CONSTRUCTION

Project Management Guide

PART 2 // SCHEDULING

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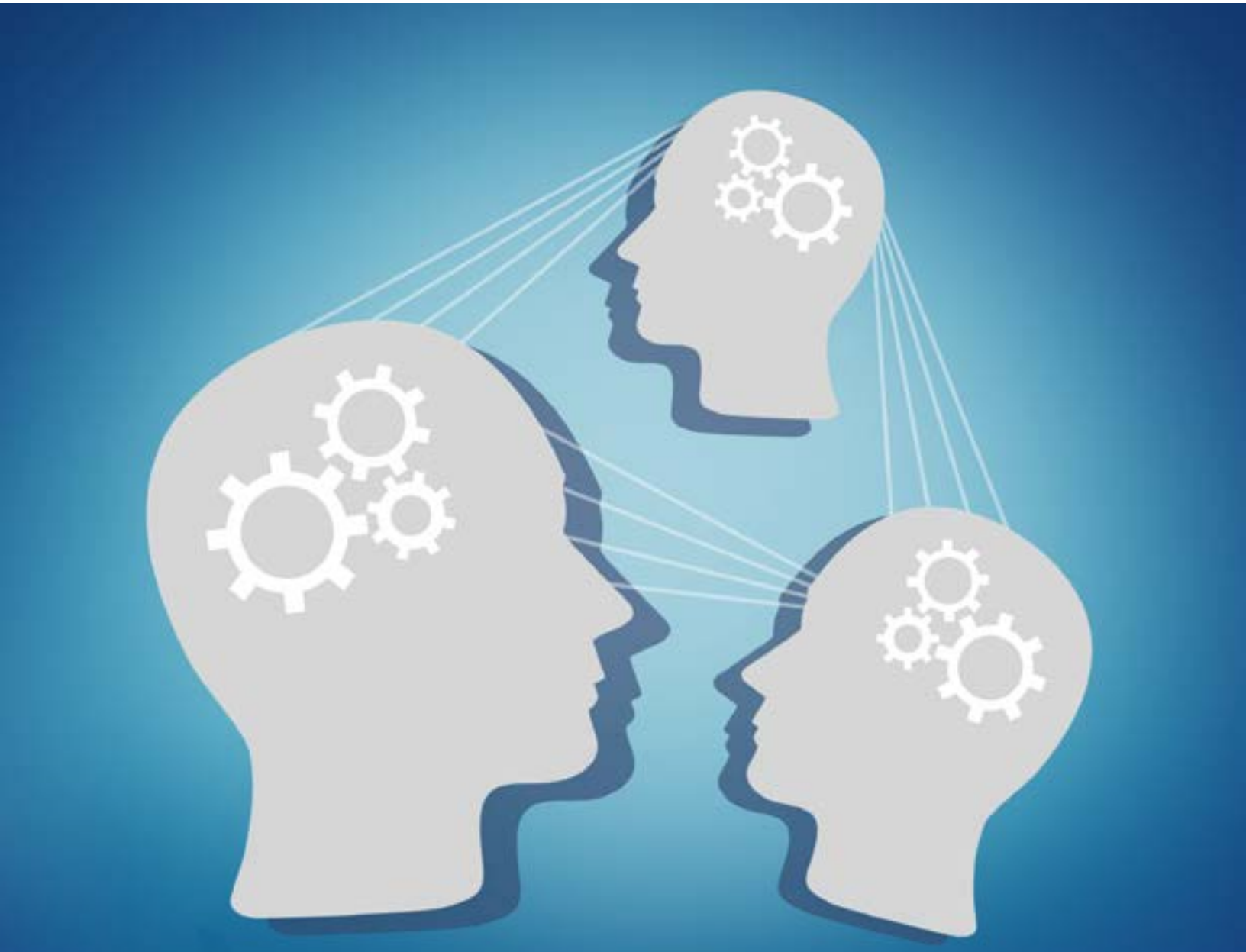
Communicating the Schedule

Construction project planners know the details of the schedule inside and out. They can look at a Gantt chart and easily see the relationship between tasks, the durations assigned and the resources committed. They can also readily recognize the critical paths and see exactly how things are running and if they are running behind schedule. Unfortunately, few others in the construction process are interested in the symbols and graphs planners rely on. This is why, as soon as the schedule is designed, astute planners practice the art of talking and writing in terms tailored to their audiences.

In "Choosing Project Success," J.F. McCarthy emphasizes the communication challenges planners face when he writes, "Many people do not like to plan; they prefer to operate and react, and many people cannot understand interrelations between activities. Furthermore, most people are incapable of using the graphs, mathematical symbols and tables that are part of scheduling." This means the planners become some of the only people in their trade who understand these resources, making them futile to everyone else involved in the build. McCarthy's advice for those who develop the schedule is to translate their contributions in layman's terms and numbers.



Circulating a Gantt chart to work crews to illustrate their tasks, along with their respective resources and time constraints communicates very little to them. However, the same chart, shared with the subcontractor planners, will not only be understood, but expected, as they speak the same “language” of planning and scheduling. Work crews need straightforward communications without ambiguity. For example: Install the electrical outlet boxes with the necessary wiring between June 10th and 20th. If you include an illustration for further clarification, McCarthy advises providing a simple bar chart without distracting critical path annotations.

MEETING UP

Project meetings focusing on communicating aspects of the schedule are crucial. In part because you want to make sure the schedule is realistic for all those doing the work, but also to get buy-in from all stakeholders. Gather detailed estimates from subcontractors and others involved when creating the schedule and find out if there are limitations that have arisen that were possibly overlooked.

