Brought to you by

Deltek Know more. Do more.™

Deltek Special Edition

Planning a Great Project For Dummies®

A Wiley Brand

Learn to:

- **Create a project schedule that's realistic and achievable**
- **Proactively reduce project risk**
- **Ensure the team buy-in you need for your project to succeed**

About Deltek

Deltek is a leading global provider of enterprise software and information solutions for professional services firms and government contractors. For decades, they have delivered actionable insight that empowers customers to unlock their business potential. 16,000 organizations and 2 million users in over 80 countries around the world rely on Deltek to research and identify opportunities, win new business, optimize resources, streamline operations, and deliver more profitable projects.

Deltek – Know more. Do more.® www.deltek.com

Follow us on Twitter @Deltek or Like us on Facebook at www.facebook.com/deltekinc

Planning a Great Project For Dummies®

A Wiley Brand

Deltek Special Edition

For Dummies®

A Wiley Brand

Planning a Great Project For Dummies®, Deltek Special Edition

Published by
John Wiley & Sons, Inc.
111 River St.
Hoboken, NJ 07030-5774
www.wiley.com

For general information on our other products and services, or how to create a custom *For Dummies* book for your business or organization, please contact our Business Development Department in the U.S. at 877-409-4177, contact info@dummies.biz, or visit www.wiley.com/go/custompub. For information about licensing the *For Dummies* brand for products or services, contact BrandedRights&Licenses@Wiley.com.

ISBN 978-1-118-92950-6 (pbk); ISBN 978-1-118-93015-1 (ebk)

Manufactured in the United States of America

10 9 8 7 6 5 4 3 2 1

Publisher's Acknowledgments

Some of the people who helped bring this book to market include the following:

Development Editor: Steve Kaelble

Project Editor: Jennifer Bingham

Acquisitions Editor: Constance Santisteban

Editorial Manager: Rev Mengle

Business Development Representative: Sue Blessing

Custom Publishing Project Specialist: Michael Sullivan

Project Coordinator: Melissa Cossell

Table of Contents

Introduction

That's quite a balancing act you're expected to perform. You're planning a project, and the stakeholders want it done in a crazy-short timeframe, they expect it to come in under budget, and of course, it absolutely must be done right. Those are three expectations that often pull you in opposing directions, and it's your job to make it all work.

At the heart of any project is the schedule. There's no way you're going to make it all work if you can't make the schedule work. Obviously, a lousy schedule is unlikely to deliver the deliverables on time. But a poorly crafted schedule is also likely to blow the budget, and could well contribute to shoddy work. Yes, getting the schedule right is the key to success.

Fortunately, you've got great tools at your disposal, including CPM — or critical path methodology — scheduling tools. They're very effective at building schedule forecasts, but if you don't know some tricks, you're not likely to come out with a forecast that's realistic.

About This Book

The whole purpose of *Planning a Great Project For Dummies,* Deltek Special Edition, is to help you use CPM tools in a way that yields a realistic schedule forecast. It outlines a five-stage process that will help you craft a schedule that is well formed, risk adjusted, and optimized — worthy of the buy-in of all the key players on the team.

The process is known as *S1 // S5,* and it begins with your first draft of a schedule, straight out of your CPM tool. Read through the book and you'll learn new secrets for critiquing the schedule to make it better, then adjusting it to account for various risks that might cross your critical path. You'll learn how to take that risk-adjusted schedule and optimize it, accelerating where possible in order to keep those eager stakeholders happy. You'll find out tips for gaining the buy-in of the team, because a schedule without buy-in is doomed.

And you'll explore how to ensure you've got the resources you need to succeed, when you need them.

Foolish Assumptions

In preparing this book, we're assuming a few things about you, the reader:

- You plan and schedule major projects for a living, using one of the CPM tools on the market.
- You're convinced that there must be a better way to build a schedule that's not only beautiful, but workable.
- You're super-busy (who isn't?), and you'd appreciate some quick insights for improving your scheduling.

Icons Used in This Book

You have, no doubt, seen quite a few *For Dummies* books out there, and like the others, this one uses icons to help you spot specific types of information.

TIP: You could say this whole book is one big tip for project-scheduling success, but this icon points out a particularly helpful tidbit.

REMEMBER: If you're hurrying through the pages of this book, please don't miss the paragraphs next to this icon, because they contain some key points.

TECHNICAL STUFF: We're trying for some light reading here, but if you want to dig into some of the more technical details, don't miss these paragraphs.

WARNING!: There are a thousand ways a project and its schedule forecast can go wrong, and this icon alerts you to a reminder we hope will help you steer clear of the danger.

Beyond the Book

For more information on how Deltek can help you plan and execute your projects successfully, visit `www.deltek.com`.

Chapter 1

Understanding Schedule Maturity

In This Chapter

- Defining what a project is
- Caring a lot about planning
- Understanding the schedule-building process
- Facing the challenges
- Introducing the S1 // S5 maturity framework

Successful project management ultimately boils down to harmonious planning. And if successful execution is the result of adherence to a great plan, then project failure in such cases is really driven by poor and inaccurate planning. In this chapter, we introduce a concept for improving the accuracy of a schedule forecast through a maturity framework called *S1 // S5*.

Defining a Project

Experts have written many formal definitions of a *project*. For example, a project:

- Is a unique, temporary endeavor
- Contains a defined start and finish
- Is an individual or collaborative enterprise that is carefully planned and designed to achieve a particular aim

These are certainly useful descriptions, but consider a different way of looking at a project. Think of a project as being like a chemical reaction: A process through which one set of chemical substances is transformed into another. A chemical reaction usually needs to be triggered by a catalyst.

When you think about it, projects are similar to chemical reactions. Projects are the transformation of raw materials into an asset that creates value. Specifically, a project takes physical or intellectual property and transforms it into, for example, a building or a software product. To make this transformation happen, you must execute project work, such as the building work or the software coding. This work requires capital investment.

One important thing to consider about projects is that they don't generate wealth or revenue. They're expenditures, pure and simple. A project is the precursor to operations, and that's the phase of the asset lifecycle when assets start to claw back the project investment, then begin reaping the rewards that lead to long-term profit and *net present value* (that's NPV for short).

With that in mind, think of project management as the discipline for properly managing this investment of time, materials, and money. If you spend too much money on being the catalyst, your project runs over budget. But if you spend too little, you run the risk of delivering an asset that doesn't satisfy the objectives of the project in the first place.

Why Should You Care about Planning?

You may think of running a marathon as one of the ultimate physical accomplishments. But consider this: By the time a runner gets to the starting line, the hardest work has already been done. This runner has gone through months of careful preparation and intense training, preparing for what should be a comparatively simple execution of a well-rehearsed plan. Barring any unforeseen hurdles such as extreme weather or an injury, the runner will finish the race.

REMEMBER

The same is true for projects. If you accurately define the scope of work required to complete a project asset, then execution really should be nothing more than an exercise of "going through the motions." Just stick to the plan, and you're guaranteed success, right?

Why, then, do capital expenditure or *capex* projects pose such a risk to the project owner's investment? Many projects are frequently plagued by cost overruns and delays.

A lot of things can go wrong with a project. In that way, projects are similar to baking. And baking can go wrong in ways similar to the potential pitfalls facing your project planning:

- **You used the wrong ingredients for baking a cake.** Today's scheduling tools offer so many different building blocks that you may end up using the wrong ingredients to represent your plan.
- **You didn't estimate the quantities correctly.** Even if you choose the correct ingredients when baking a cake, you may get the quantities wrong. Developing a project schedule poses the same risks. You can establish the perfect plan with regard to sequence of work and logic and critical paths, but what if your duration estimates are wrong?
- **You didn't plan for the antiplan.** Perhaps you didn't account for the humidity being too high to bake the perfect cake, or the impact that baking at high altitudes can have. These two factors represent the project risk to your cake, or what we like to call the *antiplan*. If your plan doesn't include contingency or allocation for potential risks and uncertainties, then your plan is naturally aggressive and overly optimistic, which dramatically increases the chances that you will fail.

Overcome these factors and you're a long way toward making your project a success.

How Are Schedules Built Today?

REMEMBER

These days, generating a *time forecast* (often known as a schedule, of course) typically involves *critical path methodology* scheduling tools, or CPM. Modern commercial CPM scheduling tools have extremely broad functionality, but they're all based on the simple premise of the CPM algorithm.

At their core, these CPM tools assign the dates associated with projects based on the *scope* and *sequence of work* that the project requires. These determinations take into account a set of core ingredients, and perhaps some optional ingredients, too.

The core ingredients include:

- **Work breakdown structure:** This is a matter of breaking down the project charter or overarching objective into manageable chunks of scope, which are known as WBS elements. These elements are the deliverables themselves, *not* the work required to deliver them.
- **Activities or tasks:** This is the work required to achieve those deliverables. In order to establish the required activities, you'll have to define the durations, costs, and resources needed to execute the work.
- **Logic:** This refers to establishing the sequence of work (no, logic isn't just for Mr. Spock). You'll often see it referred to as *precedence logic*, and CPM tools typically offer four different types of logic links.

Beyond these core ingredients, you'll need some additional building blocks when creating a CPM schedule. For example, different disciplines often follow different working hours per week (these are the *calendars* you must consider). Also, contract requirements may determine when work can begin (these are known as *constraints*). And some tasks — for example, the curing of concrete — require specific waiting periods that your CPM tool will refer to as *lags* or *durations* on logic links.

Such building blocks help create a more realistic plan, with a higher chance of success during execution. Use these ingredients as necessary, but *only* where necessary.

The CPM algorithm is the catalyst for the chemical reaction . . . that is to say, your schedule. A CPM analysis consists of what is known as a *forward pass* and a *backward pass*. These calculations take into account the rules you've defined through the durations, calendars, logic links, and so forth. The forward pass moves forward through the project to calculate what are known as the early start and finish dates, which are the earliest possible times the project can start and be completed. The backward pass begins at the end of the project and moves backward to determine the latest possible time an activity can begin without delaying the project. The algorithm also determines a duration entity known as *float*.

REMEMBER

The result of all of this work is a CPM schedule. One of the most basic but important points is that the project schedule dates are the *output* from a CPM analysis, not the *input*. The CPM building blocks are duration-based, while the results are date-based.

WARNING!

All too often, inexperienced planners build plans by first establishing the dates, rather than following the steps. This totally defeats the purpose and premise of CPM scheduling — to introduce one more idiom not related to scheduling, chemistry, or baking, it's putting the cart before the horse. When you embark on a project, you don't know how long the project is going to take. What you do know (or at least you should know) is the scope of work required to execute the project. Based on this, use the CPM tool to establish the net duration and associated dates for project completion.

What Are the Challenges?

