PROJECT MANAGEMENT

In a Theory of Constraints Environment

by **Mickey Jawa, CEO, SatiStar Management Consulting**

Most projects are difficult to manage due to the uncertainty involved in the myriad of activities that make up the project. Traditional project management requires that each and every individual activity that is a part of the project must be managed. This only gets worse in organizations that deal with multiple projects that compete for a limited group of shared resources. Applying Theory of Constraints thinking greatly simplifies the job of project managers by focusing their efforts on managing only those activities that are on the Critical Chain, and creating visibility on Project Buffers for sub-chain activities.

Effective project management relies on the efforts of a team of players, including:

- Project Managers who develop and maintain highly visible overall project timelines that meet commitments to customers.

- Functional Managers who have direct authority over the resources assigned to the various activities within the project.

- Project Resources who perform the work involved in all of the project activities, and are responsible for the quality of their output.

- Senior Managers who have responsibility for resolving conflicts between project that are competing for shared resources, and ensuring that capacity bottlenecks are addressed in a timely manner.

Theory of Constraints Thinking

The goal of any business is to make money by:

- creating throughput
- while reducing operational expenses
- and minimizing inventory levels.

The approach to implementing TOC thinking within an organization requires that the organization's constrained process (the capacity bottleneck) be identified and hopefully minimized. Then, if it is still a bottleneck, every other activity within the organization be subordinated to the constraint. This focuses the attention of the entire organization on the one issue that really matters to the customer – the bottleneck.

All other activities within the organization are synchronized with the bottleneck process, which ensures that the bottleneck process doesn't have too much piled up in front of it, nor will it ever be starved because required inputs aren't available.

Finally, anything that can be done to eliminate the bottleneck must be done – which increases the capacity of the entire organization.

Current Problems

The problem faced by project managers in most organizations is that while they bear the responsibility for ensuring that all of the activities that comprise a given project occur in a timely and high quality fashion, they rarely have direct authority over the resources assigned to those activities.

They must rely instead on functional managers who may have very different priorities. They are often measured on their own departmental efficiency, rather than the efficiency of the overall organization. Furthermore, the project resources that report to those functional managers are often measured on their own output, which again may not be consistent with the goals of the organization. This tends to sub-optimize departments, at the expense of the overall organization.

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Multitasking greatly magnifies overall cycle time on every project
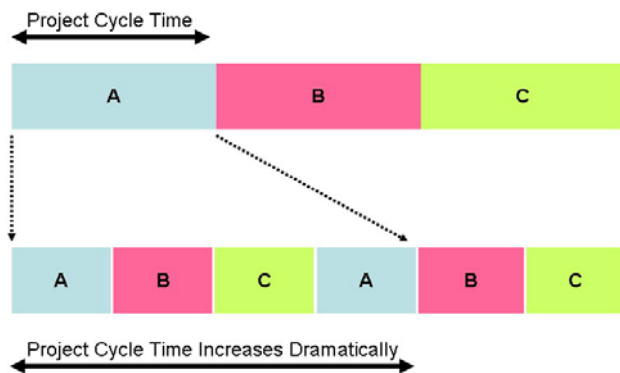
Also, people tend to divide their attention between multiple tasks in their inbox. Their thinking is usually that it's better to achieve some progress on all open tasks, rather than only achieve progress on one. This is known as multitasking. As the figure above shows, when a project resource divides its attention between multiple tasks, overall cycle times increase very dramatically. That's because real progress only happens when a given task is fully completed and handed off to the next resource in the order fulfillment chain.

The figure above is oversimplified in that multitasking actually increases the total cumulative time spent on all tasks by a resource. Putting incomplete work aside to work on something else causes a loss of focus, that usually requires additional time to "remember where I was" when the resource again resumes the incomplete task.