Schedule meetings with your teams to keep everyone on the same page. However, try to avoid scheduling them when other forms of communication will suffice. Meetings are successful when:

- Group decisions are necessary
- They offer the best way to share information that requires collaboration
- It's necessary for people to meet in person
- People need to receive the information at the same time

DOCUMENT MANAGEMENT

It's become more important to have a firm handle on managing communications, especially with all the document storage options now available. Project management solutions such as Procore include document management functions that greatly simplify the organization of all project documentation. From submittals and change orders to RFIs and punch lists, the right document management solution makes sure actionable items are acted upon, that notifications occur on time and that people have the right information when they need it.

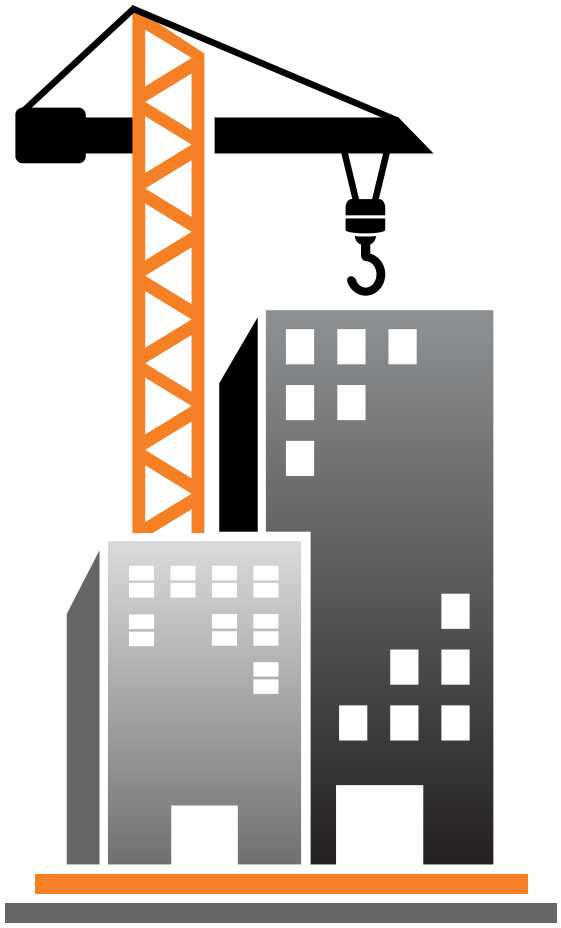
Managing verbal communications related to the schedule is a bit more challenging since discussions often happen spontaneously, and even when planned, there are technical and legal limitations related to recording them. Even if recording is an option, there are challenges of storing, sorting, searching and archiving audio files to ensure they are quick and easy to locate. It often falls on the participants to create their own verbal or written record of the conversations, within a reasonable amount of time. But many don't document their interactions and tend to rely solely on their memory to direct their responsibilities. If the communication between the two was effective, meaning both parties clearly understood what the other said and meant, it's likely both parties will make the appropriate and agreed-upon decisions. But if the communication was muddled, or both parties left with a different understanding, the decisions most likely won't be aligned.

The person talking tends to assume their message is clear and precise, but that's not always the case. When those communicating share a common ground, they have a good chance of understanding one another. However, when people of different backgrounds and professions communicate, the possibility for error increases. To make sure you understand one another, you have to ask the simple, and often over-looked, question, "Do you understand?" If you don't ask this when there's a possibility of misunderstanding, you are contributing to the confusion. Effective listening, removing distractions and occasionally summing up what the other person has said also helps make verbal communications more effective.

The schedule is ultimately the tool that will determine project success. Ensuring it is communicated accurately, consistently and completely, with all stakeholders involved, is the only way to utilize its potential.