REMEMBER

To put it simply, the challenge is getting the plan right. But there are a number of ways the plan can go wrong:

- **Neglecting the structural integrity of the schedule.** Think of your schedule kind of like a painting, and your scheduling tools like the blank canvas, brushes, and paints. You may have the tools in hand, but you're a long way from being guaranteed a masterpiece. Scheduling tools don't provide all the guidelines or checks and balances you'll need in order to develop a plan. Your tool will have logic links, for example, but doesn't know that you can't build the roof before you've built the wall structure, and you can't build the walls before you've laid the foundation.
- **Setting unrealistic durations.** When considering the durations associated with various activities, people tend

to be optimistic, often planning for the best-case scenarios. For instance, you may neglect to allocate a buffer or contingency for unknowns, instead estimating based on the hope that everything will go according to plan. That's not always realistic. What if a four-hour marathon runner announces that she's going to run a marathon in three-and-a-half hours? That would establish unnecessary pressure and set up the potential for failure. Better to underpromise and overdeliver.

REMEMBER

- **Failing to consider external risks.** If someone asked you where you'll be precisely three years from now, you'd probably laugh, because there are too many unknowns to make an accurate prediction. Why, then, do people think it's reasonable to embark on multimillion-dollar projects involving thousands upon thousands of man-hours of scope, and expect to be able to predict the exact day when the project will be done? Isn't it more reasonable to give a window of outcomes based on potential knowns and unknowns? It's easier to take contractors seriously when they offer a range of completion dates based on what they know, rather than promising completion on a very specific date.

Introducing the S1 // S5 Schedule Maturity Framework

The rest of this book discusses a concept based on a maturity framework, designed to give you a much more realistic schedule forecast. Get the plan right, accounting for potential unknowns during execution, and you'll be setting yourself and your organization up for project success rather than project failure.

Here are the five components of this framework (see Figure 1-1):

- **Schedule basis:** S1 is the starting point. It represents you, the planner or scheduler, simply doing what you do best: building a project plan. No need to change your process or bring in new tools here. S1 // S5 is designed to provide added value to your existing scheduling investment. Your S1 schedule is the noncritiqued, non-risk-adjusted schedule that you use as the basis for your journey toward schedule improvement.

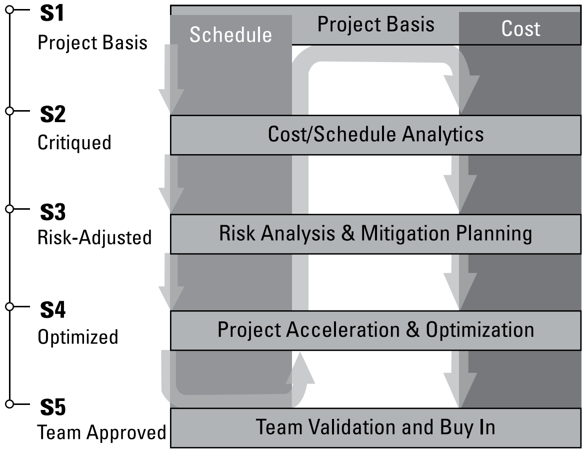


Figure 1-1: The five-stage project maturity framework.

- **Diagnostics:** S2 is where great things start to happen. S2 is all about diagnosing your schedule. It's the process of running your CPM schedule through checks and balances *(metrics)* to pinpoint shortcomings around structural integrity. For example, did you correctly use the CPM tool's building blocks? Fail to establish a strong foundation and you'll end up with a short-lived, problematic house of cards.
- **Risk-adjusting:** S3 is the step where you calibrate your schedule forecast, accounting for risk and uncertainty, to establish what is known as a *risk-adjusted schedule*. You may be thinking, this is where the forecast becomes non-deterministic, range-based, perhaps even fluffy. Wrong. Sure, if you believe you're operating with 100 percent certainty, you end up with a single-point, deterministic forecast date. The difference is that a risk-adjusted forecast date also carries a confidence level and a range. Investment banks have been using this approach for decades when establishing risk appetite. The bottom line is that the process works, yielding a much more insightful view of the project.
- **Optimizing:** S4 is a step many project managers don't realize they should be taking. By the time a schedule has been critiqued for structural integrity (S2) and has been risk-adjusted (S3), you're likely to have a project completion date that's significantly later than the original

completion date you had at S1. How is it that by doing the right thing, conducting all of this additional due diligence around schedule maturity, you've ended up with a date that is now worse than the original S1 date? Well, try looking at it differently: You haven't made the date worse, but rather have made it more realistic. That said, you still have the challenge of reporting this more realistic date back to the project stakeholders who often already have built their expectations around the original S1 date. S4 is how you look into potential acceleration scenarios to help push the S3 date back toward the original S1 date while still upholding S2 structural integrity along with adequate consideration of risk.

- **Team buy-in:** Wouldn't it be great to have a computer-optimized schedule completely free of manual errors and shortcomings? Truth is, projects are planned and executed by humans — humans who are the domain experts in their field, humans who carry the ultimate knowledge about how long things will take and how much a scope of work will be required. S5 is a review process allowing key project stakeholders to consider the schedule improvements, risk mitigations, and optimizations suggested by S2, S3, and S4. It's a buy-in process that forms the basis of subsequent re-cycles of the entire S1 // S5 process. This continuous-improvement, iterative approach represents a huge step toward establishing schedule forecasts that are as realistic as possible.

REMEMBER

The end result of going through the five states of schedule maturity is that the project now has an established schedule forecast that has been critiqued for structural integrity, that accounts for risk and uncertainty, that has been optimized for any potential acceleration, and perhaps most important, now has the project team's buy-in.

Think about the phrase "measure twice, cut once." It's not just for building or sewing. If you follow the S1 // S5 process, you have the luxury of multiple attempts at getting a plan right — plus a structured set of tools and processes for doing so.

Chapter 2

S1: The Schedule Basis

In This Chapter

- Building a CPM schedule
- Defining the different types of project dates
- Understanding the purpose of the plan
- Connecting multiple projects
- Working backward
- Wrapping up S1

To improve your schedule, you need a starting point. In this chapter, we walk through some scheduling basics and introduce you to the S1 // S5 maturity framework at the most logical spot: S1.

The Building Blocks of a Schedule

REMEMBER

Building a schedule can be a treacherous process, mainly because of the numerous modeling objects that are part of your scheduling tool. Here are some of the things you'll find in your toolkit:

- **Project:** The overarching entity that encapsulates your total scope.
- **Work breakdown structure:** WBS is your breakdown of project deliverables (not to be confused with the work needed to make these deliverables). What's listed here represents value.

- **Activities:** The work required to deliver deliverables. Unlike WBS, activities don't represent value, only expenditure.
- **Logic links:** The glue between activities. Logic links define the sequence of work.
- **Leads and lags:** These are durations on logic links. A lag is a positive duration, while a lead is a negative duration. An example of a lag is the drying period following a painting activity. There's no means for tracking performance during execution if the work scope is partially modeled using leads/lags.
- **Resources:** The labor and materials available to the project.
- **Resource assignments:** A rundown of how the labor and materials are used in order to execute the work.
- **Calendars:** These define the working and nonworking periods.
- **Calendar assignments:** Calendars can be applied to projects, activities, or resources, as well as logic.
- **Constraints:** These are the devil of CPM scheduling, and they're used to artificially drive schedule dates. There is a better way to plan, namely using the S1 // S5 maturity framework.

Different Types of Project Dates

Dates are the *answer* you get from CPM analysis; they're not the input. (For more on this, see Chapter 1.)

Based on the duration and sequence of work inputs, CPM schedules provide insight into two primary entity types: dates and float. The dates aren't just overall start and completion, but also interim milestones such as component delivery and payment dates. All activities carry start and end dates, but the story is a little more complex.

REMEMBER

Early dates are the earliest start or finish dates associated with an activity. Early dates don't mean an activity will be early! They're simply the earliest possible dates associated with that activity, assuming activity begins as early as it can while still adhering to any logic ties and/or resource constraints.

Similarly, *late dates* don't mean the activity is late. They represent the latest start or finish dates an activity can have without impacting the rest of the project.

Some people like to plan their lives adopting early dates — to start and finish a task as early as possible. Others prefer to leave the task until the last minute. Both approaches are okay, as long as they've properly forecast the time it will take to execute the task.

If that forecast is wrong, you'll quickly face the consequences of delay. Given that, if you have some flexibility regarding when you can execute a task, starting as soon as possible usually gives the best opportunity for remediation should things not go according to plan.

The difference between an early and a late date is known as *float*. Float can be associated with the start or finish of an activity, and it can relate to either the project as a whole or simply to an adjacent activity. Think of float as the wiggle room in a project.

Take a look at the simple two-path example in Figure 2-1. Activity A has a duration of ten days, while Activity B has a duration of eight days. That means Activity B has two days of float. This float can be used as a buffer, because Activity B can be completed up to two days late without impacting the overall project.

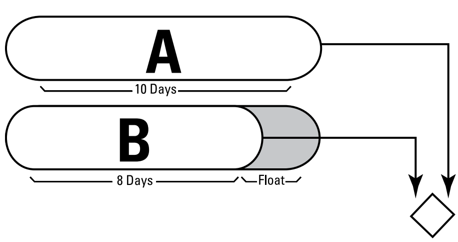


Figure 2-1: Float, as seen in a simple two-path network.

Depending on the overall structure of a project plan, some schedules can be highly *spongy,* meaning there's more float, more opportunity to absorb risk or even accelerate the schedule. On the other hand, a project plan with very little total float has a lot less room for error during execution. Given that, you can see that float isn't necessarily a bad thing.

However, negative float in a schedule is no laughing matter. Often known as a schedule *bust,* it's an indication that your schedule forecast is impossible to accomplish. You won't achieve on-time completion with a negative float schedule unless you make some changes.

Here's another kind of date for you: the *baseline date*. Think of baseline dates as a means for providing an audit trail on your project. It's one thing to have a very up-to-date schedule, but if your plan is undergoing constant change, how do you track the history of the changes? That's where baselines come in.

Baselines are at best complete snapshots of a project plan at any given time. At worst, they're simply an additional set of dates tagged onto your project plan that show a previous iteration of your schedule forecast.

When tracking baseline dates, you're best off using them as a complete snapshot of your project schedule. Baselines don't just relate to dates. Baselines can be applied to durations, costs, logic, calendars — literally every entity within your schedule can have a baseline.

Baseline your plan early and baseline often. A lot can change between the real world "time now" and your project plan "data date or time now date."

As the name implies, *actual dates* are the start and end dates of activities that indicate when the work really did start and finish. By tracking actual dates against a set of planned dates, you can start to gauge the execution performance of your project.

It's tempting to compare actual dates with planned dates in order to track performance, but be careful in doing so. Truth is, just because an activity has an actual finish date that's much later than its planned finish date doesn't necessarily mean it was a poorly executed activity. What if the activity wasn't able to start on time because a preceding activity was significantly delayed?