Frequently, this will also manifest as people begin tasks earlier than needed, to ensure that projects stay "on time". Then, as they realize that the task will be easily completed on time, they'll put it aside (incomplete) and begin to work on another task in their inbox. Not only does this magnify cycle time for the incomplete task, but it also increases the "inventory" of tasks in progress. This increased inventory of tasks complicates the job of the Project Manager charged with keeping the overall project and all of its myriad tasks on track. Senior management now has to institute systems to cope with the ever-increasing need to track progress on task performance, thereby increasing costs.

Thus, starting tasks earlier than is needed, and interrupting progress on a task are both extremely counterproductive.

Simplifying Project Management

TOC-based Project Management requires the introduction of:

- solid project requirements communications and planning processes
- an effective critical chain based scheduling process that allows for safety buffers
- synchronization of work, so that tasks begin only when resources can accommodate them, without multitasking, and that constrained resources are never starved
- project management control systems that provide excellent visibility of status and problems, and project control and decision support mechanisms that address problems effectively
- cultural change that promotes effective resource task behaviors, such as beginning work when scheduled, working in a continuous manner until fully completed, reporting completion immediately and asking for help immediately when they get into trouble.

The solutions are both technical and social in nature.

Project Planning

In this phase, all of the project stakeholders meet to fully understand the project scope, requirements, promises, constraints and deliverables.

Just as with traditional methods of good project management, the overall project plan, or network diagram is constructed backwards in time, starting from the end to the beginning. This highlights the required tasks, sub-tasks, dependencies, resources and skills. Here, one key step is to identify those tasks that can only be accomplished using specialized skills or resources, while relegating the rest of the tasks to less specialized resources. This often reduces the organizational dependence on limited specialized resources – thereby potentially reducing overall project cycle time.

The times required to complete the various tasks are then estimated by the team, including the potential variability of the time estimates. Each task is assigned a "highly probable" time, and an "aggressive/possible" time to complete it. These times are then used to build the project schedule.

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Project Scheduling

Task and resource dependencies are analyzed to determine the longest chain of work – the Critical Chain, which is analogous to the traditional project management Critical Path.

Now we separate the fixed from the variable portion of each task. The fixed portion is the aggressive/possible time, while the variable portion is the difference between the highly probable and the aggressive/possible time. This variable portion is the safety that's built into each task. This safety is then removed from each individual task and aggregated wherever possible with the safety from the other tasks in the same sub-chain of work. A portion of the aggregated safety (known as a buffer) is placed at the end of the sub-chain, where it will protect the critical chain from any sub-chain variations.
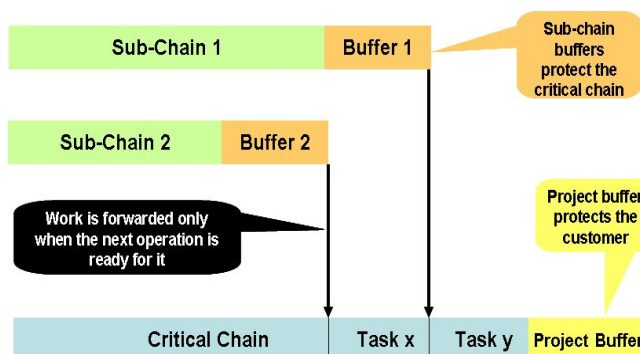
Another portion of the aggregated safety (the project buffer) is placed at the end of the critical chain where it protects the overall project from any variation along the entire chain. Because we've aggregated, the total amount of buffer is usually less than the individual task safety that would normally be required in traditional project management. This reduces overall project cycle times and costs.

The inclusion of the sub-chain buffers and the overall project buffer ensures that the project schedule is both feasible and reliable. These buffers ensure that variations in the sub-chains never affect the critical chain activities, and that variations in critical chain activities never affect the customer.

Synchronization

In traditional project management systems the capacity and availability of all resources must be balanced with each and every one of the tasks.

Introduce another project into the mix and the complexity of this computation climbs exponentially. This is usually an extremely time-consuming and onerous task that causes project managers much grief.