CHAPTER 6

A Resource View of Scheduling

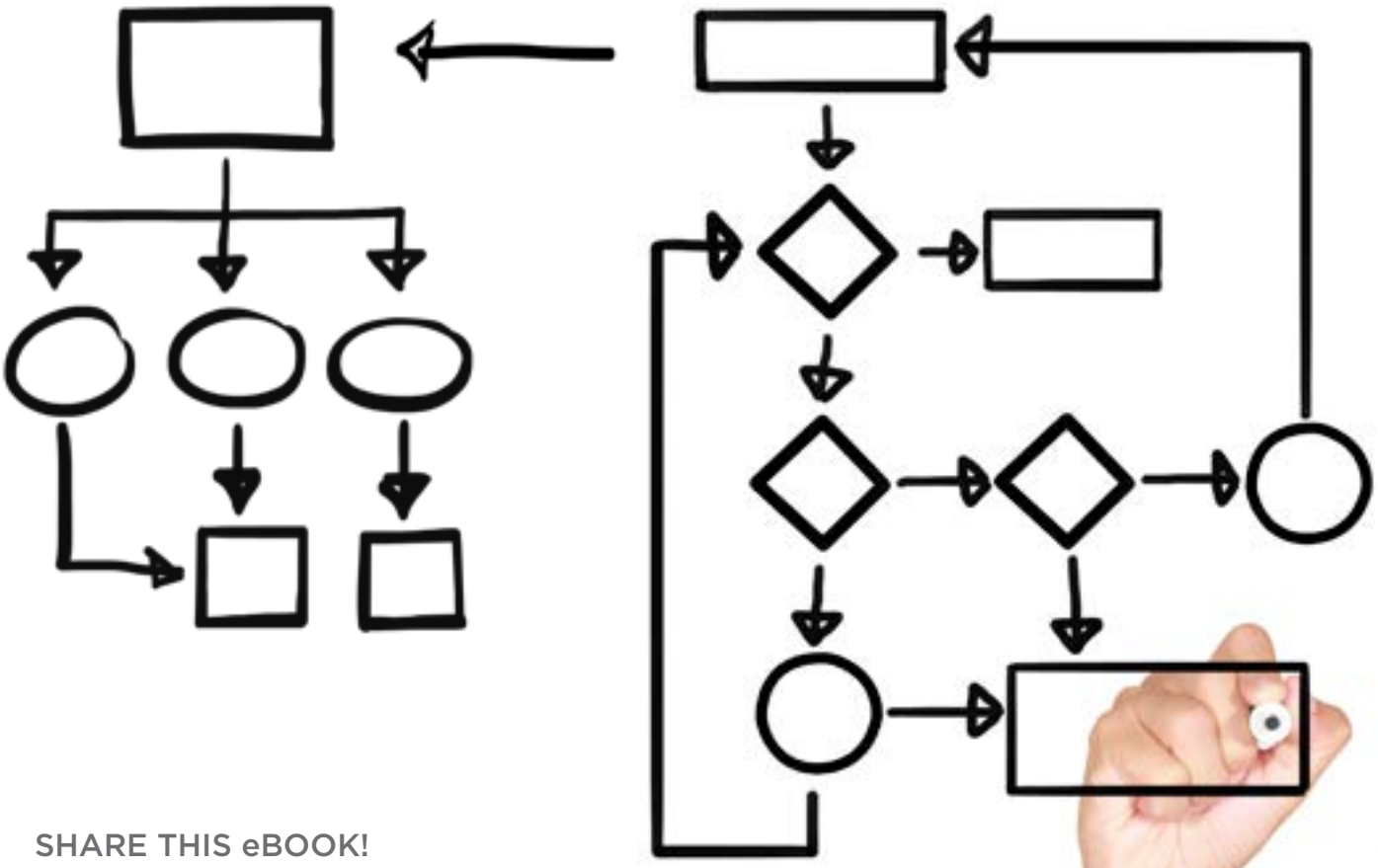


CPM LIMITATIONS

Bottlenecking, due to limited resources in high demand, can potentially be resolved if schedules are created based on available resources. For example, a construction project with environmental problems requiring a special team of remediation experts may result in delays if finding enough experts proves to be impossible. A series of linked projects dependent upon a common resource, such as a construction crane, may cause delays if, due to space and safety issues, adding additional cranes is out of the question. Taking the time to review your schedule based on the resources available, can save you time and money and keep your project on track.

A resource-based approach is often used in conjunction with the Critical Path Method (CPM), but there may be some projects where using this as the exclusive scheduling technique is appropriate. Consider a project where short-supply resources are needed for more than one task, making it impossible for the CPM to work. As Chris Hendrickson, Department of Civil and Environmental Engineering, Carnegie Mellon University states, this happens because CPM scheduling "assumes that no resource availability problems or bottlenecks will arise." There are also additional methods for dealing with resource limitations. For example, the scheduler could set up resource constraints first and then add precedence constraints. Another option would be to set up resource-challenged activities into groups that receive special attention.

Regardless of the chosen process, the schedule must ultimately reflect the resource limitations and effectively deal with them, or the issues have to be dealt with manually. One such manual approach is a reservation system for handling resource bottlenecks in which the resource in short supply is identified early in the planning stages. Therefore, participants that need the resource can reserve it at a predetermined time. In computer-managed projects, this process has been further refined by independent software agents and referred to as a Multi-Agent System. The agents are autonomous, each representing either a process or a resource, and negotiate the right matches between processes and resources. According to T. Horenburg, J. Wimmer & W. A. Günthner's paper, "Resource Allocation in Construction Scheduling based on Multi-Agent Negotiation," these systems have been tested and proven highly reliable and capable of returning high-quality solutions for resource-constrained project scheduling problems.



CPM OPTIONS

CPM scheduling alone can accommodate all resource constraints, or can be done in concert with resource-based scheduling. For example, when there is only an occasional resource limitation, you could start with the CPM and address the resource constraints as needed. If there are multiple resource constraints, then it might be more beneficial to deal with the resource issues first. Furthermore, it may be advantageous in some instances to proceed by following both approaches at the same time. There are many different ways to deal with scheduling problems– including those arising from resource constraints– and many times it simply means modifying the CPM.

Hendrickson outlines a process beginning with the CPM, in which you lay out tasks, durations and resources in their proper order. Predictably, you'll experience deviations in the start times of activities and if you schedule each activity to start at its earliest possible time, resource constraints may appear. The next step is to pick the activity that is resource-challenged and has the CPM "late-start time" earlier than any other resource-challenged activities that have all their predecessor requirements filled. Then, shift the start times of all those activities to later times. As new conflicts arise, continue applying the rule all the way through to the end of the project. When choosing what order to consider the resources, select important ones first, meaning those with higher costs or most likely to cause bottlenecks. Taking care of these early makes other decisions much easier.

RESOURCE SCHEDULING AND LEAN CONSTRUCTION

As more construction projects adopt lean construction principles, the corresponding need for very clear views of what the project requires increases. For example, in most schedules, the activities and resources necessary for transitioning from one task to the next remain largely invisible. The preparation work needed for just beginning a task is seldom shown, yet it is a time and resource-using activity. The delivery of materials and equipment, the movement of tools and supplies, the preparation of surfaces, setting up workspaces, acquiring missing components and many other activities are essentially being added to the timeline without specifically being accounted for. While resources such as materials, manpower, tools and equipment are necessary to accomplish an activity, there are also ‘sleeper’ resources that can bottleneck just as much as not having the right size fastener. These informational resources include contracts, drawings, specifications, RFIs, approvals and all other prerequisites that inform the means of a task.