Instead of using dates when you need to track time performance of an activity, compare the difference between actual duration and planned duration. This comparison gives you a much better representation of the true performance of that activity.

Target dates and *constraint dates* are often badly misused in CPM schedules. Target dates should be for reference only. Target dates in CPM schedules have no bearing on the schedule dates.

Constraint dates on the other hand, definitely do have an impact on the calculations during a CPM analysis. Constraint dates essentially override the ability of a CPM network to have free-flowing logic.

For example, say you plan to lay the foundation on Monday, build the walls on Tuesday, and then put on the roof on Wednesday. If you add a constraint date against the roof stating that you will start roof construction on Tuesday, that would go against the naturally free-flowing logic, because roof construction can't begin until Wednesday, after the walls have been built.

To be sure, valid situations for using constraint dates exist, such as contractually forced delivery dates. But always use them with extreme caution.

If your project is tasked with completion by a particular date, the worst thing you can do is plug that target or deadline into your CPM schedule as a constraint date. Instead, simply use target dates to compare against calculated scheduled dates.

For example, if the CPM schedule shows the project can be completed by November 30, but the project stakeholder wants it done by October 30, it would be poor planning to put in a constraint date artificially showing an October 30 completion.

A much better approach is to compare the target of October 30 with the scheduled November 30 date, then figure out how you're going to proceed given the disparity. Do you need to replan? Do you need to reset expectations with the project stakeholder? Do you need to look at acceleration scenarios?

Planning Versus Control

A project plan really does serve two purposes. First, it's a communication vehicle informing a project team when to expect to complete a project. Second, it's a mechanism for tracking execution performance. Performance can only be measured by comparing against either a set of rules or guidelines, or in the case of a project, the project plan itself.

Many ways to track project performance exist, and each one could have its own book (and no doubt does). For the purpose of schedule maturity, assume that your project is using one of the accepted techniques, such as:

- Straightforward actual V planned date tracking
- Earned schedule
- Earned value

The Perfect Level of Detail

Here's a common question: "How much detail should I plan to?" And here's the best answer: "Break down your project into as many manageable small chunks (activities) as needed, enough for you to have sufficient insight to be comfortable reporting the forecast during planning as well as tracking how well you're performing during execution."

Notice that the answer doesn't give an actual number. If your project is building a garden shed, breaking it down into 100,000 activities actually hinders your ability to see the big picture. On the other hand, on a highly complex refinery turnaround project, 100,000 activities probably won't give you the granularity you need to track performance down to the working-shift level.

Beyond being tracked against a plan, project performance more and more is being measured using industry benchmarking. It's one thing to come in on-time against the agreed-upon plan, you should also find out how you actually ranked against other similar-sized projects of a similar nature.

Single and Multiple Projects

There's been a lot written about the management and associated roll-up and drill-down of multiple projects within a program/portfolio.

Regardless of your project hierarchy — projects, programs, portfolios, business units — simply think of your project as part of a neverending hierarchy. CPM scheduling tools allow the creation of hierarchies through the use of indenting. Sometimes, such hierarchies are used to depict WBS structures within which sit activity hierarchies. Projects, programs, and portfolios are no different. Build a corporate project structure that simply suits your needs with regard to slicing and dicing project scope.

You may be wondering why even nest projects together at all? There's huge value in segmenting projects into separate entities, while having them sit within a hierarchy. Doing so enables fast and easy cross-project analysis, enterprise resource scheduling, and corporate cash flow modeling. This all falls under the realm of portfolio management.

Enough said.

Working Backward

Not all projects start with a defined start date that leads to a calculated finish date. Some start with a defined finish, leading to a calculated start. Clear as mud?

For example, toy factories plan backward from the holiday season. The objective is to determine when the toy development cycle should begin in order to ensure delivery to the retail market by early November.

This type of planning is really no different from the more typical fixed-start type of project. CPM tools are equally valuable for this type of project.

Working backward is not the same as "as late as possible or ALAP" planning. ALAP planning assumes that float will be consumed before an activity starts. This is different from working to a given completion date. You can certainly still have activities carrying float in a working-backward plan.

Chapter 3

S2: Critiquing the Schedule

In This Chapter

- Defining purpose at S2
- Picking the best metrics
- Tallying up the score
- Evaluating the level of logic
- Analyzing in 2D
- Checking out the impact on the dates

When you get to S2, you already have a schedule in hand (creating that was S1). The task now is to figure out how that schedule can be improved.

In this chapter, we explore some of the metrics available for critiquing the schedule, discuss how much logic is the right amount, and explore ways to chart the quality of the schedule.

What Are You Trying to Establish at S2?

S2 is all about improving the structural integrity of the schedule. In layman's terms, this boils down to the following question: Is the logic in your schedule sufficient, without any missing detail, so that the schedule is a free-flowing sequence of work with a naturally occurring critical path or paths, all leading to a reasonable set of completion dates?

We're not suggesting that S2 gives special insights or knowledge regarding which logic links should be assigned to specific types of work, or what sequence the activities should follow. For example, S2 isn't about applying the knowledge that a roof can't be built before the walls are finished. That's a totally different concept.

Instead, the purpose with S2 is ensuring that your schedule contains a blended balance of sufficient detail, rather than something that's overly complex. At this point, you want to make certain you use free-flowing logic, rather than building a schedule with missing logic. You're on the lookout for issues such as negative float and schedule busts. In short, you're ensuring that your basis is as strong as possible, so that you can then further investigate the realism of durations and sequence of work.

You conduct these checks and balances using a series of *metrics.* There's been an explosion of this kind of metrics in the past five years or so.

For example, generic BI (business intelligence) techniques have trickled into the project planning arena and become part and parcel of many corporate planning guidelines. CPM scheduling has been advanced to the next level by such things as DCMA's 14 Point Schedule Assessment and Deltek's metric-based philosophy on planning.

Different organizations use different criteria for their metrics. But the widespread adoption of metrics as a way to critique project schedules has without a doubt been one of the biggest advances in CPM scheduling in recent years.

The value of metric analysis goes beyond promoting better-quality schedules. It has also helped to undo the negative impact of the recent brain drain effect in CPM scheduling. The newer, younger generation of CPM planners can now apply these schedule check metrics to learn and self-assess when building CPM schedules, ensuring that the frameworks they're building are as solid as possible. It's a huge step in the right direction with regard to more realistic planning.

What Metrics Should You Use?

Here are nine core metrics that are invaluable when establishing a sound schedule basis. We don't fully define each one. There are plenty of other metrics, of course. As an example, Deltek Acumen Fuse has hundreds of metrics available for critiquing project schedules. That sounds impressive, but the truth is that most successes happen by making complex things simple, and metrics are no exception. Consider weighting the relative importance of your schedule checks, then combining them into an overarching score. If you need more detail, please check the reference library at `www.deltek.com/products/ppm/schedule-index-calculator/fuse-schedule-index`.

Missing logic

In theory, all activities should be associated with at least one predecessor and one successor (except, of course, the project's start and finish, if you're being picky). Making certain you don't have any missing logic ensures that you have an accurate set of logic paths through your schedule, and also differentiation between those paths that carry *float* (noncritical) and those paths with *no float* (critical).

Logic Density

REMEMBER

This metric calculates the average number of logic links per activity. If your average is less than two, it's likely that there's some missing logic. On the other hand, an average greater than four suggests overly complex logic, with a high likelihood of redundant links. Therefore, Logic Density should fall between two and four.

This is an incredibly useful metric. It's a great indicator of where and when in your schedule you have insufficient logic, and where the logic is overly complex. Figure 3-1 shows an activity (Activity B) with a Logic Density of 4. In this case, one activity has four logic links (two predecessors and two successors).

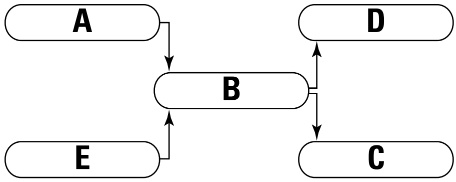


Figure 3-1: Activity B has a Logic Density of 4.

Comparatively, in Figure 3-2, Activity B has a logic density of 2.

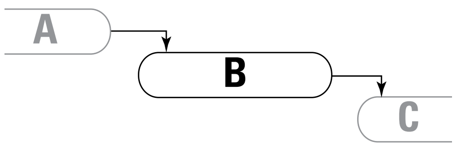


Figure 3-2: Activity B has a Logic Density of 2.

Number of concurrent critical paths

REMEMBER

There's nothing inherently good or bad about critical activities in a schedule. It is, however, useful to analyze the number of parallel critical (or near-critical) paths. If your schedule has a number of parallel, critical (or near-critical) paths, you have more risky work fronts than you would if your project had just a single critical path, even a very dominating one. A schedule with a single big problem to solve is preferable over multiple medium-sized problems all occurring simultaneously. Figure 3-3 illustrates the difference between a dominant and nondominant path.

Hard constraints

Scheduling theory recommends avoiding hard or two-way constraints such as "Must Start On" or "Must Finish On." They're poor schedule-building blocks (*constraints* are date overrides that take precedence over the naturally occurring calculated dates during CPM analysis).

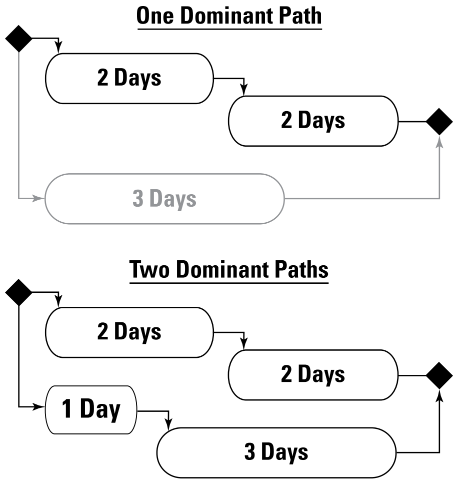


Figure 3-3: Comparing a scenario with a single dominant path to one with two dominant paths.

TIP

Use one-way constraints with caution. Remember that constraints really go against the premise of a naturally flowing CPM network. As a rule of thumb, the only time you should use a one-way constraint is if you can absolutely defend its use and simply can't use any of the other building block.

Negative float

Negative float is a result of an artificially accelerated or constrained schedule, and it's an indication that a schedule isn't possible based on the current completion dates. Quite simply, this is a "schedule bust." It's an easy problem to spot: Simply pinpoint your negative float areas and these will be the areas that won't be executed on time. Negative float indicates a high-risk area without any need to conduct a risk analysis!

Insufficient detail

TIP

Activities with a high duration relative to the duration of the project as a whole suggest poor schedule definition. If any of your activities take up more than 10 percent of the total project duration, you probably should go back and further define the scope of work. You don't want to back a capex project if you don't know the scope to within plus or minus 10 percent.

