What Should Multi-Project Operations Focus on: Resource Utilization or Cycle-Time?

The throughput of a single project is determined by the cycle time of the project. What limits the throughput (in terms of number of projects) of a multi-project organization? Is it the capacity of some resource? Is there a conflict between finishing a single project faster and doing more projects? In other words, is it possible to better use capacity by starting work earlier (increase the cycle time of projects to increase throughput)?

This article shows that there is no conflict. The way to increase the throughput in terms of number of projects is to reduce the cycle-time of individual projects. This has significant implications on how multi-project organizations are managed, which also are pointed out in this article.

How can an organization that does projects increase its throughput? What is the leverage point for the organization to do more projects faster? Should the focus be on exploiting the capacity of a limiting resource? Or should it be on reducing the cycle time of every project?

The situation is simpler in a single project. Once the project scope has been decided, throughput of a project is typically determined by how fast the project can be completed. It is clear in this case that the focus should be on the Critical Chain of the project. That does not mean that there are no resource bottlenecks in the project, in fact dealing with these bottlenecks is one way in which Critical Chain is distinct from critical path methods. Below are examples of different kinds of projects and the impact of cycle time on throughput

- For a new product development organization the cost of not being the first to market is lost market share and a smaller lifecycle for the product. For hi-tech companies the pace of innovation is so high that being that being the first can make a big difference. For pharmaceutical companies the sunset period on patents implies that reducing cycle time can have a huge impact on the return on investment for a new drug.

- For a construction project the longer the cycle time the longer the money is stuck not generating returns. Reduction in cycle time is a direct driver of increased throughput as it frees up money much faster that can be cycled much faster, because the property is sold and payments received faster.

- In maintenance, repair and overhaul projects, the asset being maintained is very expensive. Every day of the asset not being available is a day of throughput lost.

- In large engineering projects the speed with which the project is completed is directly tied to how fast the investment starts to generate returns.

If an organization were doing only one project it is obvious that the leverage for higher throughput from the project lies in reducing its cycle time. But in a multi-project organization that is continuously undertaking new projects, it appears that the same effect can be realized by starting earlier. In fact, starting work earlier may enable exploiting the precious capacity of resources. What is the right approach to increasing the throughput of the organization?

For people who are familiar with production environments, the internal limitation is generally a resource or machine. The capacity of this most limiting resource is the capacity of the entire plant. A day of production gained on the most limiting resource is a day of production gained for the entire plant. A day of production lost on that resource is a day of production lost for the entire plant. A day gained on the most limiting resource is a day gained for the entire plant!

What is the equivalent for a multi-project organization?

A week saved on the critical chain of projects is a week gained for the organization

Everyone knows that if all projects finish faster, their benefits will be realized earlier. We claim that even for increasing the organization's output/ capacity, projects should be managed to finish in the shortest possible time.

There is no conflict between reducing the cycle time of projects and increasing the number of projects an organization can do; shortening cycle times leads to higher throughput! This might sound like a radical claim, with crucial implications for how to manage. First, the reasons for our claim:

Why reducing cycle time is the way to increase throughput

1. Evidence from how time and capacity are consumed in projects

The existence of multi-tasking and Parkinson's Law indicate that resources are not a limitation; in fact typically a lot of capacity in project organizations is wasted because of how work is performed. Reducing cycle time of projects reduces multi-tasking and Parkinson's Law and increases organizational throughput.

WORK	INTERRUPTIONS	PARKINSON'S LAW

Most of us are familiar with the theory behind Critical Chain. Uncertainties make it hard to predict how long a task will take. Managers can get time estimates from individuals, but those estimates cannot be treated as commitments. Uncertainties imply that the estimates will either be too long (in which case Parkinson' Law will show up and work will expand to fill the time given; or they will fall short, making it impossible to hold the person accountable in any case.

Secondly, tasks are not executed continuously because people are pulled onto multiple projects at the same time (all projects are late). When people multitask, they lose time and capacity shuttling back and forth between tasks.

Another reason for multitasking is the constant support and decisions needed from technical experts, managers or peripheral functions. Unfortunately, such support and decisions are not available in a timely manner. The result is that the time spent on the actual work gets fragmented. In order to keep busy in this kind of an environment, individual contributors start more that one task at a time. This helps them stay busy but increases the workload of the technical experts, managers and other support functions which in turn increases the number of interruptions even more.

It is clear that major gains in time and capacity can be had by minimizing interruptions and Parkinson's Law. This implies that throughput can be increased by reducing the duration of tasks more easily than reducing the actual effort associated with the task.

2. Evidence from the Queuing Theory

According to the Queuing Theory, increasing utilization of any resource to more than 70% in the presence of uncertainties and variability gives rise to very long queues. Given the visible impact of such queues on resource loading, project delays and waiting time caused for down-stream resources, managers would increase resources to bring queues down.

Let us accept that the throughput of the organization is constrained by the capacity of some specific resource or skill involved in project work. The Queuing Theory tells us that in if the utilization of a resource exceeds a threshold (70%) the queue size in front of that resource starts to grow dramatically. Given that time is so precious on every project, there is a huge incentive for organizations to mitigate any resource constraints.

Even from a cost perspective, the amount of effort spent by one resource on the project is a small fraction of the overall effort required on the project. Unless the resource is an expensive investment (test labs, wind tunnels, hangers etc.) the cost of increasing the capacity incrementally is dwarfed by the gains to be had. As a result it is very unlikely that a large fraction of the resources will be idle waiting for a single resource.

When the above argument does not hold, the resource is typically capital intensive equipment or the facility where project is executed (e.g.: aircraft hangers for maintenance projects). In these situations also the best way to exploit this resource is to reduce the cycle time of the projects so that the facility can then accommodate more projects.

This does not mean that resources cannot be bottlenecks once in a while. But they are not what limit an organization from increasing its throughput.

3. Evidence from how organizations use their expert and support resources

Many resources in a multi-project organization do not do project work; they manage and support project work. The mechanism to exploit their capacity is to have fewer projects in the pipeline, i.e. reduce the cycle time of projects.

Uncertainties are the most difficult part of managing projects. Managing them requires improvisation, problem solving and good judgment. These are skills that are developed with long hard experience. These are the skills that are involved in managing issues and keeping the people engaged on direct project work productive.

In most organizations, if one were to look for the work that such resources perform, it wont' be found in the project plans. That is because they are dealing with emergent situations wherever and whenever they occur. They are dealing with all the situations that cannot be planned for. The workload on these resources is a function of the number of projects that are active. More the work-in-progress, higher the workload!

The best way to exploit the capacity of experts and support resources is to keep the number of active projects low so that these resources can keep the rest of the organization productive. The way to limit the number of active projects is to reduce the cycle time of projects.