

BY IAN CARTWRIGHT, C. ENG.

In this article, presented in three parts, I invite your participation in a research project that will evaluate the question, “Do scheduling specifications work?,” and attempt to provide some useful conclusions on this extremely important and troublesome aspect of project/construction management.

In Part One, I will pose a number of critical questions that I plan to answer through research and establish a framework for the ensuing discussion. The discussion will address particular and common features that appear in schedule specifications and will continue in Parts Two and Three. The article will conclude, in part three, with an online survey that will invite you to share your views on the themes and issues raised throughout the article.

Separately, my research will also involve conducting a series of semi-structured interviews with parties involved in this subject. If you are interested in taking part in an interview, please contact the writer.

The summary results will be made available here and complete transcripts of the final research document will be made available to those interested.

### THE SCHEDULE SPECIFICATION

The Schedule Specification has come to be known as the section or part of a specification that defines the contractor’s obligation with respect to the production and maintaining of the contractually required construction schedule. This specification comes in all shapes and sizes but typically addresses, among other things, what the schedule should look like, what it should incorporate, how it should be prepared, how it should be updated, how frequently it should be updated, and the requirements for revising it in the event of delays to the project.

Given the current unsatisfactory state of construction project scheduling (see below), and the practical difficulties of attempting to apply rigid boundaries to something as abstract as a schedule, I pose the following questions:

- Do schedule specifications currently help or hinder?
- Are schedule specifications necessary?
- If necessary, what should be included and excluded?
- Should a schedule specification be prescriptive or performance-based?

Answers to these questions will be evaluated through research outreach and respondents will be asked to consider their responses in the context of their own experiences and in consideration of the framework laid out below.

### THE STATE OF CONSTRUCTION SCHEDULING

My observations lead me to the conclusion that overall the

quality of scheduling performed on construction projects is poor. There is a misconception that the quality of a schedule should be measured by measurable characteristics of the schedule itself (i.e., how many activities, how many relationships). This simply is not the case.

The quality of a schedule should be measured by the extent to which it can serve as a useful, valuable management tool and the success of the scheduling effort on a project should then be measured by the extent to which it does or did serve this function. All too often, the scheduling effort is relegated to a matter of contract compliance with little value to the management of the work.

The self-adulation of some schedulers who boast of being able to produce a so-many-thousand activity schedule is part of the problem. Schedules of overwhelming size have little value and their shortcomings are quickly realized at the first update. To use a well-known and most fitting adage, “It’s not what you have, but what you can do with it that counts.”

An overarching problem is that scheduling (itself a misnomer) has become synonymous with CPM scheduling that requires the use of proprietary software. This has led to the indiscriminate use of CPM scheduling in situations where it is inappropriate.

For their part, scheduling software proponents propagate the CPM allegory. Indeed one can draw a parallel between the scheduling software industry and the pharmaceutical industry; both are adept at developing new products designed to cure our symptoms and both are supported by a horde of associated parties who benefit from their products’ claims.

Whereas both undisputedly can provide valuable solutions to some problems, the particular solution may be unnecessary if one takes the time to understand the root cause of our problem and consider an alternative and/or preventative action. So it is with CPM scheduling. It is not a matter of one-size-fits-all.

In its quest for control, management science has, unfortunately, become accustomed to measure something, as opposed to the right thing, and has come to believe that legislation ensures success of our intentions. Both are generally erroneous when applied to scheduling.

### DISCUSSION FRAMEWORK

To improve the quality and usefulness of scheduling as a project management tool, and understand the role of the scheduling specification in this objective, it is necessary to get back to basics. Some of the fundamentals appear to have been overlooked in the melee of today’s scheduling

effort. A legendary construction success story helps us start.

### The Empire State Building

Architect: Shreve, Lamb and Harmon Associates  
 General Contractor: Starrett Brothers

Height – 1472 feet to top of antennae, 1250 feet to 102nd floor observatory  
 Volume – 37 million cubic feet  
 Area of site – 83,860 square feet

Steel frame – 58,000 tons  
 Erected one storey per day (at times faster) without overtime  
 This erection speed has never been repeated since

Opened May 1, 1931 by President Hoover. He turned on the building's lights from Washington, D.C.

Construction time – 410 days

Project budget – \$50 million  
 Total cost – \$40.9 million  
 Actual construction cost – \$24.7 million (No, it's not a misprint!)  
 Today's construction cost estimate – Greater than \$600 million

Scheduling software – None  
 Construction success attributed to – Starretts' innovative project management.

The statistics speak for themselves. Construction of the Empire State Building was most definitely planned and planned very well. In all likelihood the work was also scheduled, but not using CPM or computer software. I know of no recent project with the benefit of modern CPM scheduling that approaches this performance. Can it be concluded that modern construction "problems" are not schedule-related but rooted in other problems that the schedule merely reports?