Number of lags

A lag is a duration applied to a logic link that's often used to represent nonworking time between activities. Lags aren't necessarily a poor planning technique, but they lead to problems when tracking performance execution. Lags tend to hide detail within the schedule and can't be statused like normal activities. For that reason, you should convert lags to actual activities with durations. No excuses on this one — convert them all!

Number of leads

A lead, also known as a negative lag, is often used to adjust the start or end date of a successor relative to the logic link. This is a poor practice, because it can result in the successor starting before the start of the predecessor. Leads have the same problems that lags do, and should be treated in the same way. That is to say, avoid them — end of discussion.

Merge hotspot

A merge hotspot indicates how complex the start of an activity is. It's defined as the number of incoming logic links leading into an activity. If the number is greater than two, there's a high probability the activity will be delayed. That's because all of the links will have to be completed on time for the activity to start on time.

How Well Did You Score?

It must be human nature to want to know the score. Quantifying or scoring and the associated use of indices happen all the time, all over — from determining who won a football game to gauging your credit when obtaining a loan to measuring the outside temperature.

However, scores are really all just relative. Next time you chat with a Martian, ask whether 90 degrees is warm or not. The Martian will have no idea. Give that Martian a "welcome to Earth" gift of a typical analog thermometer labeled from

40-below up to 120 degrees, and the Martian might be better able to answer whether 90 is warm or not. The point is, scoring is a great way of *comparing* how well you're doing, but you need something to compare it to.

The Deltek Acumen Fuse Schedule Index is a single score (0 to 100) based upon the weighted results from some of the metrics described in the previous section. Of course, establishing the perfect set of schedule-critique metrics is in itself an ongoing project, but it's very valuable to have a single score that you can use to critique the quality and underpinnings of a project schedule.

This year, the average Fuse Schedule Index has increased by close to 20 percent. Figure 3-4 shows the improvement of the Fuse Schedule Index across thousands of projects. If nothing else, that's a true indication that projects are adopting metric analysis and are generating more realistic schedules.

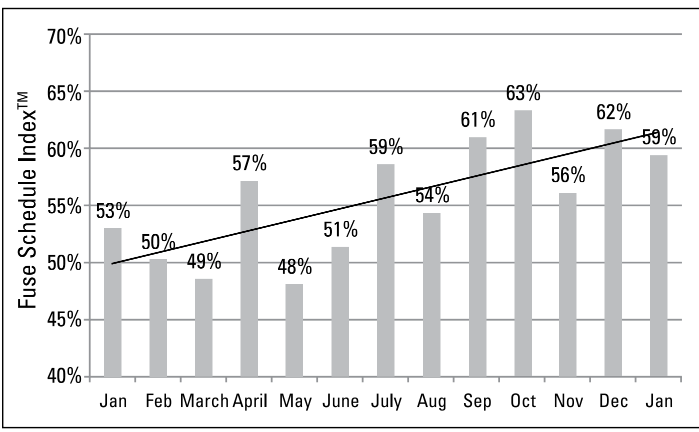


Figure 3-4: Improvement of the average Fuse Schedule Index over 12 months.

Using an accepted scoring method is also a great way to benchmark the quality of your schedule, and there are many things to which you can compare it. Benchmark it against itself over time. Benchmark it against other projects in your organization. Benchmark it against other similar projects outside your organization. Those are all helpful scores to know.

Logic, Logic, Logic

It's impossible to stress how important logic is to a sound CPM schedule. Identifying missing logic is key, but equally valuable is the identification of redundant logic.

Schedules often carry too much logic complexity. Put another way, single activities carry too many predecessors and/or successors, which makes the management of the schedule very difficult.

In some cases, some logic links actually are completely redundant, because they're outclassed by other, more detailed, driving logic. Figure 3-5 illustrates a redundant link between Activity A and Activity C — you already have logic flowing through A to B to C.

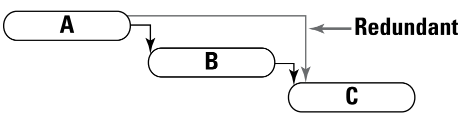


Figure 3-5: Redundant logic.

TIP

Removing redundant logic helps make your project schedule clearer and also lessens the overhead of maintaining risk models.

2D Schedule Analysis

Although metrics are useful at the project level, they're even more valuable to slice and dice a project, pinpointing hot spots. Slicing a project isn't a new concept. The application of work breakdown structures and code fields enable this type of slicing, but they can only segment data in a single dimension.

Figure 3-6 shows an example of a two-dimensional slice-and-dice of a project (time is on the horizontal axis and contractor is on the vertical). It's particularly useful to overlay the schedule metrics against these two dimensions, so you can see not only when in time any schedule quality issues arise, but also which contractor's scope of work is most problematic.

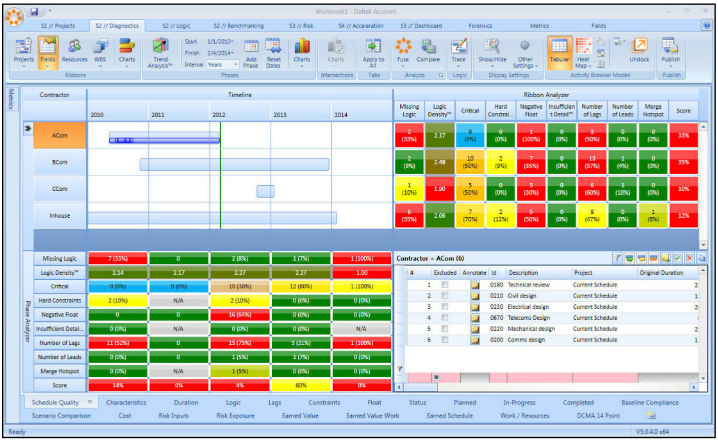


Figure 3-6: Standard S2 analysis performed in Deltek Acumen Fuse.

This type of reporting mechanism doesn't just count the issues, it pinpoints them. And pinpointing a problem is the first step toward resolving it.

Now the S2 Schedule Looks Worse!

After you build your schedule, run metrics against it, and pin-pointed and resolved the shortcomings — lo and behold, the finish date is now worse than when you started!

REMEMBER

Correction: it's not worse, *it's more realistic*. What you've established is a much more sound basis of schedule upon which to firm up the durations and account for potential risk events. That's S3. Read on!

Chapter 4

S3: Analyzing Risk

In This Chapter

- Creating a qualitative risk assessment
- Understanding the risk-adjusted P schedule
- Capturing uncertainty
- Quantifying risk events
- Conducting risk analysis
- Reporting your risks
- Beginning to mitigate

Yes, the word "risk" is in the title of this chapter, but the overarching goal is the opposite of risk, the counterbalance. This chapter discusses certainty and confidence, and how to establish those things in your schedule forecast.

Project schedules are tools for forecasting, used to generate an educated estimate regarding when a project will finish and what happens on the way to that point. But project schedules fall short in accounting for or differentiating between the known scope of work (activities) and the uncertainty surrounding this work (in other words, scope uncertainty).

Even worse than that, CPM schedules aren't designed to naturally account for external risk events, those discrete events that have an impact — typically negative but occasionally positive — on ability to execute the plan.

This is where project risk management comes into play. In this chapter, we discuss the varying levels of maturity of project risk management.

Qualitative Risk Identification

At the most superficial level, a *qualitative risk assessment* is conducted through the means of what is known as a *risk register*. The risk register is simply a list of identified risks along with optional tracking of their probability of occurrence and their potential impacts on the project. It's often captured in something as simple as a spreadsheet.

Figure 4-1 shows an example risk register where the risks have been sorted from high (most risky) to low (least risky). The scores by which they're sorted are based on the intersection of each risk's probability and impact, using a risk matrix or probability impact grid (which everyone likes to call a PIG).

Risk				Current			
Enabled	ID	Type	Name	Probability	Schedule	Cost	Score
	R9		Risk of delay due to fab yard constraints	Very High	Very High	High	25
	R37		Risk of major dredging equipment failure	Very High	Very High	High	25
	R3		Risk of insufficient in country skilled labor	Very High	Low	Very High	25
	R1		Risk of delay post transportation due to incomplete work	Very High	Very High	Very High	25
	R42		Risk of inability to hire craft to maintain labor curve due to catering, camp fa...	Very High	High	Very High	25
	R34		Risk of actual required resources exceeding planned/forecasted resource av...	Very High	High	Medium	20
	R36		Riks of theft of materials (especially long lead such as 9% Nickel steel) and/o...	High	Very High	High	20
	R41		Risk of delay in approvals of visas	High	Low	Very High	20
	R38		Risk of change in law impacting construction	High	Very High	Very High	20
	R5		Risk of pirates during FPSO sail from fab yard to site	High	High	Medium	16
	R2		Risk of customs delays	High	High	High	16
	R44		Risk of Governmental agency directing EPC to stop work due to alleged envi...	Very High	Medium	Low	15
	R11		Risk of lack of labor availability of skilled craft in-country	Medium	Medium	High	12
	R35		Risk of major mechanical equipment failure during commissioning and start...	Medium	High	Low	12
	R4		Risk of insufficient SURF contractor resources	Low	High	Very High	10
	R10		Risk of delay due to heavy lift vessel not being available on time	Low	Very High	Very High	10
	R45		Risk of delays in releasing equipment or modules out of customs	Low	Very High	High	10
	R6		Risk of poor quality materials being delivered in country	Medium	Medium	Low	9
	R8		Risk of damage to key equipment during transportation/offloading/installati...	Low	Low	Medium	6
	R40		Risk of review of safety report results in changes to facility design	Low	Medium	Medium	6

Figure 4-1: A risk register.

Figure 4-2 shows an example risk matrix, or PIG, where a risk event with a very high probability of occurring and a very low impact receives a score of 25. This kind of approach is certainly a good starting point for managing project schedule risk, but it falls short of any true quantification of risk, and in reality can be highly misleading.

Consider the risk register shown in Figure 4-1. Based on the scores, the risk register suggests focusing your efforts on the top risk, which is the risk of delay due to fabrication yard constraints.

Probability / Scoring Template						
Name	Min Value	Very Low	Low	Medium	High	Very High
Very High	>75 %	5	10	15	20	25
High	>50 %	4	8	12	16	20
Medium	>25 %	3	6	9	12	15
Low	>10 %	2	4	6	8	10
Very Low	<=10 %	1	2	3	4	5

Figure 4-2: A risk matrix defines the scoring thresholds used in a risk register.

Makes sense that this type of risk would be at the top of the list of risks, but there's more to consider. If the top risk has a potential schedule impact of 30 days, that certainly sounds bad. But what if that failure would impact an activity in a schedule that happens to have 60 days of float? If I were the project manager making risk mitigation decisions, I would let this risk potentially occur, because I know that the 60 days of float is more than enough to absorb the 30 days of risk impact, if that failure even happens.

