivering the samples had been 8 weeks, but they were already extended out to 10 weeks, and were frequently missing even those delivery dates. On the horizon was an even bigger volume of work to meet the demands of the last trials before the submission of the new drug. The company had explored outsourcing the process to a contractor, but it was going to take months to validate them as a supplier and moving the process out of the company would also extend the lead times due to the approvals that were needed on each batch of products. Adding people to their existing operation would also take time, especially for some of the more unique jobs where things were breaking down already.

The climate in the clinical pharmacy made it not exactly opened to improvement. The group had recently been moved off the main campus of the company to make room for the growing staff there, resulting in a negative impact on the workers quality of life, and a loss of social connections to their colleagues in other departments. Moving to a remote physical location was also slowing down certain approvals and sign-offs from managers who remained on the main site. Things that had been handled in five minutes by walking over to a person's desk, now turned into unanswered voice and e-mails, adding to the delays. In addition, once the analysis showed where the real constraint was, and with the mounting pressure of the growing workload, the people naturally became increasingly defensive, and protective of their turf. "Helping" people under these circumstances to improve their process was not exactly the ideal situation.

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The Opportunity

The opportunity that existed for the clinical pharmacy was to understand much better how work flowed, or in their case piled up and trickled, through their system. The conventional methods of project management had long been established in the company with all of the usual effects apparent:

Projects were consistently behind schedule or late

Resources were not available when needed, even if promised

There was constant firefighting, with priorities shifting continually

There were too many changes and too much re-work

Necessary things (specifications, approvals, documentation) were not available when needed

They needed to understand how their mode of operating caused these effects, and to see how the Critical Chain approach would enable them to address the underlying causes of these symptoms. One of the most important of these causes was bad-multitasking, in other words stopping work on a task before it is completed to work on another more urgent one. It was widely believed that the “earlier you start a project, the early it will finish.” This had resulted in the large piles of work evident at each step of the process. With the increasing pressure brought on by the growing demand of trials and their missing delivery dates, bad-multitasking was the daily reality.

The other major contributor to the situation was the common management practice of focusing on the on-time completion of each tasks, in the mistaken belief that this would result in projects finishing on-time. Instead, as it does in most environments, it had resulted in people inflating their task estimates to protect themselves. With the growing work loads and the large piles of tasks at each step of the process (there were no fewer than 5 tasks on each person's desk at any given time), this meant that most of the time it took to complete a task was waiting in the queue to get started. All the data they had showed that the time to complete a given task was getting longer, and that people's estimates were in line with these times. What they didn't understand was that there was a different way to manage the projects that would enable them to reduce both the individual tasks times and the overall project durations.

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The solution to both of the core problems already existed in the critical chain process. First it was essential to reduce the work-in-process in the system, to shrink the queues at each step so the work would flow faster, and to eliminate the pressure to multi-task that was coming from having so many active projects that were not progressing. Through self-discovery workshops using interactive games and exercises, the clinical pharmacy's managers realized for themselves how their conventional management methods were creating the problems they faced. They saw also how these practices could be modified to create very different results. While the changes were significant, the tools and processes enabled them not only to accept them but to take a strong measure of ownership in them.

Applying the methodology with the support of Concerto® software, the clinical pharmacy made the three fundamental changes for Critical Chain:

- They loaded projects into their pipeline only to the level that their most heavily loaded resource (their constraint or bottleneck) could handle them. This meant staggering the projects, starting many of them later than they had previously planned.
- They cut the times of each task by 50%, aggregated this time into a project buffer placed at the end of the project plan to protect them against the uncertainties and variability inherent in their projects. Then they cut this buffer in half, reducing the overall project duration to about seven weeks, from a little more than the previous ten weeks.
- They began to drive priorities only according to the rate at which these buffers were being consumed. In other words, tasks were worked based on which project had the least amount of buffer left relative to the amount of work remaining on the project.

By loading the projects based on their real capacity, the team insured that there would not be increasing backlogs of work in the system, thus the work would flow much faster without having to wait. With fewer open tasks the opportunities to multitask were greatly reduced, and work spent much less time waiting in queues to be worked. Stripping out much of the safety time from the tasks, then did not create any problems as most of this time had been needed for the queues. By placing it in the buffer at the end meant that it was visible to all, so they had a clear barometer for seeing if a project was tracking on time. It also made the safety time available for anyone whose work might take longer than expected due to unforeseen issues. But with work flowing more

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rapidly than before much less total safety time would be needed, so the overall project times went down. Shifting the behavior to focus on the most at-risk tasks insured that these projects got first attention. Projects with more safety, could wait without jeopardizing their delivery date. The team adjusted their measurements and indicators to match the new model.

The Results

Right from the beginning things improved. Within one month on-time delivery went from almost zero, to 50%. The lead time to deliver was reduced to seven weeks from ten, and within three months on-time delivery was at 100%, with projects completed up 40% After the first wave of improvements and stabilizing on-time deliveries at 98+%, the team realized there was the opportunity to further reduce the project lead times. Lead times were cut first to six weeks and then to three, just four months after launch. After six months the number of projects completed had doubled from the original rate, while on-time performance held steady at the new level.

The impact on the drug launch was remarkable. By addressing the constraint of the larger system the entire time-to-market of the drug was reduced. The rate of the clinical trials was accelerated and what had been an estimated advantage of “a couple of weeks” over the competition resulted in Big Pharma launching their drug four months ahead of the competition. During it's the first year on the market their product outsold the competitors by more than \$1 billion dollars, but it had cost less than \$200,000 for the full implementation.

Since then Big Pharma expanded the use of Critical Chain to all of its global clinical pharmacies, to other critical product development processes, to facility construction and upgrade, and manufacturing process validation, with similar results. But these are subject for other stories.

Of course not every company has the leverage of a multi-billion dollar drug, but cutting project durations by half, while increasing output substantially, and moving to nearly 100% on time, can still has substantial benefits for almost every company. We hope you have enjoyed this installment in our series.

To comment on this story or to inquire about other stories you'd like to see, e-mail me at kfox@tocc.com

Posted by kevinfox at 2:49 PM [1 comments](#)

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