TOC-based project management ensures that all tasks are synchronized to the capacity constraint of the most heavily utilized resource (the synchronizer). The project manager only needs to maximize flow through the entire system rather than balancing the various resource capacity issues. As long as the synchronizer resource is fully utilized, overall throughput is maximized. This implies that the rest of the organization's resources need only have enough capacity to ensure that that throughput is maintained.

A synchronization schedule is now created based on the availability of the synchronizer. This schedule basically staggers the introduction of new projects, and allows for new project work to be introduced only when the synchronizer can handle it.

New projects must be both scheduled and synchronized prior to committing to completion dates.

As with multitasking at a single resource level, multitasking at the organizational level magnifies overall cycle time. Hence, properly staggering the introduction of new project work actually reduces overall project cycle times.

Project Management Controls

The job of the Project Manager is greatly simplified, because project control consists mainly of monitoring the project buffers and the status of the critical chain. As long as these are within acceptable (pre-defined) limits, the project manager does not need to intervene in any of the sub-chain tasks. Delays or early accomplishment of chains either consume or add to the buffers.

Functional managers assign tasks to their resources and need to monitor buffers to determine the urgency of the assigned tasks. They also need to monitor the loading of their resources and take proactive action to ensure that sufficient resource capacity is provided when needed.

Senior management typically needs to monitor progress along the critical chain, overall project buffers and overall project budgets.

The posting and communication of highly visible project performance indicators is critical to the effective management of projects. The key measures include critical chain progress measures, buffer status and current and projected resource loading.

Cultural Change
The solutions are both technical and social in nature, because work processes depend on the people that perform the assigned tasks. The behaviors of those resources are often ingrained and difficult to change. Also, many of the concepts of TOC-based thinking are counter-intuitive to most people.

One of the most important behavioral changes requires resources to begin work as soon as they have been assigned to tasks. Of course, functional managers only assign tasks when dictated by the needs of the schedule, rather than at the beginning of the project – thereby minimizing the potential for multitasking.

A related behavioral change is that resources must work continuously on assigned tasks until those tasks are completed. They must also immediately communicate the completion of those tasks.

Also, resources must feel safe in asking for help if they perceive that they won't be able to meet assigned timelines without worrying about negative consequences during their performance appraisals. Associated with this they should comfortably report whenever they finish early (without fearing that the quality of their work will be suspect). They must also feel comfortable refusing requests that could lead to multitasking.

TOC-based project management facilitates much of this cultural change by aggregating the safety (that traditionally gets wasted) and then ensuring the aggregated safety is highly visible to all.

Implementation Strategy
The change from a traditional project management environment to a TOC-based environment is quite complex, requiring the entire organization to understand and enroll in the change.

Few commercially available project management software tools are designed to implement TOC. However, existing tools can be used to supplement and simplify the job of the project manager. The optimal approach usually is an evolutionary one, in

which the migration to full TOC-based project management may take up to two years to fully implement, even though the basics can be put into place within a few weeks.

The initial stage requires setting the foundations into place at all levels of the organization for the required behavioral changes. The leadership team must understand their role in implementing TOC, and then be able to communicate to the organization the consequences of TOC.

The project managers, functional managers and the resources need to understand their roles, and what their new behaviors must become.

Then, the majority of the process design is finalized, and implementation begins gradually. People begin to work with and learn the new project scheduling methods, and the new management control systems. New, highly visible project tracking mechanisms are deployed throughout the organization. Projects begin to be re-scheduled using the new TOC approach. Initially, most risk-averse organizations use a dual project scheduling approach that incorporates both traditional and TOC-based project management. This stage usually is completed within a few weeks.

Depending on the lifespan of a typical project within the organization, full implementation may take many months (or even years).

The increased project visibility that is achieved in the initial few days enables everyone to quickly focus on the most important constraints in the organization's processes. Then, they can begin to identify and suggest improvements that increase overall throughput.

Mickey Jawa is the CEO of SatiStar Management Consulting, and has over 25 years of experience in a wide range of industries. He has assisted companies worldwide in implementing Business Performance Improvement, especially in the area of cycle time reduction.

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