# White Paper 2016-02

## How to Check the Quality of an Integrated Project Schedule – part II: On the Source File

*One of the key skills of a Project Manager should be to be able to vet the quality of schedules produced by his team. In this two-part White Paper we give important clues that allow to quickly assess whether the technical quality of the schedule is sufficient. In this particular White Paper we discuss how to investigate further in the scheduling software itself. Refer to White Paper 2016-01 for checks on the schedule print-outs.*

**Important note:** *the content of this Chapter is only strictly applicable to project execution schedules. Feasibility study or tender schedules may not be built following the same rules for the following reasons:*

- *Detail of activities unknown or assumed in some areas, replaced by placeholders*
- *Logic of the schedule might be different, e.g. schedule built from the delivery date backward to assess a required start date, utilization of positive or negative lags to avoid detailing, etc.*

Further investigations can be performed on the schedule source file. This requires looking at the schedule in the original scheduling software (Oracle Primavera, Microsoft Project etc.) so as to observe the actual dynamics and linkages. It does not require specialist training, just some practice and logic and it is absolutely fine to get the software manipulated by the planner during a workshop, or a conversation (in all cases the planner will have to implement the changes so it is better that he/ she is present).

Some specific software exist that can perform automatically a health check of the schedule and can be used as a support to the following checks.

> We are always astonished to be called in to review Projects only to find out that they have, for starters, a poor schedule from its technical quality perspective.

## Main Check-Points

Some useful heuristics and key issues:

- In most sound schedules, **the number of links should be around twice the number of activities** (on the order of between 1.5 to 2.2 times). Less links indicate a weakly connected network with possibly insufficient representation of internal constraints between activities and chains of activities; more reflect an overcomplicated schedule that might have been excessively linked and thus constrained,
- **Open-ended tasks should be of course avoided** as all activities should have at least a predecessor and a successor, except milestones, the start of activity chains and the final activities of the Project,
- **The number of date constraints** (where the start or the end of an activity is constrained by a date) **should be minimal**. They should be replaced by schedule logic. This also applies to soft constraints (such as 'start later than…'),

- **Start-to-Finish** links should be avoided (and they won't work for probabilistic risk analysis), except possibly for milestones links.
- More advanced issues include:
  - **Avoid negative lags**. A negative lag is an overlap in the logic between two activities – often it is used to represent an activity starting earlier, with sufficient time allow some other work to happen. Lags cannot have risk or uncertainty in Schedule Statistical Analysis. In reality it is likely that the negative lag represents a necessary overlap, whose duration is uncertain. Consider replacing a negative lag with another kind of link that does not need the lag. For example, replace a negative lag on a Finish-to-Start link with a positive lag on a Start-to-Start link; or split the activities so that the overlap is explicitly represented by an activity.

### Proper schedule coding to produce different views

Check that the schedule is properly coded so as to enable easy filtering and display in ways that will be useful to different Project contributors.

Custom fields should allow filtering/ display the schedule by the Work Breakdown Structure dimensions (refer to White Paper 2015-15 'How to Relate Schedule Hierarchy Levels and Work Breakdown Structure':

- Function/ Trade (Engineering, Procurement, Fabrication, Construction, Commissioning, etc.),
- Plant/ facility area,
- System,
- Contractor (when relevant).

Each of these needs to be further subdivided in sub-functions and sub-areas as useful.

Should these codes be missing, the schedule will not be very useful for the team. To draw maximum utility, this coding should be introduced, and a number of pre-defined schedule views setup so as to allow automatic production of all the relevant and appropriate printouts on a regular basis.

### *Proper schedule coding for Earned Value Management*

In addition, in those areas where Earned Value Management is planned to be implemented (typically, engineering and construction), specific coding needs to be implemented. This coding has to be entirely consistent with the Work Packages used by Cost Control. This breakdown structure needs to be implemented in the schedule in the form of a separate specific field so as to be able to implement Earned Value Management according to the relevant subset of the WBS

## How to run a schedule source file check

In summary, play with the schedule to check that it flows properly and without hurdle!

The checks should be done with the schedule running live on the screen, and the same representation used as for the checks on the schedule print-out (in particular, with the Total Finish Float apparent).

- **When changing significantly and artificially the duration of an activity** (as a test, double or triple the duration of a key activity to see what happens), the full network should flow and change without visible artificial constraints. It is quite easy to see visually on the Simplified Project Schedule and can be a bit more difficult to see in the Integrated Project Schedule, but it can still be done,

- When significantly and **artificially lengthening the duration of an activity** that is not on the initial Critical Path, alternate Critical Paths should appear running through the entire schedule duration,

- **Follow the logical links from one activity to the next, in particular on the Critical Path**. It is easily done in all scheduling software through the function that identifies all predecessors and successors of a specific activity, and allows jumping directly to these other activities. Through a suitable sampling, this will quickly give a sense-check of whether the EPCC (Engineering- Procurement- Construction- Commissioning) chains are properly represented, as well as whether the most important interfaces and dependencies between chains of activities are properly linked (a Project Manager will generally know what these are). In that review it is important to keep it at the sampling level for the Integrated Project Schedule without following on to review the entire schedule. On the other hand, this review can be expected to be done in an exhaustive manner in the Simplified Project Schedule: this is also required

> **Schedule coding and detailed linking is essential in making sure it is a representative model of project execution that can be used.**

if the Simplified Project Schedule is used for Schedule Statistical Analysis.

- Sample activities and **look for the number of successors and predecessors**. Too many predecessors and successors, in particular if they use the same resources, is unrealistic. Also, this tends to effectively reduce the float available in the schedule network and is hence diminishing schedule resilience (ref. the concept of 'merge bias').

## Conclusion

We are always astonished to be called in to review Projects only to find out that they have, for starters, a poor schedule. Poor in the sense of poorly linked, not representative of the work to be done, or unhealthily unbalanced between the types of activities that have to be performed.

Setting up an adequate route map at the onset of the Project should be the utmost priority of the Project Manager. Unfortunately, this does not always happen, either because of work overload or of a lack of competency from the Project Manager. This White Paper provides straightforward ways to challenge a schedule to get it improved to a point where it can be realistic and useful.

In all cases, before sailing away, make sure to have a proper map of the right quality in hand!