### Project Management, Planning and Scheduling

The construction industry has adopted the words schedule and scheduling to be synonymous with plan and planning and this is unfortunate. The terms are intrinsically related but distinctly different, with scheduling a sub-set of planning. Significantly both Primavera (P3) and Microsoft (Project Planner) refer to their products as planning or planning & scheduling software.

In my opinion, these three terms represent a hierarchy of operations, though planning might be considered a synonym for project management, a proposition explored below. The point is that scheduling is the last in the

sequence of operations and certainly not the driving force. Now, consider each of the following terms.

### Project Management

I will not attempt to define project management since, like planning, we all know what it means. But its abstract nature makes a definition elusive. I reference it in order to compare it with planning. However, for reference, I submit the definition of the roles of management advanced by Henry Fayol in 1916. It is valid today and as good as any definition. The definition of the roles is as follows:

1. Prevoyance – To forecast and plan. Examine the future and draw up a plan of action.
2. To organize – To build up the structure, people, and material.
3. To command – To maintain activity among personnel.
4. To coordinate – To unify and harmonize all activity and effort.
5. To control – To assure that policies and plans are followed.

### Planning – What is it?

The management guru Henry Mintzberg, in *The Rise and Fall of Strategic Planning*, asks the pertinent question "What is planning anyway?," citing his observation that the question is seldom addressed in planning literature. He suggests five broad interpretations and there are arguably many more given the lack of its definition.

- Planning is future thinking
- Planning is controlling the future
- Planning is decision-making
- Planning is integrated decision-making
- Planning is a formalized procedure to produce an articulated result in the form of an integrated system of decisions

One can take these various suggestions and conclude, as Yehezkel Dror stated, "Planning, in a word, is management."

So where is this taking us? Well, a scheduling specification directs or attempts to direct the way in which contractors plan (and schedule) their work. If planning is simply a synonym for managing, then effectively the scheduling specification attempts to direct the way in which contractors manage their work. Conceptually this seems improper and appears to be in direct conflict with the long-standing doctrine that the contractor is responsible for determining the means and methods by which it performs the work.

When applying this notion to the specific act of planning and scheduling, one has to ask why a contractor should be coerced into planning his work using a prescribed method, especially when other methods may be more appropriate.

(A point discussed in more detail later.) For the moment, I ask you to ponder the philosophy of telling a contractor how he must manage his work.

#### Planning versus Scheduling

Planning is largely a cerebral function. The person responsible for planning a construction project (i.e., the planner) must consider the work to be performed, the contract time, the resources available, vendors, subcontractors, external constraints, and so on. With these considerations, the planner will draw upon and apply experience, intuition, insight, and personal preference in determining the approach to getting the job done.

This process results in the project plan and is the first and most important part of the planning process. Scheduling assists the planning process and gives the planner a means to forecast the time that the proposed plan will take to execute. In this regard, scheduling is simply a formulaic or mechanical function. The planner performs schedule analysis and modifies his/her plan in an iterative process until a satisfactory solution is reached.

In popular scheduling language, the plan (step 1) is represented foremost by the logic, constraints and the resources applied. The schedule analysis (step 2) determines the resulting activity durations and time for completion of the work. This is the method proposed by the AGC in its simple but instructive publication *Construction Project Planning & Scheduling*.

#### So What is a Schedule?

A schedule, to use this (misunderstood) term as we know it, is the means by which the contractor communicates how he intends to perform the work and meet his contractual requirement to deliver the project on or before the contractual end date. It is his plan.

An effective plan is one that can be communicated easily and understood by those responsible for implementing it. In this regard, CPM schedules often do a poor job of (re)presenting the plan or logic in any intuitive manner. This is in part because of the unnecessary imposition of artificial requirements in the schedule specification, such as the requirement to include so many activities per dollar value of construction.

A schedule is not a rigid, definitive, and unchangeable blueprint of what the contractor will do and when. It is a forecast of how the contractor intends to approach the work. It can often serve this purpose without the level of detail that many schedule specifications seek to elicit.

#### WHY PLANNING/SCHEDULING IS OFTEN INEFFECTIVE

##### Management by Data (and schedulers)

Rather than manage by objectives, owners — through their scheduling specifications and at times the recommendation

of their scheduler advisers — are attempting to manage the planning function by the quantity of data (despite seldom analyzing it) in the belief that more is better and that more sophistication is even better still.

CPM scheduling is a good tool. CPM in the wrong hands is an incredibly dangerous situation and where we often find ourselves today. The adopted convention of emphasizing scheduling rather than planning has:

- Placed emphasis on the software (and its capabilities) rather than the results
- Has propagated a generation of schedulers (not real planners) who lack construction experience
- Isolated the real planner (the superintendent, project manager, foreman) from the planning process

The tail is presently wagging the dog. Among the true professional schedulers are those that have proliferated because of their computer operating skills and knowledge of the software rather than their knowledge of construction. Moreover, in recognition of their power base, they have sought to strengthen and protect it. Hence, we end up with schedule specification that keeps schedulers employed, but fails to serve a meaningful project management/planning function.

