TOC in a Commercial Shipyard

by

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When should a company view a product it is delivering to the market place as a project and when should it view it as a production effort? In some cases the scope of the required work makes the decision obvious and not much thought is required. When the undertaking is relatively complex and has a relatively long lead-time we intuitively know that it should be scheduled and managed as a project. If the undertaking is shorter or less complex in nature, then most likely it should be treated as a production effort. Sometimes it may not be readily obvious and we have to think about it until we determine which type of scheduling and planning technique is the best fit. But in general the level of effort and complexity points us one way or the other.

But what should we do if a major part of the effort is in fact a project and the other part is production? Typically the organization develops a project plan that it uses to manage the overall effort based on what engineering defines as the scope. As a parallel effort the production-scheduling department is hard at work developing their schedule and identifying the material purchasing requirements. In the successful companies a great amount of care is taken in coordinating the efforts, ensuring the production schedule is supporting the needs of the project. How successful are they in executing these plans? Unfortunately, many project managers feel they are not getting the necessary support from production. In turn the production managers are convinced that purchasing just cannot keep up with their needs and is incapable of providing parts in a timely manner. Even those companies who do have a high rate of meeting the promised delivery times, in today's business climate, are questioning whether their cycle times are as short as they can be? If they are not asking this question on a daily basis, their competition will surprise them and show them the way.

I would submit that more than ever the need for merging enterprises programmatic and manufacturing requirements is essential. TOC provides this capability and permits us to put an agile and very effective demand chain in place.

This was recently demonstrated at a commercial shipyard that was already successfully meeting their clients needs. They concluded that TOC would provide the necessary breakthrough solutions, taking the shipyard to the next level of competence. It was in this environment that the challenge of satisfying the programmatic and manufacturing requirements, both necessary conditions surfaced.

The company builds new ships and clearly understands the value of increasing throughput and the positive effects it would derive. They are ISO 9001 qualified, produce a high quality product and recognized as a 100 per cent on time delivery supplier. It was obvious to them that a new model, robust and flexible was needed in order to take them to the next level. They were constructing the ships by aggressively managing them as projects while maintaining a highly efficient steel processing operation to support the construction. But were they capable of optimizing both operations in order to maximize throughput? Unfortunately, like most companies they were assuming that if both operations were individually operating efficiently, it would result in maximizing their productivity. Their assumption was erroneous

The first undertaking was to change how they planned, controlled, and constructed the vessels. Critical Chain the TOC project management solution was chosen as the method for planning and controlling the ship construction work being performed in the shipyard. The company was taken through a comprehensive Critical Chain implementation. A highly focused and comprehensive effort, supported by the company's senior management, went quite smoothly. The project and resource managers quickly adapted to the TOC concepts of building logically connected task and resource relationships, managing the constraints and monitoring the buffers. They realized they had much greater visibility on how well the work was progressing. No longer were they focusing on the individual tasks and the resultant continual fire fighting this caused. Instead, focusing on managing the process and allowing the Buffer Management to prioritize and direct their actions.

It became apparent to the majority of the management team, that the steel processing and manufacturing area, though crucial to building the ships, had enough available capacity to support all of the operations in the shipyard. However, not everyone agreed with this. In fact many experienced and long time employees felt this was an area of concern and would immediately become a bottleneck if the company attempted to increase throughput. They recognized reduced cycle times would place an increased demand on the available capacity.

By using TOC multi-project scheduling they could now let the company's Drum Resource and the individual Critical Chain schedules determine the correct staggering of work released into the shipyard. While laying out the schedule for the fourth ship in flow they realized the steel manufacturing area could no longer adequately support the schedules. The company realized that starting the fourth ship in the queue was would in fact turn the steel processing area into a capacity constraint. As is usually the case, when a physical capacity constraint surfaces, internal policies were to blame. The solution to this problem required two major policies to be challenged. The first one was in production scheduling and the second one in engineering.

Drum Buffer Rope was the obvious solution in solving the production scheduling problem. The value of this approach was easily understood and showed early indications of acceptance. A consensus on the importance of exploiting the constraint was achieved and accepted as the key to increasing throughput.

The second policy constraint resided in the engineering department. They were guided and greatly influenced by the deeply ingrained cost world belief of focusing the nesting algorithms on minimizing the steel scrap rate. This led to developing sub-optimized nesting algorithms used in the plasma cutting tapes for the steel. The plasma cutting tapes were heavily weighted toward keeping the plasma cutting operations efficient, thus minimizing the scrap rate.

Predictably the output of the engineering department was disconnected from the needs of the ship construction schedules. Plenty of parts accumulated in front of the Drum. Unfortunately, many of the parts arrived there out of sequence with the needs of the schedule. In many cases this drove them to deviate from the schedule in their best efforts to get back on schedule, by keeping everyone busy. The algorithms needed to be changed to support the Drum of the shipyard, which drove the schedule for all of the work being performed. Subordination of the nesting tapes to the Critical Chain schedules and to the Drum availability was crucial. This would allow the steel manufacturing department's output to be pulled by the Drum requirements and thus maximizing the company's throughput.