In other words, the risk register doesn't properly take into account the ability for a schedule to absorb risk rather than be impacted by risk.

The moral of the story is that a traditional qualitative risk assessment using a risk register doesn't give true insight into schedule risk impact. That's the reason why these days, more project-led organizations are adopting a truly quantitative risk assessment that leads to a risk-adjusted schedule.

The Risk-Adjusted P Schedule

A *risk-adjusted (P) schedule* is a schedule that takes into account any uncertainty of duration along with identified risk events. To avoid any confusion, it's a schedule with a single set of dates and a truly deterministic finish date — not a range of dates nor a statement of "We may finish anywhere between here and here." It is truly a schedule.

The real difference between an S3 P schedule and the S1 or S2 schedules that you generated in earlier steps is that the S3 schedule accounts for uncertainty, risk, and potential opportunity. It's a much more realistic forecast, because in the real world, the future always holds some uncertainty and potential risk.

So what about that P in its title? The P stands for percentile, and is an indication of confidence. Here's a secret: You could actually generate multiple risk-adjusted schedules, covering anywhere from what is called P0 all the way to P100. A P50 schedule is a schedule for which you're 50 percent certain you won't overrun. A P0 schedule is the best-case scenario, while a P100 schedule is the worst-case outcome, based on what you know today. It's worth noting that many organizations will both plan and finance a project using a P schedule (S3) rather than the original S1 non-risk-adjusted schedule.

In fact, in the energy sector, where projects can cost tens of billions of dollars, it's common to present a P75 or P80 schedule to the sanction or finance board. That means the bankers are already looking at scenarios that are approaching the worst case. From that perspective, the investment then carries an overrun risk exposure of no greater than 25 percent for a P75 schedule or 20 percent for a P80 schedule. It's a sophisticated way of living out that adage, "Plan for the worst and hope for the best."

Don't hold your project execution team to an S3 risk-adjusted P schedule — hold them instead to the S2 schedule. Because a P schedule factors in risk and uncertainty (which is typically known as *contingency*), most P schedules show a longer duration and a later completion date. That's fine, because you're simply planning for risk, and the additional duration is a buffer to take possible problems into account. But if you let the folks on the project team count this risk allocation as part of their normal allocation of time for execution, you can bet they're going to take it.

We call this *student syndrome.* Give a student a deadline and that student will take the full window of time to complete the task, absorbing any buffer rather than trying to complete the assignment as early as possible. You'd think the student might want that free time at the end of the task before the deadline occurs, but odds are the student's going to just be less productive.

That doesn't mean you can't negotiate terms, secure funding, and agree to payment milestones based on a P schedule — while still tracking the project to the non-risk-adjusted schedule. That's perfectly normal.

Similarly, if you want to finish your project in 12 months, plan an 11-month schedule with a buffer of contingency built it. Worst case, you come in on time. Best case, you finish a month ahead of schedule, which makes you look like a project superhero!

Capturing Uncertainty and Risk Events

There are three main things you need when building a P schedule:

- A sound schedule (yes, that's rather obvious). You have already established this at S2.
- Ranges of uncertainty for the durations of the activities in the schedule.
- Your list of risk events (both threats and opportunities), and how they map into the schedule. Which activities do you think they are going to impact?

Capturing Duration Uncertainty

How realistic are the durations of activities that are in your schedule? Capturing *duration uncertainty* is the process of answering that question. This is done by establishing a range of values for each activity duration — typically a three-point estimate that shows the best case, the most likely case, and the worst-case scenario.

This hasn't always been easy to do. When schedule risk tools were in their infancy, capturing these ranges meant the end user had to define arguably complex statistical factors, such as distribution types and optimistic and pessimistic duration values.

Project stakeholders generally couldn't care less about a statistical distribution type — they just want to get the job done and get it done well.

To get through this bottleneck of accurately capturing domain experts' knowledge and translating it into three-point estimates and distribution types for use in a mathematical risk analysis model, use the Uncertainty Factor method.

Figure 4-3 shows an example of an Uncertainty Factor template defined through five different categories: Very Conservative through Very Aggressive. Each category represents a range of uncertainty based on the minimum, most likely, and maximum percentages. Apply these categories to activity durations and they translate into absolute duration ranges. Project teams find it easier to relate to this type of approach instead of being forced into statistical discussions.

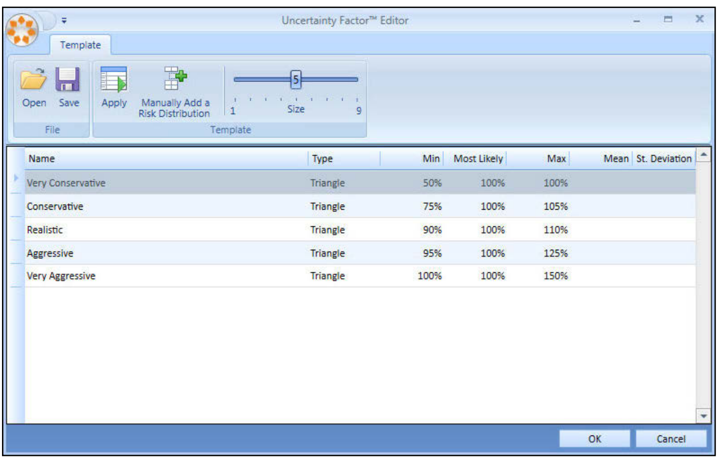


Figure 4-3: Uncertainty Factor approach.

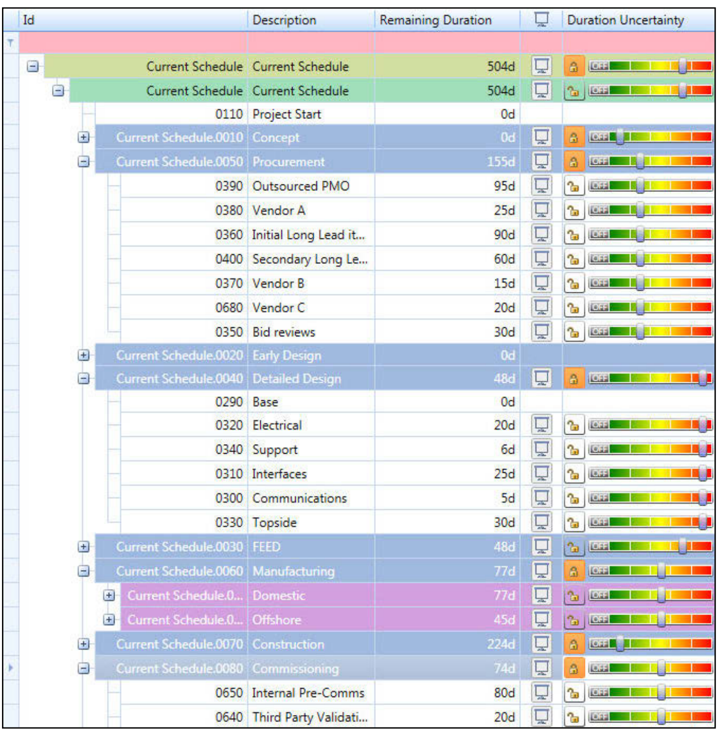
Many large capex projects are modeled using schedules containing thousands of activities. Can you imagine what would happen if you bring the project team together in a risk workshop and ask members to range every one of those thousands of activities? The team would tune out quickly.

REMEMBER

The solution is to follow a top-down categorization approach using the Uncertainty Factor method. Rank groups of activities (perhaps by WBS or discipline). Each activity within the ranked group gets the ranking assigned to the parent grouping. If necessary, you can make some exceptions to the parent group rankings for certain individual activities or subgroups.

That way you end up with the best of both worlds: A detailed schedule that is ranked in its entirety without taking up days of project time, yet you still retain exceptions and detail where needed.

Figure 4-4 shows a schedule grouped at the project WBS level providing the ability to quickly assign uncertainty. Adopt a top-down ranking approach and you'll do more than just accomplish the uncertainty loading of very large schedules in drastically reduced amounts of time. You'll also eliminate the need for the alternate approach of manually creating rolled-up summary representations of the true schedule to be created and used for the risk model. Doing that would be a fundamentally flawed approach. You simply can't recreate or emulate detailed logic from a 1,000 activity in a higher level 100 activity CPM network. You may build the world's best risk model, but you're building a model on a schedule that's not your true project schedule!



Id	Description	Remaining Duration	Duration Uncertainty
Current Schedule	Current Schedule	504d	
Current Schedule	Current Schedule	504d	
0110	Project Start	0d	
Current Schedule.0010	Concept	0d	
Current Schedule.0050	Procurement	155d	
0390	Outsourced PMO	95d	
0380	Vendor A	25d	
0360	Initial Long Lead it...	90d	
0400	Secondary Long Le...	60d	
0370	Vendor B	15d	
0680	Vendor C	20d	
0350	Bid reviews	30d	
Current Schedule.0020	Early Design	0d	
Current Schedule.0040	Detailed Design	48d	
0290	Base	0d	
0320	Electrical	20d	
0340	Support	6d	
0310	Interfaces	25d	
0300	Communications	5d	
0330	Topside	30d	
Current Schedule.0030	FEED	48d	
Current Schedule.0060	Manufacturing	77d	
Current Schedule.0...	Domestic	77d	
Current Schedule.0...	Offshore	45d	
Current Schedule.0070	Construction	224d	
Current Schedule.0080	Commissioning	74d	
0650	Internal Pre-Comms	80d	
0640	Third Party Validati...	20d	

Figure 4-4: Using a top-down approach to risk-loading the schedule.

You may recall a *Seinfeld* episode that warned of double-dipping: dipping a chip into the chip dip after you've already taken a bite. If you're not careful when determining uncertainty ranges, you could end up double-dipping in a different way, skewing your pessimism by accounting for the impact of potential risk events (you'll capture those separately in the risk register). To keep this from happening, ask yourself, "Under normal working conditions, in the absence of any external, discrete events, can we complete the work in the time shown on the schedule?"

Quantifying risk events

The third input you need for building your risk model is a set of agreed-upon quantified risk events. We say *agreed-upon* because it's paramount that the scores captured in the risk register really do represent the team's consensus.

Calibrate your scoring mechanism

Before you capture risk events, you must make sure that the categories for both probabilities and impact types are aligned with the project size and complexity. If you're planning a three-year project, it's not going to be very helpful to have five categories of schedule-impact — ranging from one day to five days. Such short durations aren't going to capture the real impact of project risks on a three-year project.

Similarly, if you define too large a range of impact types relative to the size of the project, you'll end up artificially putting the majority of the risk events in the lower end brackets. That gives a skewed representation of risk distribution.

Also, take care if you're inheriting probability scales from HSE (health, safety, environmental) risk registers. These types of risks tend to have extremely low probabilities, such as 1 in 10,000 chance of a fatality. Such probability ranges aren't applicable to project schedule risk.