In the paper, “Integrated Production Scheduler for Construction Look-Ahead Planning,” the authors explore how an Integrated Production Scheduler (IPS) System can effectively manage issues arising from missing resources at any stage of the schedule, even those that are invisible. The system relies on a person designated as the Integrated Production Scheduler to act on behalf of all the stakeholders from project managers to suppliers. It develops the look-ahead schedule with a short-term, detailed focus that is critical to keeping a project on track once underway. IPS identifies the information and resource constraints that are most likely to derail the timeline, and focuses on them to minimize their impact.

This process is ongoing and involves establishing a series of four buffers, as described by David, K. H. Chua and Li Jun Shen, in their paper, “Constraint Modeling and Buffer Management with Integrated Production Scheduler.” The buffers discussed are not constraint buffers, but schedule buffers put in place to focus on critical resources and information requirements to control delivery and availability. Once suppliers confirm the availability of their constraint items, the activity they relate to is placed on the look-ahead schedule.

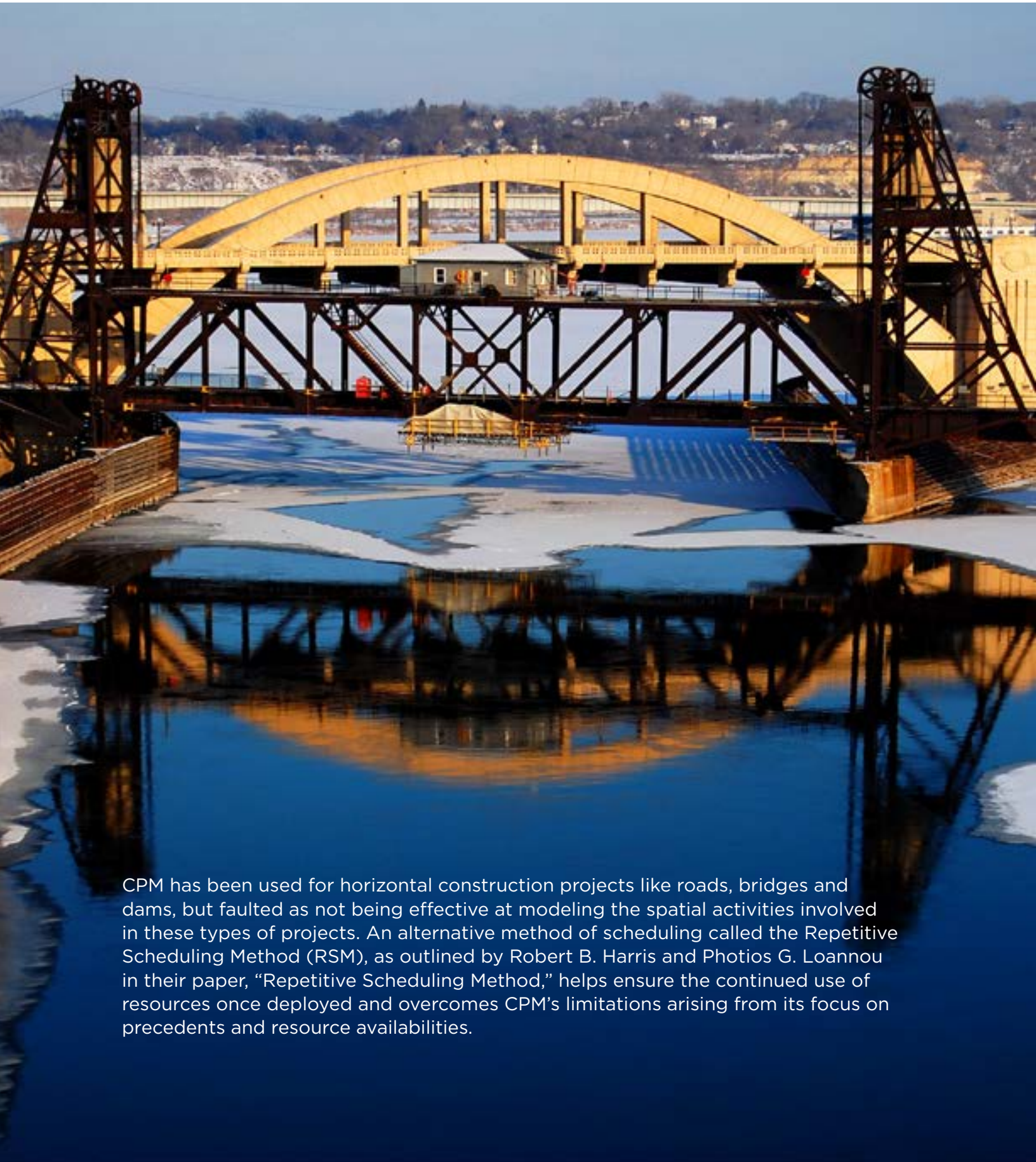
Construction planners and schedulers handle the variables of resources from the inception of the project until completion, and sometimes beyond that. When resource and information constraints are light, the CPM works well on its own. However, as the number and complexity of resource and information constraints increase, it can be beneficial to incorporate alternative scheduling processes.

CHAPTER 7

The Evolving Construction Environment

For more than 60 years, construction has largely relied on a single type of scheduling process, the Critical Path Method (CPM). The seeds of CPM were started by DuPont in the early 1940s and then developed into a project modeling technique in the late 1950s by Morgan Walker and James E. Kelley, a mathematician who had been working on linear progression.

