White Paper 2012-18

How to Manage Allowances and Contingency in Your Schedule

It is quite amazing that in conventional project management practice, risk management is widely applied to cost (with allowances and contingency), but not so much to schedule. And this happens although for large, complex projects, schedule is the main driver of the project performance! In particular, appropriate convergence at the few critical points of the project play a crucial role. Why and how can we extend the concept of allowance and contingency in the field of schedule management?

Conventional schedule and schedule risk treatment

Conventional project management practice considers a schedule which is a linkage of tasks, which are given a certain duration, without any apparent explicit treatment of their potential variability.

In fact, it is widely recognized that task duration variability is often treated implicitly by padding the duration estimates. Why is this practice commonly accepted in the field of schedule management, when it is recognized to be a poor practice in the field of cost management?

In addition, this practice leads to a vicious circle: confronted to more time to do a task, the responsible person will generally fall into the Student's syndrome[1] and will miss the target after having shown a very low productivity at the beginning of the task.

It is thus important to recognize that padding time estimates is a poor practice and that time variability needs to be treated explicitly and separately, exactly as it should be in cost management.

Probabilistic schedule treatment

Lately, some tools have appeared to analyze schedule-related risks, like PertMaster, which is fundamentally a Monte Carlo simulation applied to schedule. Probabilistic durations are allocated to activities, instead of fixed durations. PertMaster simulations will give a probabilistic distribution of the end date of the project… which is not realistic, as it only shows limited variability, and we know from experience that projects can really spiral out of control schedule-wise.

Why are the PertMaster results not realistic? Because a Monte Carlo simulation assumes that each activity's duration variation is independent. It is not the case in real life: variations in activity durations have often a common cause which is related to resourcing (quantity or quality). In addition, the possible spread of the duration of each activity is often underestimated by the project team.

Still, Monte Carlo simulations like PertMaster can give some interesting information by looking at the probability to have alternate critical paths in the schedule depending on the duration of activities. If there is a substantial chance that the nominal critical path will not be critical, then the activities in the other possibly critical branches need to be considered carefully.

Use activity floats and project buffer as an equivalent to allowances and contingency

All the techniques used currently to manage the schedule risk are thus insufficient in particular when it comes to large, complex projects.

In the cost area, best practice for managing line items variability is treated by making sure the estimate is a P50[2] and making explicit what are the allowances, if any, for this line item. In addition, an overall contingency is allocated to cover the overall statistical variance of project cost, which is not allocated to any particular line item.

A similar approach should be used in scheduling. Activity durations should be set at the P50, without padding. Any "allowance" for the duration of a particular activity should be shown explicitly as an activity float allocated to this particular activity. And the project delivery date should be protected by a project buffer, which is an overall "contingency" applied for schedule.

As in the best practice in cost management, at the beginning of the project, no activity float should be allowed, only the overall project buffer. This is to ensure that the baseline project schedule takes into account the P50 durations. Activity floats may be introduced later, as long as they do not impact the project buffer, to cater for new knowledge about the expected duration of certain activities.

Dealing with intermediate milestones

In general, intermediate mandatory milestone dates should be avoided in the project as they will add many constraints in the project program which will result in unnecessary standby of resources and other inefficiencies.

If intermediate mandatory milestones are unavoidable, their number should remain minimal; and each milestone should be protected with a milestone buffer so as to allow a protection against fluctuations in activity durations.

How to use explicit activity floats and project buffer

The first use of the project buffer and activity floats is a healthy monitoring of the effective convergence of the project. During the project execution, the evolution of the project buffer can be monitored and corrective measures taken early if this evolution becomes divergent, way before the delivery date of the project is impacted.

The second use is a much better usage of opportunities. In conventional scheduling practice, it is very rare that opportunities for shorter durations of activities, if they arise, are effectively exploited for the project. By making sure that the time estimates are not padded, the baseline schedule is more aggressive which allows for a better utilization of the possible opportunities – while protecting the delivery date with a buffer. Leveraging opportunities when they arise can be further enhanced by identifying the critical resources involved in the critical activities and making sure they are ready to work even if the previous activity finishes earlier than expected.
The third use is an accurate knowledge at all times of the conservative assumptions that have been introduced in the project schedule that can be shared and discussed explicitly with interested stakeholders.

How can we estimate the P50 for activities?

One of the greatest challenges is to estimate P50 durations for activities, because project team members and suppliers alike will have a tendency to pad their estimate to ensure that they fulfill their delivery commitments.
A strong data base is needed to be able to benchmark actual durations. Such a database often exists for cost and not for schedule; it needs to be extended to schedule data as schedule is indeed the main driver for large, complex projects.
On the short term, while this knowledge database is being developed and filled, some rules of thumb can be used.
For documents, engineering deliverables that are done in-house, P50 can be taken as half the announced duration. It seems harsh but is a very valid rule of thumb. For suppliers, duration estimates can be made part of the competition in parallel to price so as to have a feel of what is reasonable to expect compared to what would be announced without such constraint.

How can we estimate the project buffer?

The project buffer should normally be estimated using a Monte Carlo simulation with realistic (experience based) spreads of duration. These spreads should be very wide for activities like engineering so as to give a realistic value to the project buffer.
Otherwise, a rule of thumb would be to have a project buffer equal to 10% of the project duration found by using P50 estimates for a simple project with low convergence pattern, up to 25% for a complex project with a high convergence pattern.

Conclusion

In large and complex projects, schedule performance of a project is directly linked to its overall performance. It is vital to make the assumptions about allowances and contingency as explicit in the schedule as they are in the cost. This practice, combined with the convergence plan monitoring practice (White Paper 2012-04), has multiple advantages over the conventional scheduling approach, while building on it in an easy manner.

References

This note is heavily inspired by the Critical Chain Project Management approach to project management

Notes

1. *The Student's syndrome is commonly associated with the fact that when they feel they have a lot of time, people procrastinate and tend to start working on a task only just before the due date and, thus, they generally miss the due date!*
2. *P50 means that there is a 50% chance that the cost will be lower (and thus 50% chance it will be higher). Conversely, a P80 means that there is a 80% chance that the cost will be lower (and thus 20% chance it will be higher)*

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