A good rule of thumb for calibrating a schedule risk matrix is to take 20 percent of the project duration and make this your largest category. Then use an approximate exponential scale moving downward, with the smallest category rounding to team-friendly values. Here's an example for a 30-month project:

Very Low	< 1 week
Low	< 1 month
Medium	< 3 months
High	< 6 months
Very High	> 6 months

How many categories do you need? A 5x5 risk matrix is common, but some organizations prefer a 4x4 matrix. Even-numbered matrices force risk workshop participants to choose either a low or a high score rather than simply selecting the middle value. We've also seen some projects use 7x7 or even 9x9 risk matrices, but we challenge the wisdom of this. Project teams have a hard enough time in risk workshops without being faced with 81 different score combinations.

Separate the impact types

When you're capturing risk impacts, it's important to score schedule impact separately from, say, cost or any other impact type you may also be tracking. That's because a high schedule risk may not necessarily also be a high cost impact.

Similarly, though this isn't a hard-and-fast rule, very high-impact risks typically carry a low probability of occurrence, and vice versa. No, that's not always the case, but it's a good litmus test when agreeing on probability and impact scores.

Track current and mitigated states

One question you'll run into when capturing risk events is "The score as of when?" There's no point in capturing risk scores from the past, but there's real value in capturing the score as of today, plus another score the team members feel they can achieve in the future if they work to mitigate the risk.

By capturing two sets of data (current state and mitigated state), you can generate two risk models with comparisons that show how effective mitigation plans may be. This is a great way to defend your mitigation strategy and justify additional investment for funding your mitigation plans. It's a true return on investment analysis of your plan to reduce your risk exposure!

Track the cost of mitigation

Mitigation doesn't come for free — it takes time, effort, resources, and, of course, money. When you forecast your mitigated risk states, be sure to consider the cost of mitigation. By incorporating this additional overhead into your model, you'll have a true forecast that accounts for the fact that you'll be spending time initially in order to save time later. Again, this leads to a clearer ROI view of your mitigation.

About black swan risks

Black swans are risks that carry an extreme impact but also a very low probability of occurrence. They're outside the control of the project. Be careful about including these in your risk model, because they tend to skew your risk exposure unfairly in the direction of pessimism. A black swan example might be a global recession that wipes out your organization (of course, in that case your project risk register becomes irrelevant anyway!).

By the way, if you happen to be building a schedule risk model in Perth, Australia, you'll encounter puzzled glances if you introduce outlier risks as "black swans." Why? Because black swans are the norm in Perth, not the outliers!

Accentuate the positives

Risks aren't all bad. People don't always think in these terms, but the truth is, a risk event can present both a threat to the project and an opportunity. It may feel counterintuitive when building a risk model, but be sure to give sufficient emphasis to brainstorming positive risks in the form of opportunities. After all, your team members are the experts on the project and should be able to create opportunities for improvement, not just fight fires.

Risk Analysis

After you capture your uncertainties and risk events, you need to merge the risk events into your schedule. This is known as *risk mapping* — linking the identified risk events to activities in the schedule. You need the help of team members who are extremely close to and knowledgeable about the schedule, or else this can be a painful process. It's often best to do this exercise with a subset of the risk team (specifically, the lead planner and discipline leads).

When linking risk events, connect them to the earliest appropriate activities in the chain of events, then let the logic in the schedule reflect the knock-on effect. For example, when linking a "risk of Customs delays" risk event, map it to the "delivery of materials to site" activity rather than the end of construction. Of course, this risk will have an impact on construction, but let the knock-on effect from delayed delivery cascade through the construction activities. You're trying to pinpoint risk hot spots and bottlenecks so that you can fix them right at the source of the trouble.

A risk analysis is typically a simulation, and the most common is an approach known as Monte Carlo. It may seem intimidating at first, but a Monte Carlo simulation is actually very simple. You'll execute a number of iterations, each one being a standard CPM analysis. The clever bit is that in each iteration, the activity durations vary depending on their uncertainty ranges.

Add to this variation the fact that you'll trigger risk events in each iteration. Run enough of these iterations and you'll end up with a large sample population set, large enough to draw conclusions that are highly defendable. If you run 1,000 iterations of a schedule risk Monte Carlo model, in effect you end up with 1,000 scenarios from which you can then determine the most likely outcomes. Monte Carlo is a brute-force approach that is really doing nothing more than simulating the execution of your project — albeit simulating it thousands and thousands of times over.

Risk Reporting

Why are you building a risk model and running your analysis? So you can gain insight into your risk exposure and understand what is driving this exposure. To help bring that insight into focus, you'll create schedule risk reports that fall into two categories: the *what* and the *why.* The *what* reports give insight into what is your risk exposure and what is your P50 completion date. The *why* reports explain why the exposure is what it is, and detail which events and/or activities are driving this exposure.

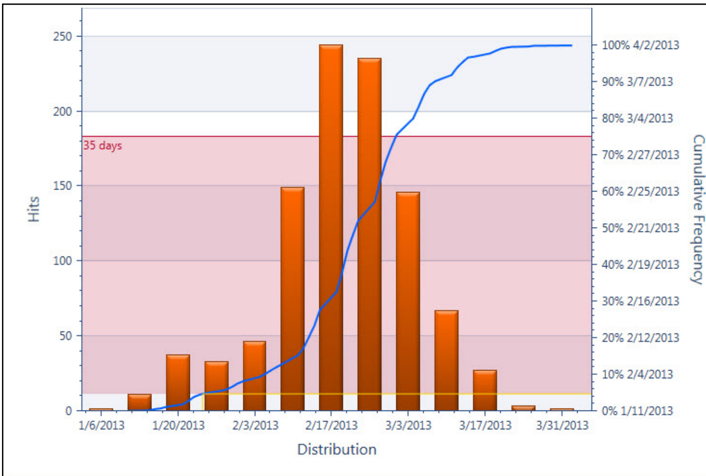
The risk histogram (the what report)

Use a risk histogram to report multiple risk exposure metrics, including those listed in the following sections.

Confidence level of achieving the S2 completion date

Figure 4-5 shows a project with a confidence level of only 5 percent. That sure sounds like a risky project, doesn't it? Well, not necessarily. Confidence level can be a misleading metric. Confidence level is actually more driven by the complexity of converging logic in a schedule, rather than risk and uncertainty. Don't be alarmed to see your schedule completion confidence level in the single digits.

Skeptical? Take a simple two-activities-in-parallel schedule and apply a plus-or-minus five-day uncertainty spread to both activities (each of which has 20-day deterministic durations) and run a simple Monte Carlo simulation. You might expect the confidence level to be 50 percent, but it's not even close! The chance of both activities finishing on time is actually 50 percent times 50 percent, which equals 25 percent. Extrapolate this out across tens of activities with multiple paths, and the confidence level quickly diminishes to single digits.



Metric	Value
Deterministic - 5 %	1/24/2013
Mean (P52)	2/21/2013
P0 - Best Case	1/11/2013
P75 Contingency	35 days
P100 - Worst Case	4/2/2013
Range	81 days
Risk Range Factor	25 %

Figure 4-5: The risk histogram (the *what* report).

P date

Based on your desired confidence level (such as 75 percent confidence) you can determine the corresponding P date. The example in Figure 4-5 shows a P75 date of 28 February compared to the S2 forecast of 24 January.

Contingency

Contingency needs to be reported within the context of a confidence level, such as P75. Contingency is defined as the difference between your S2 deterministic date and your P date. In this case, the P75 contingency is 35 days.

REMEMBER

What does this number reveal? That you're 75 percent certain that you'll be no more than 35 days later than the 24 January forecast. Adding contingency to a schedule is, in many ways, a reactionary response to risk rather than a proactive means of reducing risk. Contingency doesn't reduce your risk exposure, it simply absorbs it.

Risk range

By looking at the difference between the best-case scenario (P0) and the worst-case scenario (P100), you can establish a risk range. This is actually a much more valuable risk metric than confidence level. It gives you context regarding the size of risk exposure.

Risk range factor

Taking risk range a step further, compare the risk range to the remaining duration of the project. For example, a risk range of three months relative to 30 months remaining equates to a 10 percent risk range factor. This gives sound insight into the amount of variability looking forward that you are being exposed to as a result of risk.

The risk tornado (the why report)

The *risk tornado* (shown in Figure 4-6) reports what is causing your risk exposure or contribution. Risk tornadoes can report in multiple ways, such as criticality and schedule sensitivity, but these don't offer much true insight into actual duration contribution.

Historically, metrics such as criticality have gotten a lot of the focus. Criticality reports how many times an activity falls on the critical path, with the idea being that the more times the activity falls on the critical path, the more often it is going to be a risk driver.

WARNING!

Problem is, criticality reports the frequency of being on the critical path, but it doesn't give any indication of the size or degree of impact it has on the critical path or the finish date of the project. One activity can have a high criticality while having only a couple of days' impact on the project. That's not as concerning as an activity that only falls on the critical path 30 percent of the time, but when it does, it has a six-month impact on the project's finish date.

REMEMBER

The *schedule contribution factor* is a better metric. The schedule contribution factor reports the biggest risk drivers in a schedule, and reports contribution to risk in terms of duration. It also separates contribution from uncertainty and contribution from risk events. Doing so clarifies whether it is the activity scope/certainty or indeed a risk event impacting the activity that causes it to become a key risk driver.

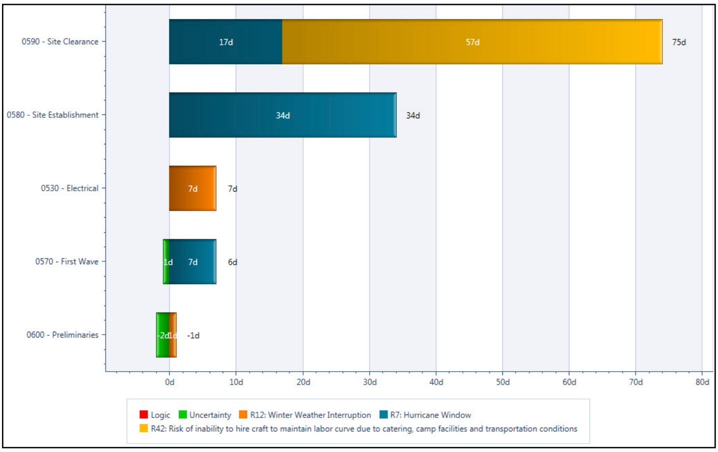


Figure 4-6: The risk tornado (the *why* report).

Figure 4-6 shows not only which activities are the risk hot spots but also whether this is because of uncertainty or because of specific discrete risk events. This type of reporting helps determine which risk events you should mitigate. More often than not, the top risks in the risk register aren't the ones that most impact the schedule.

Now Mitigate!