Until the advent of CPM, project schedules were governed by Gantt charts with dates and durations based only on the experience or best estimates of the planners, according to Patrick Weaver FAICD, FCIOB, PMP and Director of Mosaic Project Services Pty Ltd. Needless to say, the planners weren't always right, especially on complex construction projects. Planners had only their personal opinions on the potential length of delays when things went wrong, causing contractors and owners to flood projects with resources, often at a very high cost.



CPM has been used for horizontal construction projects like roads, bridges and dams, but faulted as not being effective at modeling the spatial activities involved in these types of projects. An alternative method of scheduling called the Repetitive Scheduling Method (RSM), as outlined by Robert B. Harris and Photios G. Loannou in their paper, "Repetitive Scheduling Method," helps ensure the continued use of resources once deployed and overcomes CPM's limitations arising from its focus on precedents and resource availabilities.

CPM is also being challenged on the vertical construction front by scheduling techniques that enhance building information modeling and lean construction, with RSM and location-based scheduling (LBS) being the main challengers. Where CPM focuses on time, LBS focuses on resources. LBS, however, is not a new idea, having been successfully used in the construction of the Empire State Building, which set records for its construction rate, according to Natalia Rodriguez Martinez in her doctoral thesis.

LBS assigns and tracks crews as they proceed through a series of repetitive tasks in different locations. Instead of task duration timelines for the chart, LBS has flowlines that quickly show the speed of crews relative to one another. Building Information Modeling (BIM) fits naturally with LBS because it provides more information that is actionable from a scheduling perspective, according to Capital Project Management, Inc. For example, schedulers could use material quantities shown on each floor to decide crew sizes and assign timeframes and productivity.

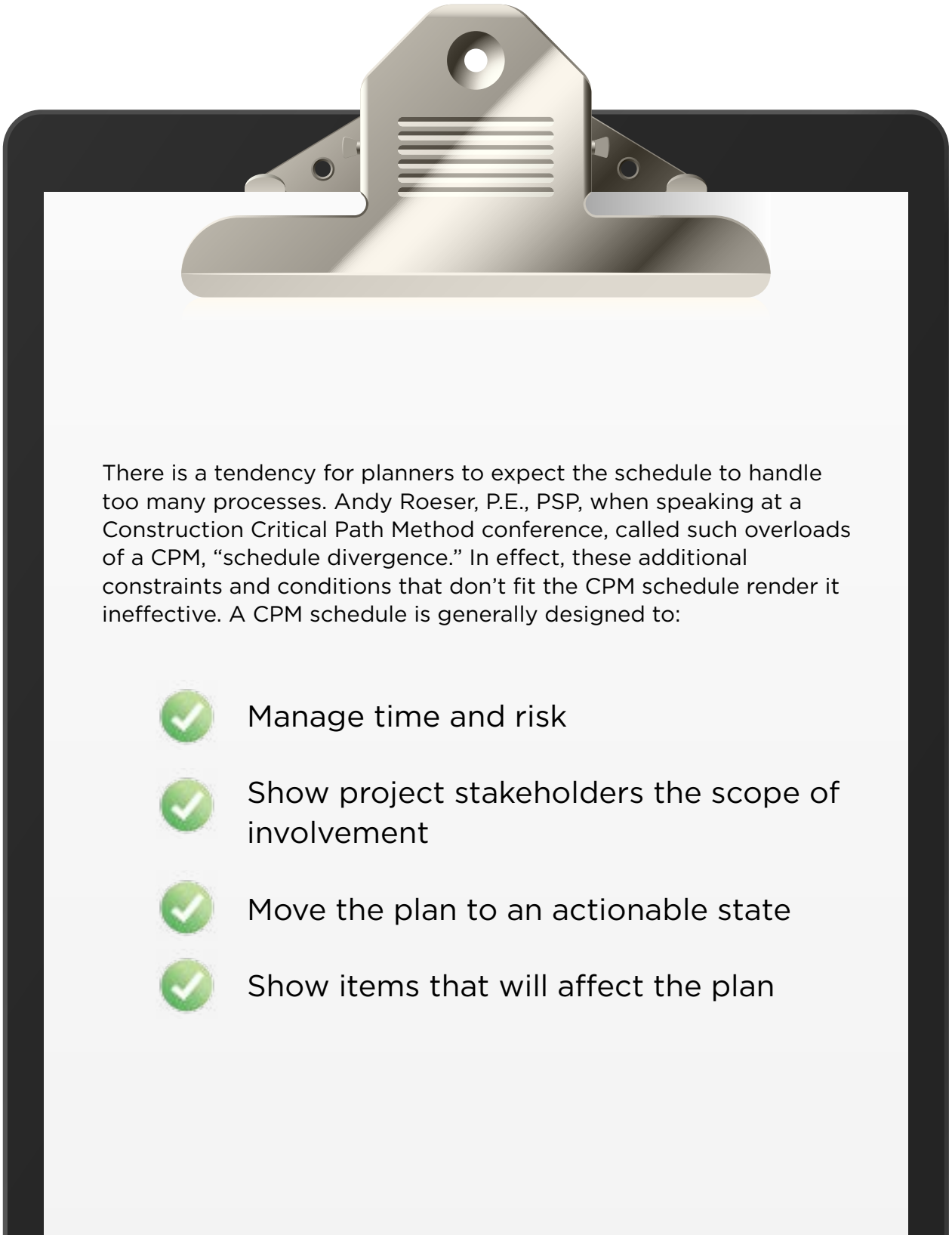
PRACTICES FOR CPM

No one expects CPM to go away anytime soon, especially with more than 90% of construction firms using it today, but as new technologies such as BIM continue making inroads into the sector, changes in the processes that take advantage of the benefits arising from those new technologies will continue to gain speed. In the meantime, CPM will hold its dominance not only because of its familiarity, but because other project scheduling processes are not as well vetted when it comes to legal aspects such as proving delay claims. CPM is also intertwined with the earlier project management processes like planning.