Often the scheduler is engaged to translate the planner's plan into the form prescribed by the schedule specification. Too frequently, much gets lost or missed in the translation. The upshot of this is the situation where the field personnel build the project and the scheduler "does his/her scheduling thing." This situation is unacceptable.

There are many reasons for this situation, including but not limited to, a generation gap, computer literacy, lack of training, lack of understanding, lack of experience, and lack of integrated project management teams. Against this backdrop one must wonder what benefits can be gained by exacerbating the situation with ever more complicated prescriptive-type schedule specifications.

#### CPM Schedules are Overused and Misused

CPM schedules are used where they are not appropriate (in a large proportion of construction projects) and for inappropriate purposes. The former applies to the use of CPM scheduling in lieu of other more appropriate scheduling (planning) techniques that have been usurped by CPM. The latter comment applies particularly to the use of the schedule as a progress payment tool and for claims purposes.

In this regard owners are attempting to use the schedule, and therefore develop the specification, for too many purposes. The more you "get the schedule to do," the more complex the schedule becomes, and the more complex the accompanying specification...all of which dilutes the

real purpose of a schedule, which is to provide a forward-looking planning tool.

The irony of using the schedule as a payment mechanism is that for work to be paid, it must be physically measured as having been done. (The mere representation on a schedule does not connote the fact.) If the work is measured, and a record of it exists, then why is there a need to separately and discretely represent it on the schedule? Using the schedule as a payment tool unnecessarily increases the level of detail.

#### The Claims Prevention Folly

Schedule analysis can only assist in the interpretation and impact of quantifiable delaying events.

Here are some observations from my years of dealing with construction claims:

- Schedule disputes arise from one side trying to offset its failures on the other.
- Seldom does the resolution of a claim turn purely or significantly on a CPM schedule analysis.
- The underlying facts are much more important than the overall CPM schedule analysis.
- Forensic schedule analysis is a very imprecise science and has often been criticized by the courts.
- Juries don't understand CPM schedules.
- The battle of experts will merely give the jury two analyses it cannot understand.

Some believe that CPM schedule analysis can prove, as if by magic, construction delays. This is not the case. Nevertheless, CPM scheduling gained prominence for its purported ability to prove construction delays. Schedule specifications are, in part at least, an offshoot of this. Fearful of the cost of delay impacts, owners often want “bulletproof” protection in the event of a delay and, consequently, experts in forensic scheduling frequently write schedule specifications.

However, there is a certain paradox in that these so-called “bullet-proof” schedule specifications are often in fact bad

specifications. A bad specification leads to a bad schedule. A bad schedule is ineffective as a project management tool. A poor project management tool gives rise to poor contractor performance, a delay, and ultimately a claim. The “bulletproof schedule specification” causes the very thing it set out to avoid.

When relatively few construction projects end in a dispute, is it not better to draft the specification for the desired outcome rather than the unlikely one?

#### SUMMARY

Planning — and its resultant product, the project plan, a.k.a the schedule — is a project management tool to assist in the management and decision-making that affects the execution of the work. Any requirement of the schedule that does not fulfil this objective is redundant.

A plan, by definition, is forward-looking. Anything in the past is a record of fact. Any use of the schedule for historic recording purposes is unnecessary and should not interfere with the primary purpose of its project management function.

#### END OF PART ONE

This concludes Part One of this article. I have enjoyed introducing this topic, which was necessarily long to emphasize the wider context of the problem before us. I hope I have whetted your appetite and stirred some debate, for this was the intention. I hope that you will follow me through Parts Two and Three and ultimately respond to the survey.

In the next part, we will look at some of the specific areas of concern regarding schedule specifications, why they are believed to be important, how they generate conflict, and ask if they necessary. Issues will include a discussion of whether or not size is important (of a project, that is); agreeing on baseline schedules, activity duration, and resources; float ownership; updates; and rescheduling.

#### ABOUT THE AUTHOR-

**Ian Cartwright, C. Eng.** — Mr. Cartwright is a professionally registered engineer, quantity surveyor, and builder with 20 years experience of technical, contractual and financial aspects of capital construction. He has been involved with all stages of construction projects from inception through completion. Mr. Cartwright's experience covers highways and bridges, railroad electrification, power generation, transmission and distribution, oil and gas processing, institutional buildings, recreational facilities, cold storage and refrigeration. He has provided expert services for Contractors' Counsel, State Agencies, City Law Departments and Attorney General's Office in support of negotiation, arbitration and litigation. Mr. Cartwright is based in PinnacleOne's Middletown, Connecticut office.