REMEMBER

Hurray! Your risk modeling is now almost complete. But there's one more step. In order to understand the benefit of your planned mitigation strategy, you need to run a second scenario using the mitigated risk scores. Compare this against your base model to determine the ROI of reduction of risk.

The example in Figure 4-7 compares an unmitigated risk scenario to the same project including mitigation. Mitigation saved 26 days of delay!

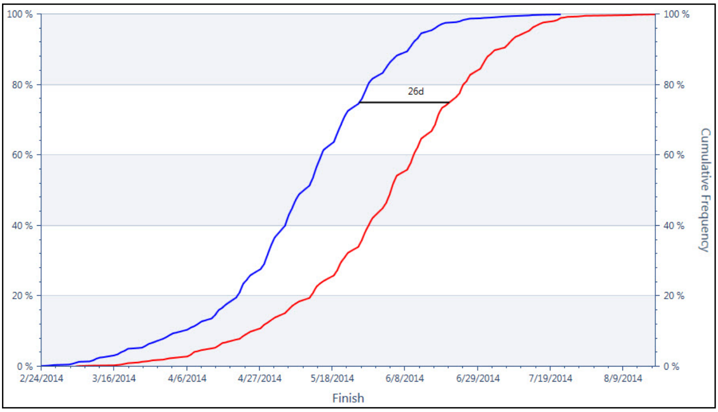


Figure 4-7: Comparison of project risk with and without mitigation.

Chapter 5

S4: Acceleration and Optimization

In This Chapter

- Accelerating the schedule
- Setting the acceleration goal
- Defining your criteria
- Generating S4 scenarios
- Benefiting from S4
- Deciding when to conduct S4 analysis
- Assessing the cost

So you've built an S3 P75 risk-adjusted schedule and, guess what? Your three-year forecast has jumped to three-and-a-half years. All this diligence and improvement in your schedule basis, and the expected completion date is now significantly later than your original forecast.

Have no fear; all is not lost! You're only partway through the schedule-development process. The next step is to explore alternate scenarios that better align with your original forecast. Is it possible to accelerate certain parts of the schedule to regain some of the time lost to risk and uncertainty? Can you assign additional resources in order to help accelerate? Can you conduct more work in parallel?

In this chapter, we discuss how you answer those questions. We demonstrate how you can set a new goal or target and determine whether it's possible to achieve it (or at least move closer).

Goal-Based Schedule Acceleration

Goal-based schedule acceleration is a CPM-based technique for accelerating project schedules. Its purpose is to ensure that a project schedule is realistic, aligned with stakeholder expectations, and executed successfully. Needless to say, that's a balancing act. Put forward a schedule that is too aggressive and it isn't achievable. Put forward a conservative schedule and it won't satisfy your stakeholders' desire to finish earlier.

Goal-Based Schedule Acceleration goes beyond standard CPM techniques by conducting multiple CPM analyses, in the form of a simulation that incrementally adjusts pinpointed sets of activities based on defined criteria. There are two reasons this technique is so powerful:

- It uses CPM analysis to schedule the project, which means it's true to the widely accepted and globally used technique for scheduling projects.
- It uses criteria defined by project team members to make informed decisions regarding which activities (or groups of activities) should be targeted for acceleration.

The technique is based upon three steps, shown in Figure 5-1:

Figure 5-1: Three steps to goal-based schedule acceleration.

Setting the Acceleration Goal

The acceleration goal is the target you're trying to hit. The target might focus on the entire project, such as "Accelerate the project as a whole by 10 percent," or it could be based on a particular activity or milestone, such as "Accelerate Project Sanction or First Oil by three months."

Defining Acceleration Criteria

After you define the acceleration goal, the second step is to define acceleration *criteria.* These are rules to which the simulation must adhere when incrementally attempting to accelerate the schedule. Criteria steps define the following:

- **The action:** What change should be applied during the acceleration? For example:
  - Reduction in activity duration (such as "Reduce activity duration by up to 20 percent").
  - Change in activity calendar (such as "Change from a five-day to a six-day work week").
  - Reduction of lags (such as "Reduce lags by up to 50 percent").
  - Removal of constraints (such as "Remove constraints on the schedule to determine the impact of a more free-flowing schedule").
- **The target set:** Which activity or groups of activities should the rule apply to? Target sets are analogous to filter sets, defining which activities receive the action. Here's an example: "Reduce engineering durations by up to 10 percent, with the exception of mechanical engineering."
- **The priority:** The acceleration simulation inherently places emphasis on activities that fall on or near the critical path. By definition, a project is driven by its critical or longest path, so only the activities on this path will actually drive a project completion. Within this set of activities, the "action" and "target set" together pinpoint where in the schedule the acceleration should be specifically aimed, and how. In addition, there's a layer known as priority. Prioritization enables you to specify which of the activities is targeted first. You have several options for prioritization:
  - **Earliest first:** This choice focuses most of the acceleration on the early part of the project, resulting in a front-end-loaded acceleration scenario.
  - **Latest first:** This gives the focus to back-end activities during the acceleration.

- **Longest duration first:** This gives initial attention to those activities with the longest duration.
- **Easiest first:** This approach determines the path of least resistance to decide which activities are the best candidates for acceleration. It pinpoints parts of the schedule that have the least amount of concurrent work faces.

Generate the Scenario

REMEMBER

As soon as you've defined the goal and criteria, you can run the simulation. A simulation consists of hundreds or thousands of CPM analysis runs, and each iteration applies one or more of the criteria. As each iteration is run, the schedule *incrementally* accelerates until the goal is reached — or, not reached, if the goal is too aggressive to be achievable using the criteria you've defined.

The net result is an acceleration scenario you can use as decision support during both tactical and strategic project discussions regarding acceleration. Your scenario will answer such questions as "How can we support a three-month acceleration?" or "Could we get back on track by focusing on construction?" or "Can we define a stretch goal and incentivize the contractor to meet this goal?"

Figure 5-2 is an example showing two alternate scenarios that use different criteria to arrive at two different accelerated project finish dates.

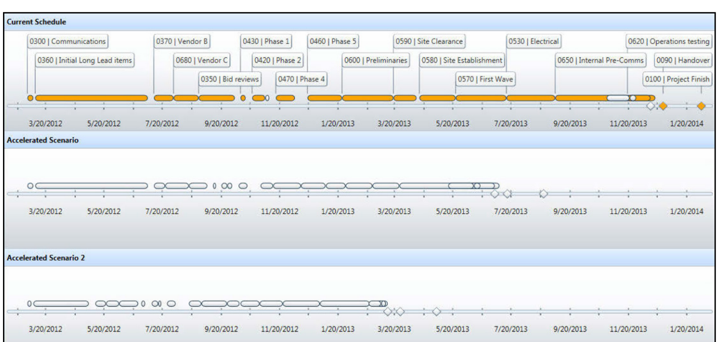


Figure 5-2: Two accelerated scenarios.

The Benefit of Goal-Based Acceleration

The first thing you'll love about goal-based acceleration is how much time it saves you. The technique runs thousands of iterations in a matter of seconds to generate a scenario. Try that manually and it'll take days if not weeks.

Also, software or simulation skeptics will be pleased to note that this approach doesn't take away from the expertise of the planner. Quite the opposite, in fact. By capturing the criteria as defined by the planner, the technique eliminates the manual process of generating alternate scenarios. That frees up the planner's brain to focus instead on analyzing the results and making highly informed decisions regarding which scenario to adopt.

When Should Schedule Acceleration Be Carried Out?

Projects have several phases: planned, in progress, complete. They also tend to have more than one *basis* (think of a project basis as a viewpoint or perception).

First, there's the *plan basis*. Often known as a baseline, this is the agreed-upon schedule for a project that forecasts when key milestones will be completed.

Then there's the *actual basis*. This is the statused version of an in-progress schedule that (you hope) reflects true reality. It accounts for historical completions, actual progress and delays, as well as changes made to the original plan. Not surprisingly, the actual basis often deviates from the plan basis. Comparing the differences helps us track and understand project performance.

And, there are various types of what is known as *management basis.* Sometimes referred to as a target schedule, a management basis is often driven by commercial or strategic factors such as "time to market," "investor requirements," and even simple factors such as "management would like to finish by . . ."

Rare is the project for which the plan, actual, and management basis are in complete alignment, with no deviations. In a way, that means a project essentially has three schedules that are being worked. The more that these three schedules are out of alignment with one another, the more the project may be perceived to be slipping, failing, or "doing badly."

Goal-based schedule acceleration is an ideal way to bring these three forecasts back into alignment. Typical use cases include:

- Aligning a planned schedule to fit a management-defined completion date. For example, "The schedule shows a December 2015 completion date and management wants a June 2015 completion at the latest."
- Providing what-if scenarios when determining how a planned project can be accelerated. Something like, "If we were able to bring the project online sooner so we could benefit from earlier operational revenue, what would be the best scenario to achieve this?"
- Bringing a project delayed in execution back on track (realigning it to the plan). Goal-based schedule acceleration answers the question, "What is the most effective means of regaining the three months of schedule slippage that we've already incurred?"
- Achieving schedule competitiveness. For example, "Independent benchmarking shows we should complete within 50 months, but our schedule shows a 55-month completion — what's the best means of achieving this 50-month benchmark?"

Faster Completion, but at What Price?

One of the additional benefits of conducting a goal-based acceleration is to get a better understanding of the acceleration/risk benefit. Acceleration, of course, comes with a price, so it's very valuable to be able to determine how acceleration changes schedule risk exposure.

You'll find an example in Figure 5-3. This technique was applied to a project with a December 2018 completion date. A previous risk assessment had shown that the P50 date pushed out to March 2019, a three-month slip. The project investment group wanted to look at faster alternatives, and a goal-based acceleration resulted in an accelerated scenario of 12 months earlier (December 2017). A subsequent risk analysis on this scenario showed a P50 accelerated date of May 2018.

What this simulation shows is that 12 months of acceleration was achieved, but the risk exposure increased from three months to five months. With this insight, the investment team could make an informed decision about moving forward with the accelerated scenario. Decision-makers learned that despite the increase in risk exposure, the new risk-adjusted accelerated date was still seven months earlier than the original schedule date. Earlier completion with managed risk exposure is a true win-win scenario!

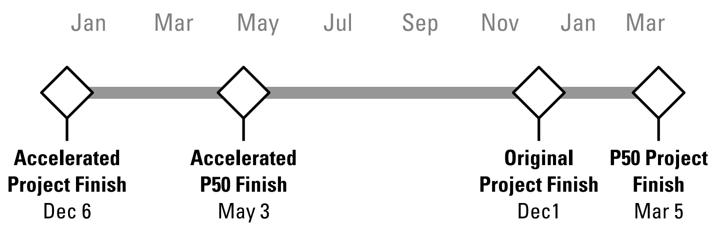


Figure 5-3: Impact of risk on an accelerated scenario.