Ultimately, the values derived from the planning stage are plugged into a CPM scheduling application such as MS Project or Primavera, which can then be integrated into software programs like Procore. These schedules are available online for easy viewing and sharing, along with all the other aspects of the project. The following items form the basis of the schedule:

01	Tasks
02	The relationships, or dependencies between tasks
03	The time for completing each task
04	Stopping points that feed successive tasks or that feed the project's end

Once these are entered into the application, you can see the duration of tasks, and of the overall project, along with the earliest and latest a task can start without affecting the project's schedule. You can use analysis tools to get various views of tasks, durations and the project's critical path to completion. The real advantage is that whenever you change resources, tasks, time, or dependencies, the changes automatically trigger a recalculation of time-to-completion and adjust other affected parameters. This makes it convenient for carrying out "what-if" scenarios, and makes it highly efficient when changes become necessary.



There is a tendency for planners to expect the schedule to handle too many processes. Andy Roeser, P.E., PSP, when speaking at a Construction Critical Path Method conference, called such overloads of a CPM, "schedule divergence." In effect, these additional constraints and conditions that don't fit the CPM schedule render it ineffective. A CPM schedule is generally designed to:

- Manage time and risk
- Show project stakeholders the scope of involvement
- Move the plan to an actionable state
- Show items that will affect the plan

According to Roeser, the kinds of additions thrown into a CPM schedule that can cause it to divert from its intended purpose include:

01 Too much data

02 Incorporating change management and using the CPM as a claims and payment tool

03 Not incorporating changes in a timely and accurate manner

04 General contractors and construction managers not communicating the plan

05 Updating the CPM incorrectly

In particular, it can be dangerous to have too many people interacting with the schedule. As new requirements are added, such as tracking change orders and cost data of resources, the schedule becomes increasingly overloaded with information, inhibiting its effectiveness and rendering it useless. While prudent to limit the kinds and amounts of data resources used in CPM, there's evidence that incorporating information flows can be beneficial.

The authors of “Information Flow Integrated Process Modeling” used a case study to examine how incorporating information dependencies into a CPM schedule can detect information loops and find conflicting process relationships. The authors first identified the information dependencies and incorporated them into the schedule. They found they could reduce information conflicts such as those that arise when stakeholders don’t receive critical scheduling information, a technique especially relevant for lean construction practices. Construction projects are infused with greater and greater levels of complexity as delivery options, design methods, materials, and construction methods evolve. When CPM is not specified by owners, construction planners should take advantage of alternative scheduling processes that best fit their building needs.

CHAPTER 8

Addressing Schedule Challenges

Construction project schedules go through predictable cycles of changes as more and more specifics of the project are revealed, and the plan, in its entirety, is fine-tuned. But even as the last item is placed on the timeline, there are some schedules that require extra finesse to make them truly workable. These schedules often suffer from resource constraints and excessive tasks creating lag time. Most commonly, as the projected costs move from vague to clear, there is often a last-ditch effort to move costs back in line with the original budget.

Building a schedule that minimizes costs usually relies on optimizing the lower tasks to such extremes that they push out project completion. The knee-jerk reaction to those results often leads planners to go too far in the other direction and schedule all tasks equally. Using overtime because of a compressed schedule leads to higher labor costs, but as Chris Hendrickson, author of “Project Management for Construction” points out, it can also lead to increased accidents and lower quality work. Both which lead to higher costs.

When you apply this approach systematically, you will reduce the project's duration to a point where another path becomes the critical path. Continue this process until you're satisfied with the cost/duration ratio. From there, you can optimize the schedule by alternating between both approaches. This process will also show you when the project deadline is unattainable. These processes are most effective when there are resource constraints and when the time-cost balance for tasks isn't known ahead of time.

Tweaking the schedule by adjusting durations and the cost of items directly confronts issues with the project's total budget and completion time. Other schedule problems such as resource constraints, excessive lag times and missing requirements are often the result of incorrect assumptions made either in the estimating or planning stage that ultimately informed the initial decisions. Solving these challenges comes down to reviewing and correcting earlier assumptions.

THE MAGIC OF OVERLAPPING TASKS

Gantt Charts look most alluring when all the lines connecting tasks drop straight down from the end of one to the beginning of another. But most of the time, these charts aren't so symmetrical or predictable. It's actually a good thing many tasks on most project portions comfortably overlap each other. This presents the opportunity to refine the schedule and make up for resource constraints and excessive lag times.

For example, painting can begin long before the entire house has been rocked. Plumbing can proceed on one portion of the fifth floor while wire is being pulled on another. Moving successor task start times to the earliest time possible can easily result in significant reductions in durations and costs. The trick is to do so cautiously so as not to upset the rhythm of each task. If the drywall installers are working in the back of the house and the only way to get the materials into the work area is to come through the entrance hallway, it's probably best not to have painters working in that hallway. And if HVAC ductwork isn't installed above the furnace, then having plumbers install the hot water heater in the same utility closet might be taxing for not only the space, but the crew as well.

However, tightly scheduling tasks where there are space limitations is not entirely out of the question. If you are working with skilled crews you know well, and the return on time or cost savings seems worth it, employing exceptional and timely coordination could make it work without any negative side effects.

