



White Paper 2012-03

The Fallacies of Conventional Scheduling for Large, Complex Projects and How to Overcome them

Conventional scheduling is needed. But it is not sufficient to effectively manage large, complex projects. Relying too much on conventional scheduling entails the risk of overseeing those critical items that might stall the project. In this paper we will explain why that is the case specifically for complex projects and what we can do about it.

The limitations and usual traps of conventional scheduling

Conventional scheduling (networks, Gantt charts etc) are a common tool used in project management. It allows to follow the physical progress of the work, and identify the critical path, which is supposed to guide the focus of the project management team.

Conventional scheduling addresses poorly resource management

Conventional scheduling was developed in the manufacturing industry at the beginning of mass production and has been later adapted to project management. It has a few drawbacks which have been already widely noted in the literature. The main issue is that it does not address directly the problem of resource constraints: generally a schedule is built independently of resource availability; then resources are allocated to activities. And when it comes to resource leveling, it becomes suddenly very mysterious. Different scheduling software will implicitly do different choices as to which activity should be considered as a priority, and effectively the project team loses control over the prioritization process (a problem which many project managers avoid by avoiding resource leveling altogether).

This is a real problem because in the reality of project management, progress is often driven by resource availability, and a multitude of other factors not considered at all in conventional scheduling, such as: organization, motivation, prioritization of tasks at the individual level, etc. In particular, most scheduling programs will not consider the costs and lags of mobilizing and demobilizing resources, whereas it is a real issue in real project life.

The trap of schedule complication

The other issue that Project Value Delivery notes often is that, faced with a complex project (by definition, involving a lot of different entities with widely different goals), project teams tend to seek comfort by adding substantial detail in the schedule. Schedules tend to end up having thousands of activities, drowning the user into a multitude of activities, and increasing exponentially the work to update the progress, leading sometimes to incomplete progress reports. Increasing detail is counter-productive after a certain point, mainly because individual duration of activities become meaningless, and understanding of the overall logic gets lost in the midst of pages after pages of schedule. Interestingly enough in

EPCI projects, planners tend to details to death the construction activities with which they are comfortable but not so much the engineering – procurement – fabrication part, although that part is certainly much more critical to the overall success of the project.

What the project leader really needs

Let's come back for a minute to what the project leader really needs from the scheduling tools. The main goals boil down to:

- Have at all times an updated plan for the future that allows to anticipate what needs to get done (in particular, in terms of resource identification and mobilization)
- Be able to identify clearly those areas that are critical for the delivery of the project and thus, allow the project leader's focus to be targeted to these areas.

The conventional scheduling tools, provided they cover the resourcing needs, are excellent tools to respond to the first objective. With the proviso that things never happen according to the plan, it is useful to have developed one to enable action.

However, the conventional scheduling tools are poor when it comes to the second objective. Critical path or even critical chain approaches are not sufficient. In complex projects, delivery issues often come from areas which nobody considered critical and suddenly pop up as being crucial.

Why conventional scheduling does not really allow to anticipate problems in complex projects: natural variation and convergence

Let's assume that a reasonably detailed schedule has been produced for a complex project. We are probably looking at several hundred of activities. A critical path has been defined which focuses the attention of the project team. But is it really true that if we accelerate the critical path activities we will accelerate the project delivery?

In reality, it is not for complex projects, because of two major influences which are typically much greater in this case: natural variation and convergence.

- **Natural variation** is the result of any kind of natural disruption in the progress of the work. In a complex project, natural variation happens to be higher and more difficult to control because of numerous different interconnected contributors that can be spread geographically

and follow their own interests. The theory of constraints teaches us that even in a linear production setup, natural variation creates huge inefficiencies, because it impedes the smooth flow of work. It creates bottlenecks and standby of resources. In a project situation where activities converge toward an outcome, it will also create unexpected bottlenecks that will often be outside the foreseen critical path, and yet that can stall the project and have a huge impact on cost and delay.

- **Convergence** is a typical characteristic of complex projects: a multitude of activities are finally converging into a single outcome. Many later activities can only start when all the preceding converging activities are complete. This adds a lot of constraints because the project needs to ensure the simultaneous completion of many tasks. Whereas the critical path approach only identifies one set of critical activities, it does not identify what are the critical convergence points in the project schedule where progress might get stuck.

Because of both enhanced natural variation and convergence, complex projects tend to hang on small deliverables that nobody identifies as critical until it is too late.

A solution: the convergence plan

The solution is for the project leader to focus on the effective convergence of activities on the few critical convergence points of the project. This requires another tool which is called the 'convergence plan'.

The 'convergence plan' does not replace conventional scheduling; it is a complementary strategic tool for the project leader.

The convergence plan identifies the critical convergence points, list all the associated deliverables, and is monitored regularly to identify whether a convergence effectively occurs. Because it allows to anticipate issues, the project leader can then decide to reallocate resources to ensure that the convergence will effectively happen on time. The details of the utilization of a 'convergence plan'

are covered in another note (White paper 2012-04 "*Convergence Management, the Key to Large, Complex Projects Success*").

Complex projects require a shift in mindset

Most important of all, in complex projects, the mindset of the project leader needs to change. In manufacturing like in the execution of simple projects, the focus is on efficient utilization of resources. Cost at completion is mainly controlled through a thrifty allocation of resources to the tasks at hand, because it is directly related to the final cost.

Not so in large projects. The ultimate success depends on managing the critical convergence points so that the whole project does not come to a grind because of a missing minor deliverable. This might involve investing in more resources early to avoid this huge cost impact; and thriftiness is not the best solution. The wise complex project leader knows she needs to keep some good resources available at hand to handle those difficult deliverables, in addition to what would strictly be required to execute the project from a planning perspective.

Conclusion: what to do with conventional planning

Conventional planning is required, but not sufficient for complex projects. As any tool, its scope and limitations need to be understood. Counterproductive uses, like excessive detailing, need to be limited. Activity resourcing and resource leveling are activities that need to be looked at with care; a recommendation is not to let the software decide, but rather to do it manually to fully understand the issues at hand.

Moreover, for complex projects, conventional scheduling needs to be supplemented with convergence planning, a key tool for success. Knowing and effectively using convergence planning with discipline is the key to success.



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