White Paper 2013-11

Why and How to Increase your Project Schedule Resilience: Ensure Deeper Sub-Criticality of Non-Critical Activity Chains

Beyond a project schedule hides a very important question: how resilient is this schedule to unavoidable events and surprises? For Large, Complex projects this question is critical, because the resilience of the schedule can vary greatly without the management being aware. In this White Paper we discuss the notion of resilience and offer some principles to make your project's schedule more resilient.

Beyond deterministic schedule

Deterministic scheduling is an important portion of decision making. Expected project durations are vital inputs in profitability computations and other considerations related to the actual interest of the project. For different reasons developed in White paper 2013-09, deterministic schedule predictions can often be considered to be too optimistic. Experience shows that delays often compound and actually end up to be much higher than expected at the beginning.

Beyond the deterministic schedule it is thus important to measure how much a project schedule is resilient, i.e. how much effect will have an unexpected event on the project schedule. This event can be internal (e.g. productivity of a particular trade) or external (e.g. non reliability of an important supplier).

Insights from Schedule Statistical Analysis

When performed properly, Schedule Statistical Analysis will give useful insights into the criticality of different chains of events (ref White Paper 2013-10 '*What you should really seek when conducting a Schedule Statistical Analysis*'). Often, the first focus will be on trying to shorten the critical path to save time on the project. This is not necessarily the right thing to do. By doing so, other chains will inevitably become less sub-critical, i.e. the probability of these other chains becoming critical will increase, sometimes systematically. The question is, is it better to have a schedule with a very neat critical path and other chains of events very subcritical, or is it better to have a schedule with many chains of events competing for criticality?

In addition, schedule risk analysis limitation is that it generally does not take into account the commonality of resources. As discussed in White Paper 2013-04 '*Project Risk Management Reloaded*', common causes of failure are the most dangerous incidents that can impact your project or any endeavour. Understanding how common causes of failure related to resource availability or productivity is a key insight to apprehend the actual resilience of the project schedule.

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It is far better to have a schedule with a very clear critical path and ensure that all other chains of events are very subcritical, in particular if they share resources

Having at all times a very clear critical path for the project (and all other chains of activities very subcritical) is a great asset that makes the schedule much more resilient, for the two following reasons:

- In terms of decision-making and management focus, it is far better to be sure at all times where the critical path is and will remain. It gives a direct handle to project management on the actual delivery of the project, and a sounder decision-making platform. Most project surprises (and outright failures) stem from the fact that the actual critical activities have shifted and it has not been recognized by the project team in time;

- In terms of resources management, deep sub-criticality of all the other chains of activities in the project will allow to redeploy resources to the critical chain so as to compensate unexpected issues and events, without changing the overall logic of the schedule. This creates a much higher level of intrinsic resilience, as surprises can be compensated by re-deploying resources internal to the project.

Hence, before trying to optimize the schedule duration by optimizing the critical path it is much better to check the overall resilience of the schedule and ensure that it is up to the minimum that would be required from the project perspective.

Additional hints for increasing schedule resilience

Depending on the circumstances of the project, there are other ways to increase resilience.

- If the project consists of several chains of events that are realized by the same resources (e.g.: several modules on a yard, or several areas of a plant), there is a great benefit to have the non-critical chains of activities start earlier than the critical chain, if possible. This will ensure that the uncertain learning curve that is

inevitable at the beginning of any type of activity will not impact the project's critical path: the subcritical chains of activities will have borne the delays and the risk, which is fine as they are very subcritical. Even substantial difficulties will not impact the project delivery date.

- If the project contains a chain of activities which is very uncertain, and thus could unexpectedly become critical and drive project delivery (e.g. a component particularly difficult technically or requiring a substantial R&D effort with high uncertainty), it might be useful to plan to have two or more solutions competing up to a certain point. In some instances it might even be required to order twice similar critical parts to two different suppliers (thus ending up with a set of unused parts) just for the sake of maintaining the risk to the rest of the project within acceptable bounds.

The investment of schedule resilience

This last example illustrates clearly that increasing your schedule resilience has an implied cost. In the choice between trying to shorten as much as possible the project delivery and rather, increasing resilience by increasing the sub-criticality of non-critical chains of activities, cost and time will come into account.

It is often possible to improve significantly the schedule's resilience at minimum cost by some counter-intuitive actions such as starting subcritical chains earlier

It is one of these typical situations where organizations dealing with large and complex projects will know how to invest in decreasing significantly their risk, contrary to most organizations that will only try to minimize cost (and maximize promised return on investment).

The issue is not to come up with the shortest schedule possible and kick off the project with an unrealistic expectation, but rather how to ensure that project delivery will happen as expected notwithstanding the inevitable disturbances from the project's environment. A resilient schedule is far preferable to a shortest schedule where most activity chains will compete for criticality.

Luckily most of the time when resilience is being analysed on a project schedule, there are ways to improve it without impacting the project's overall schedule, which is the main cost driver. It leads to the counter-intuitive changes of starting earlier the sub-critical chains of activities to improve significantly the project's overall resilience. It is often easy to do with a minimum cost impact.

Conclusion: improving your schedule resilience before starting your project is a MUST

It is now part of Project Value Delivery's methodology to examine the resilience of a project schedule by running an appropriate project schedule risk analysis and examining the criticality probability of the different activity chains.

It is often possible to improve significantly the schedule's resilience at minimum cost by some counter-intuitive actions such as starting subcritical chains earlier.

The advantages of this practice are numerous; the most notable arguably is to give the project management team a stable focus on a critical path that will not change except in case of major disruption, hence ensuring appropriate decision-making throughout the project.

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