PAYING PARTICULAR ATTENTION TO LABOR

Another opportunity to tackle challenging schedules is to re-examine how the mix of resources is being deployed. In this case, you start by looking closely at activities on the critical path. By increasing the manpower on a task, work will be completed faster assuming:

- There is room for everyone to work efficiently
- Everyone has the necessary skills and tools
- The predecessor task is far enough ahead so the increased momentum of the successor task won't cause the two to crash
- The necessary equipment and materials are available

Sometimes, replacing labor with mechanization can radically reduce time and cost constraints. Machines are tireless and unaffected by mood, attitude and comfort level, and provided you have the necessary resources for operating and maintaining equipment, can become your greatest asset in addressing schedule limitations. It is critical, however, to know the limitations of machines and the resources that surround them. Machines that are utilized inefficiently, or that compromise their strengths, will inevitably become problems. If machines aren't reliable and well maintained, higher costs and longer durations will result.

FINDING MORE TIME

You have to factor productivity into any schedule when you want to extend the workday calendar. Having a six day week without bringing in fresh crews for the sixth day increases the risk of higher costs due to overtime pay, heightened accident risks, and lower productivity. It's better to simply extend the work week to seven days and arrange the crews to average 30 to 40 hours a week. Crews stay fresh longer, accident potential decreases, productivity is higher and overall task durations are shortened, all without increasing costs. Be aware of the importance of buy-in from all parties when interrupting the traditional work week and remember to factor in all local labor laws.

GAINING DEEPER INSIGHTS INTO REQUIREMENTS

In the imperfect world of construction schedules, there is great value in having a second pair of experienced eyes to overlook the schedule. In particular, the project manager should review and inform the rest of the team on the progress of the schedule. There are likely things that only the PM knows, as they are privy to negotiations surrounding the duration of various participants' tasks. There may also be global constraints only known at the highest levels and special considerations related to labor and equipment that are part of contractual obligations or other encumbrances and requirements.

CHAPTER 9

Managing Unrealistic Expectations

While each project has an estimated completion date, construction projects are notorious for requiring many adjustments to scope throughout the process. Owners, bankers and others involved at the highest levels always consider the project in terms of completion because, as everyone knows, the longer a project is under construction, the more it costs. The goal is to get it built as quickly as possible, so the product can move into its most useful stage where the highest returns on investment are possible.

UNREALISTIC DATES WITH VALID REASONS

There are times when the completion date is driven by a strict and quickly approaching deadline. If a tax credit expires at the end of the year, investors will attempt to harness the tax advantages before December 31st. Solid deadlines like these can't be adjusted and if the principles haven't provided enough time for thorough planning and execution, the project will inevitably face problems. Hopefully, those in charge of deciding the scope trust the planners to make appropriate adjustments and take into account the lack of time. Otherwise, those creating the schedule are left with the often difficult task of making expectations more realistic. According to Claude Emond, project management consultant, coach and trainer, if you continue with an unrealistic schedule, you could face the following negative results:

- The team won't be able to buy-in
- The schedule will fail to deliver
- You'll be the scapegoat for the missed deadline
- You'll be asked why you didn't inform people of the schedule problem

BECOMING THE SOLUTION

To handle this situation, you must make sure you are working with up-to-date information and that you've created a plan with input from team members that reflects the shortest time to completion. If, after you've tried crashing, fast-tracking, and applying alternative estimates of critical path activities, you end up with a plan that fails to meet the deadline, the next step is to ask management if the project length you've arrived at is acceptable. If not, you'll need to come up with alternatives, according to Rita Mulcahy, PMP. There may be options you can present that will address the problem and bring the project in on time. These include:

01	Scope changes that eliminate or shorten portions of the project
02	Different methods such as using prefabricated components
03	Increasing resources
04	Specifying receipt of certain information by a certain date
05	Changing particular quality specifications

The benefits of following this process, according to Mulcahy, include:

- Pushing back in a positive way
- Involving management in a way that gets buy-in
- Arriving at a realistic project schedule

UNREALISTIC DATES WITH INVALID REASONS

There are times when a project deadline could be used in a manipulative way. An owner or project manager will sometimes set unrealistic deadlines hoping to pressure the team to pull it off. In one way, unrealistic deadlines that are founded on a real need can spur teamwork and ultimately provide a sense of accomplishment, says Vincent McGevna, PMP. But when deadlines are superficial, they can become problems for the following reasons:

- They encourage shortcuts that result in defects
- They muddle the availability of resources
- They put pressure on those responsible for the late-in-project successor tasks
- They force project participants to fix defects from one task, while working on the next task

This is another situation where communication is critical. Project managers and planners are retained for their expertise and when they don't demonstrate their know-how and set potentially damaging expectations, they do a disservice to the client, and themselves. There is often the fear of being regarded as less than competent if you tell project owners that their dates are unachievable. The opposite is actually true, however, assuming the homework has been done and the deadline is proven unrealistic.

SCOPE CHANGES AND PLANNING TIME

Scope changes can be another source of unrealistic expectations and often continue to be so long after the schedule is complete and the project is in the construction phase. Those changes have to be dealt with as they occur, but changes that take place while the schedule is being assembled require accommodation before construction begins.

Changes in scope requirements during the project planning stage can sometimes result from new information being revealed. For example, as estimators and planners receive information about site conditions, they may detect situations that require remediation or extra work. Poor drainage, unsuitable soil conditions, access problems and complications with utilities are often exposed in these early planning stages.

These and many other factors will ultimately push the desired completion date if they can't be mitigated. When these changes continue in frequency and volume to the point where they affect the time available for planning and scheduling, something must be done. Just as a plumber requires a minimal amount of time to complete a task, so too does a planner. In the absence of adding planners to the job, the issue of not providing enough time to properly plan must be confronted.

