

impose or remove restraints. One of the problems they see in PDM is automatically making an activity or string of activities critical that may not belong on the critical path, a practice that they claim is anathema to well-trained CPM users.

"The point is, we lose the intellectual rigor and discipline required to properly go ahead and to properly utilize the technique," says Wickwire. A law book he co-authored, *Construction Scheduling: Preparation, Liability, and Claims* (Aspen Publishers, 2003), is full of examples of schedules being written or altered improperly. In one example from a few years ago, a contractor simply shortened the duration of activities in the later stages of a project when work fell behind on the early phases. But good scheduling practices require monthly updates including performing forward or backward passes through the entire project.

As for the software, all that's needed in some instances are asterisks to draw attention to places where the logic has been overridden, says Plotnick. "It's not the software's fault, but the software company should have something in there so the engineer is given a warning when somebody is misusing it," he says.

Faris agrees that leads and lags can be used excessively, but he says assigned constraints and retained logic both have legitimate uses.

One complaint by O'Brien and others is that polished, easy-to-read graphics are being emphasized over process integrity. That complaint, agrees Russell J. Lewton, construction manager for the Weitz Co. LLC, Des Moines, is right on target. "You must be careful not to be sucked in by the fact that it is a polished-looking schedule because computer schedules can be overwhelming (in size and complexity) when they incorporate too great a level of detail," he says. But if not sufficiently detailed, they are meaningless, he adds.

"Among the young guys, computers have made it easy to slap together something that looks right, but there is a thought process that must be involved, and it is hard to tell in many contemporary schedules if the thinking happened or not," Lewton says. Weitz puts the schedule writer together with the project staff to get "the right detail for the application."

AVOIDING CLUTTER. A similar dilemma exists for other contractors. A "big and complicated" schedule negates its effectiveness, says Allen P. Read, chief scheduler for Salt Lake City-based Layton Construction Co. For that reason, he avoids resource loading, data on work crews and other things needed for the job, unless he must do so because a public works agency requires it. Some government agencies want to see a lot of specifications and milestones and some even limit the duration of project activities. As result, Read may have to break the activities into components, "adding clutter to the schedule."

Others say cooperation and how a schedule is prepared and used on the project is more important than errors by schedulers made possible by the software. "The most glaring weaknesses in schedules result from a failure to seek adequate buy-in at the front end," says Joe Wathan, a project director for San Mateo, Calif.-based Webcor Builders. But he also says that the

HOW PDM SCHEDULES ARE ABUSED

Excessive leads and lags:

A lag is the number of work periods by which an activity may be delayed. It may fail to show which part of an overlapping activity is critical or to identify how much must be in place before successor starts.



Result:

Makes identifying impact of changes difficult.

Multiple calendars:

May lead to difficult and sometimes anomalous results in calculating project status on updates, as well as overall project duration.



Result:

Can lead to discontinuous float paths and make it hard to identify the critical path.

Assigned constraints:

Overrides computer calculations at the core of CPM scheduling.



Result:

According to one scheduling expert, "If you do this, it's a bar chart" and not a traditional CPM network diagram and schedule. But the problem exists in degrees, and one assigned constraint is not anywhere near as damaging as 500.

Retained logic:

When used for automatically updating out-of-sequence activities, critics claim it makes it impossible to get an accurate update.



Result:

If you don't revise logic when work is out of sequence, you will get erroneous remaining durations because there is no way to know, short of spending much time researching the network, which activities are driving the activities that are currently in progress.

Sources: *Construction Scheduling: Preparation, Liability, and Claims, 2nd Edition.*

tools available in scheduling software are running ahead of the training and resources dedicated to using it. "If you take the Lamborghini scheduling tools on a large project without the resources necessary to manage the tool, we still get the student-driver result," he says.

Another phenomena worth noting, says Kent D. Pothast, scheduling manager for Portland, Ore.-based Hoffman Construction Co., is that schedules often are anticipated as tools in claims and lawsuits. As a result, what may have started as a pure construction schedule is written to include owner decisions, architect's timely submittal of drawings, approval processes for changes and other data. The common result, whether float is being added or eliminated, is "you are trying to keep somebody off you or put pressure on somebody else," says Pothast.

Some contractors set up schedules in which anyone else's delay of any kind allows them to file for more time and money. Government agencies are wising up, however. At least one agency now specifies how many activities can be within two weeks of the critical path to stop contractors from putting in semi-artificial activities to get rid of float, says Pothast.

The software programs all do the same thing, he says, and once activities, durations and logic are entered "you can trust the software," says Pothast.

Plotnick wants scheduling to be a branch of engineering, like steel design, so that software is used properly and those who would perpetrate deceptions can be penalized. Others say the only solution is to discourage questionable PDM practices, which is exactly why the College of Scheduling exists. O'Brien says he believes Primavera wants to do what's best for the industry and produces an excellent product. "Like the gun industry, their exceptional product can be put to bad purposes," he says.

Primavera's Faris questions whether the software firm has the responsibility to uphold law and order. His answer: "We have the responsibility to provide a tool that provides correct answers." □

By Richard Korman, with Stephen H. Daniels