White Paper 2013-18

Why You Need to Avoid As Much As Possible Intermediate Constraints in Project Execution

In project execution, flexibility and agility is a key success factor. Requiring the completion of intermediate constraint deliverables impedes project execution, which can sometimes have significant negative consequences on overall project success. Whether prescribing or executing, avoid as much as possible to introduce intermediate constraints. This White Paper explains why, and what are alternatives.

Intermediate constraints are not control gates

In this paper, the terminology 'intermediate constraint' is used to cover those deliverables that are made mandatory in the project execution by stakeholders in the midst of the actual project execution. They are not the same as control gates such as the convergence monitoring gates, which are self-imposed intermediate check points for project execution that serve to regulate the effort but can be re-baselined as required.

Intermediate constraints create inefficiencies

It is a well known fact from the Theory of Constraints applied to project schedules that introducing fixed constraints for specific activities or deliverables in the middle of a chain of dependent events creates inefficiencies, in the form of additional waiting time: it does not allow to benefit from the full potential averaging of the natural variation between the different activities.

Intermediate constraints can be a significant aggravating factor to projects facing unforeseen circumstances

In a more complex project environment, intermediate constraints tend to create the same fundamental inefficiencies, related in particular to assignment of resources to complete the deliverable in a way that might impact significantly other activities required for the project. However it is not the major effect – the main issue is about making the schedule less flexible.

Intermediate constraints are mostly an obstacle to flexibility

In complex systems, a significant role of the project team is to account for unforeseen events by playing around with the project tasks by rescheduling, re-sequencing, and possibly changing the resources involved. Intermediate constraints and intermediate mandatory activities (as well as any resource constraint in time) add significant impediments in the how the project schedule can be reshuffled in case it is needed.

The effect of such constraints in the project execution schedule can be extremely significant – and generally adds a significant additional burden to a project that faces already issues and difficulties. Intermediate constraints can be a significant aggravating factor to projects facing unforeseen circumstances. Ultimately the delivery of the intermediate constraint deliverable might become, temporarily, the main driver of overall project execution.

What intermediate constraints could be acceptable?

In certain circumstances, it may be unavoidable to specify intermediate constraints. So as to minimize their impact the following rules should be followed:

- Intermediate constraints should result from a stream of activities and resources as independent as possible from the rest of the project;
- There should be a significant buffer between the planned availability of this constraint deliverable and its required date for the overall project so as to minimize the possible impact of a delay on the rest of the project execution.

What should you do when there is an embedded intermediate constraint?

The priority should be to avoid as much as possible intermediate constraints. Often, they are more warranted by some political issues than by real requirement.

Still, should it be unavoidable to have an intermediate constraint that is deeply embedded in the overall project execution (for example due to a stakeholder requirement during the discussion of a contract), the following general recommendations would apply:

- Try to keep as much flexibility as possible for the required completion of this constrained deliverable,
- Examine how the realization of this constrained deliverable can be made as independent as possible from the rest of the project execution in terms of resources and linkages; introduce a significant buffer for both the realization of the deliverable and its required date on the project.

A common process for the first point is not to include penalties for delays on the intermediate constraints, or to include a clause that waives these penalties depending on the actual completion date of the overall project.

Intermediate constraints have a cost!

In any case, introducing intermediate constraints almost certainly will have a consequence on the project cost during project execution even if it not apparent from the initial project plan, and corresponding contingency amounts should be included in the project budget. Introducing this additional cost will often allow to

measure whether the introduction of that constraint is really worth it and will help discourage unwarranted intermediate constraints.

How can we evaluate the potential cost of additional constraints in a project schedule? The risk is to have a large portion of the project resources being busy to complete that intermediate deliverable while it would be more effective to have them progress on the rest of the project, leading to additional delays to the actual completion of the project. The risk must hence be measured in terms of additional overall duration of utilization for those resources which are mobilized at the time of the intermediate milestone. The cost of running the project resources at that moment being known, an estimate of the potential excess duration remains to be estimated. It depends on the potential for schedule slippage at that period of the project, diminished by the buffer available for the completion of the constraint deliverable. Without further data, and being aware that the potential for schedule slippage is always underestimated by probabilistic schedule reviews, a rough estimate we use commonly for that potential slippage on a large, complex project can be estimated to be 15% to 20% of the duration of the project until that point (refer to our White Paper 2013-09 '*Crude estimates of project overruns*'). Hence the potential additional contingency associated with the intermediate constraint can be really significant if it is not protected by an ample buffer!

As much as possible, projects should be made responsible for the ultimate result of the project only – and not on intermediate constraints if they are purely artificial.

Control through intermediate contraints is a waste

Sometimes, intermediate constraint deliverables are introduced by stakeholders as a way to "control" the project. It might even be that decisions regarding the project continuation be taken at these intermediate milestones. It turns out to be a very costly way of controlling the project during the execution phase, because of the inflexibility it will bring to its execution. It will tend to make the project execution a series of small projects in series, from one control milestone to the next, and will tend to remove any gain from parallel execution with the final end in mind. (however it is a fine way to control the project at study / front-loading phase).

There are many other ways to effectively control the execution of a project without creating the burden of intermediate physical deliverables, and they should generally be preferred.

Conclusion: Avoid intermediate constraints - or cost the risk!

Intermediate fixed constraints are often the scourge of project execution. They are often introduced by stakeholders or as a way to apparently control the project. Make sure to avoid as much as possible this trap – or, alternatively, make sure to get compensated fairly for the additional risk this creates to your project execution. In particular in Large, Complex Projects, intermediate constraints that are deeply meshed with the overall project execution can contribute significantly to increase the severity of unforeseen events on project execution. Never underestimate this possible effect when costing a project as it will strain the organization and diminish significantly the agility you would need for project execution. As much as possible, projects should be made responsible for the ultimate result of the project only – and not on intermediate constraint milestones if they are purely artificial.

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