This situation is often more difficult than tasks on the timeline because it's easier to view scheduling as a non-contributing factor to project completion. But in the final analysis, inadequate timing always leads to a poorly planned project that does not meet expectations.

Regardless of the project, it is the level of trust management in estimators, planners and project managers that influences how their take on unrealistic expectations and unrealistic schedules is regarded. When the trust isn't there, the project will undoubtedly fail on many levels.

CHAPTER 10

Analyzing the Schedule

Drafting the project schedule is an important step in the construction process as it guides the direction of the project. For simple projects with short durations and less than one hundred tasks or components, the first draft may provide enough information to implement the project. For more complex projects, however, there are usually subsequent drafts required to better address issues such as lengthy critical path and project completion date extensions. Other areas where additional analysis may be needed include:

01	Tasks, resources and assignments that don't flow logically, or that need special considerations
02	Costs that exceed activity or project budgets
03	Over allocation of resources
04	Achieving a better fit of allocated resources to tasks
05	Adjusting task relationships

The best way to make these adjustments manually is to utilize project management software. For example, Microsoft Project includes a number of ways to adjust what is displayed and how it is displayed so you can see problem areas, share information and improve the schedule. By selecting the appropriate views, you can locate problems within the schedule that you wouldn't necessarily see otherwise. However you plan to do your schedule review, put it in writing and describe your process clearly. Be consistent from one project to the next as it will help define your review process and work style and allow others to follow along. There are many different approaches to analyzing the schedule and you should pick one that matches not only your work style, but the types of projects you work on. For example, the Defense Contract Management Agency 14 Point Assessment is required for government projects and provides a step-by-step process for analyzing a schedule.

DCMA ANALYSIS

When analyzing a schedule, make sure it is logical. For a logical framework, you must ask yourself why the project is being done, what the expected outcome will be, how the project will be achieved, the means required for success, and the overall project cost. While these items will most likely not appear on a timeline, as a resource or on a task list, they are still crucial components of a successful project plan.

Timelines, however, do possess logical characteristics as well. Any task on the timeline that does not fit the criteria of the project is a mistake. Likewise, if tasks are not appropriately linked as predecessors and successors, it's a red flag that must be examined closely.

Two other key factors to review on a schedule include the number of leads in predecessor relationships on incomplete tasks and the number of lags on incomplete tasks. There should not be any leads in predecessor relationships, due to the critical path and their negative affect on analytics. When it comes to lags, those numbers should be kept to 5% or less. Because the DCMA 14 Point Assessment is designed to be completed throughout a project's reporting cycle, total tasks, completed tasks and incomplete tasks are all included in the metric. If you're using this standard to evaluate the schedule before the project begins, most, if not all, of the tasks will be incomplete.

By counting the number of start-to-start, finish-to-finish and start-to-finish relationships for incomplete tasks, you'll be able to make sure that at least 90% of your schedule uses the finish-to-start relationship. Also, look at the number of start-to-finish relationships and see how often they are used. These should be rare and if used at all, should be accompanied with sound justification.

Make sure that incomplete tasks do not include more than 5% of hard constraints because the schedule will then become illogical. Likewise, they should not contain more than 5% of floats exceeding 44 days, and should not be missing predecessors or successors. Check for tasks with floats that are negative and adjust the schedule as necessary to eliminate them.

Next, look for incomplete tasks with high duration, like those exceeding 44 days. You should try to keep those instances to less than 5%. These tasks will most likely not be broken down enough to be manageable and provide transparency into exact timing and cost. Also, look for invalid dates. There shouldn't be any start or finish dates occurring after the end of the project or after the end of a particular reporting period. Then, make sure that all tasks have either hours or dollar amounts assigned to them and check to see if the project completion date has a negative total float number. Two other analyses to perform are the Critical Path Length Index and the Baseline Execution Index, both of which come into play once the project is underway.

OTHER ANALYSIS HELPERS

You might decide to look for help with the schedule analyzing process. Short, simple projects as well as those that are long and complex can benefit from outside analyses. This could be done by consulting planners or by individuals with similar project experience. There are also software programs available that can perform schedule analyses and flag troubled areas. Here are a few of these software programs:

Schedule Cracker analyzes the schedule and addresses problems that occur in seven main areas. It finds these issues and gives insight to the schedule by including cost metrics analyses, highlighted activities with alarming conditions, and showing the places where closer inspection is needed, such as abnormal activities. This tool also tells you how closely the schedule fits the Defense Contract Management Agency 14 Point Assessment requirements and compares a base schedule against a revised schedule, analyzes the trends, and performs an earned-value analysis.

Acumen Fuse is a diagnostics tool that "pinpoints and resolves shortcomings in a matter of minutes." It uses industry-wide standards and allows users to define their own standards as well. This software checks for logic, float, sequence of activities, level of detail, costs and risks, and earned value. It too compares changes over time and analyzes single or multiple project files. Once the analysis is completed, the tool then summarizes the results to include a quality indicator score that can be used to assess the schedule's quality against industry benchmarks.

Steelray Project Analyzer says it can "evaluate your project schedule for quality and performance in minutes." It also has a "coach" that helps you fix problems using actionable guidelines. This software calculates the longest paths, detects circular chains of activities, assesses the schedule against the 14 DCMA points, compares schedules, provides a scorecard and justification, analyzes by phase/period and allows you to interact with UN/CEFACT files.

Because project schedules are usually built in a fluid and dynamic environment, they require constant adjustment. Once the project is ready to implement, a thorough review of the project schedule will pave the way for success.

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