Chapter 6

S5: Gaining Team Buy-in

In This Chapter

- Accepting or rejecting acceleration S4 candidates
- Understanding how acceleration impacts risk
- Planning by consensus
- Repeating the process

S4 schedule acceleration is an extremely powerful way to accelerate a risk-adjusted schedule. But you know what the Scottish poet Robert Burns wrote about "The best laid schemes of mice and men" — they often go awry without team buy-in (Okay, Burns didn't mention the team buy-in part). In any case, before acceleration can become your execution plan, you must ensure the team embraces the suggested mitigations and changes modeled in S3 and S4.

Team buy-in is arguably the most important success factor when establishing a project schedule. You can create a perfectly formed, risk-adjusted, optimized schedule, but if the project team members don't believe it is actually achievable, then it most likely won't be — your project will fail. In this chapter, we explore how to get the team onboard — at this stage of the process, and even earlier.

Accepting or Rejecting Acceleration S4 Candidates

In Chapter 5, we explore how to develop S4 acceleration scenarios. It's an iterative process, and after each scenario is created, the list of activities that need to be targeted as part of the acceleration exercise must be reviewed. The review cycle is an important part of this process.

Figure 6-1 shows a targeted list of activities that must be completed in less time in order to achieve project acceleration under one particular scenario. Before they can agree upon this scenario, the project team should have the opportunity to review the acceleration candidates and either accept or reject the suggestions.

#	ID	Description	Activity Type	Remaining Duration	WBS Code	WBS Name	Current Schedule	Accelerated Scenario			
WBS Name: Detailed Design (5 items)											
1	0300	Communications	Normal	5	Current Schedule.0040	Detailed Design	5	▼	-2	(-40%)	3
2	0310	Interfaces	Normal	25	Current Schedule.0040	Detailed Design	25	▼	-12	(-48%)	13
3	0320	Electrical	Normal	20	Current Schedule.0040	Detailed Design	20	▼	-10	(-50%)	10
4	0330	Topside	Normal	30	Current Schedule.0040	Detailed Design	30	▼	-15	(-50%)	15
5	0340	Support	Normal	6	Current Schedule.0040	Detailed Design	6	▼	-3	(-50%)	3
WBS Name: Procurement (4 items)											
6	0350	Bid reviews	Normal	30	Current Schedule.0050	Procurement	30	▼	-15	(-50%)	15
7	0360	Initial Long Lead items	Normal	90	Current Schedule.0050	Procurement	90	▼	-45	(-50%)	45
8	0370	Vendor B	Normal	15	Current Schedule.0050	Procurement	15	▼	-7	(-47%)	8
9	0680	Vendor C	Normal	20	Current Schedule.0050	Procurement	20	▼	-10	(-50%)	10
WBS Name: Domestic (5 items)											
10	0420	Phase 2	Normal	10	Current Schedule.0060.0440	Domestic	10	▼	-5	(-50%)	5
11	0430	Phase 1	Normal	4	Current Schedule.0060.0440	Domestic	4	▼	-2	(-50%)	2
12	0460	Phase 5	Normal	20	Current Schedule.0060.0440	Domestic	20	▼	-10	(-50%)	10
13	0470	Phase 4	Normal	15	Current Schedule.0060.0440	Domestic	15	▼	-7	(-47%)	8
14	0480	Phase 3	Normal	5	Current Schedule.0060.0440	Domestic	5	▼	-2	(-40%)	3
WBS Name: Construction (5 items)											
15	0530	Electrical	Normal	40	Current Schedule.0070	Construction	40	▼	-20	(-50%)	20
16	0570	First Wave	Normal	40	Current Schedule.0070	Construction	40	▼	-20	(-50%)	20
17	0580	Site Establishment	Normal	30	Current Schedule.0070	Construction	30	▼	-15	(-50%)	15
18	0590	Site Clearance	Normal	20	Current Schedule.0070	Construction	20	▼	-10	(-50%)	10
19	0600	Preliminaries	Normal	40	Current Schedule.0070	Construction	40	▼	-20	(-50%)	20
WBS Name: Commissioning (4 items)											
20	0620	Operations testing	Normal	20	Current Schedule.0080	Commissioning	20	▼	-10	(-50%)	10
21	0630	Certification	Normal	5	Current Schedule.0080	Commissioning	5	▼	-2	(-40%)	3
22	0640	Third Party Validation	Normal	20	Current Schedule.0080	Commissioning	20	▼	-10	(-50%)	10
23	0650	Internal Pre-Comms	Normal	80	Current Schedule.0080	Commissioning	80	▼	-40	(-50%)	40

Figure 6-1: Activities that must be accelerated.

In the example shown in Figure 6-1, topside detailed design work would need to be completed in half the originally allocated time. Is this even possible? Can this be accomplished by throwing more resources at the endeavor or outsourcing to a third party, or perhaps even cutting scope? These are the types of questions that need to be answered.

There are three outcomes that can result:

- **Full acceptance:** "Yes, we believe we can achieve the full 50 percent required acceleration for topside detailed design."
- **Partial acceptance:** "We don't believe we can achieve the full 50 percent acceleration of topside, but we do believe we can achieve 25 percent acceleration by adding more designers to the work."

- **Rejection:** "No way, we don't believe we can achieve any further acceleration on this task."

Once you've gained buy-in (or sometimes rejection), then rerun the model and revisit the updated list of acceleration candidates. If you encounter pushback on topside detail design, then a different set of acceleration candidates will result in the next analysis and scenario generation.

Continue this process until you achieve an acceptable level of team buy-in for the overall project. You've now created your S5 go-forward plan!

Acceleration Means More Risk?

Think of a project schedule as being similar to a sponge. The harder you squeeze a sponge, the more resistance you experience. You'll eventually squeeze to the point that you can squeeze and compress no more.

Project acceleration also reaches a stopping point. It's easy to accelerate a one-year project by a day, but it becomes increasingly difficult as you attempt to accelerate by a week, a month, two or three months, or more.

In addition, the more you accelerate a project, the more likely it becomes that its schedule risk exposure will increase. Project risk exposure varies as you accelerate or decelerate the timeline. Extend a project by three months and you lessen the pressure of completion, thus reducing schedule risk exposure. Accelerate by three months and you naturally increase the risk exposure.

Consensus-Based Planning

An emerging approach to building more realistic project schedules is to adopt a consensus-based approach for determining duration values and risk scores.

Consider the risk register established at the S3 stage (see Chapter 4 for more on that). The risk register captures both current-state and mitigated-state risk scores, but it didn't really capture any differences in opinion among the participants in the risk workshop.

TIP

This is where collaborative tools like Deltek Kona can help (there's an example in Figure 6-2). If multiple project team members have the opportunity to give their opinions on a list of risk events, you can capture these opinions and come up with a team consensus. Take this consensus-based version of the risk register and incorporate it into your schedule risk model, analyze it, and compare it to the original risk model.

What does this achieve? Well, first, you get a more representative view of what team members believe. It's likely to lead to a forecast that is both more realistic and has more buy-in. Your S5 buy-in will be easier to achieve if you set the stage for it earlier in the process.

TIP

Second, by comparing the difference between the original and the consensus-based results, you can gauge the degree of buy-in. Track this over time and you'll find it to be a useful tool for determining whether or not you have sound control over your project.

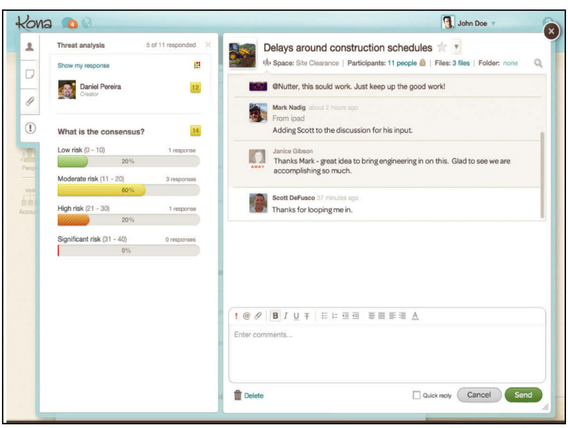


Figure 6-2: Collaborative tools like Deltek Kona enable feedback and buy-in.

Repeat . . . Repeat . . . Repeat . . .

S5 has allowed you to establish a structurally sound, risk-adjusted, optimized schedule that the team has fully bought into. Job well-done! Almost, but not quite.

If there is one thing you can say about planning with certainty, it's that the plan is always going to be out of date. Projects are continuously evolving, changing, morphing into something new. Your plan needs to reflect these changes.

S1 // S5 is a proven technique. It works. It increases the realism and achievability of forecasts established through CPM project schedules. Even so, the forecast needs to reflect the current state of the project. That means S1 // S5 should be a continuous-improvement process. Every time you have a material schedule change or update, you should follow a recycle of S2 // S5.

There's another benefit of repeating this process. Doing so allows you to look back over time and compare how your completion dates have changed, and how your risk exposure has evolved (for the better, you hope!).

Having this historical trending data helps build your confidence in predicting the future. After all, that's what project planning is really all about — using your past experiences and knowledge to predict the outcome of a future endeavor.

Chapter 7

Beyond Scheduling: The Bigger Picture

In This Chapter

- Building cost- and resource-loaded schedules
- Connecting S1 // S5 with earned value
- Linking to a project-based ERP system
- Tying it all together

This book is all about project schedules. However, it's worth mentioning another key element of the three-legged project stool (also known as the triple constraint of time, cost, and quality). Cost is a topic that's always important. In fact, cost is probably the most important factor that bubbles up through a project to the overall corporation.

This chapter focuses on the value of building cost- or resource-loaded schedules, and reveals how S1 // S5 can be useful not just in scheduling but also in cost forecasting. And it should put an exclamation point on the fact that, whether you're executing rudimentary cost modeling or advanced government compliance-based earned value performance analysis, having a sound basis of schedule is an absolute necessity. Schedule is king — for project-led organizations, project schedules actually play a huge role in corporate level cash-flow and finances!

Cost- and Resource-Loaded Schedules

When it comes to managing costs, projects fall into one of two categories:

- Projects that develop a truly integrated cost/schedule model by building cost- and resource-loaded schedules.
- Projects that establish a detailed cost estimate and manage it as a separate entity from a schedule that isn't cost- and resource-loaded.

Both approaches have their place, and both have strengths and weaknesses.

Resource-loaded schedules

When you develop a project schedule, you establish a timeline — a linear sequence of work showing when you expect to execute that work, all leading to project completion. This all assumes, though, that you have the resources you need to execute according to the duration and timing of the activities.

Activities are merely objects in a plan, used to model what work needs to be done to achieve a deliverable. But to execute any particular activity, you need to consume resources. These might be labor resources, such as engineers or welders, or they could be nonlabor resources, such as steel pipes.

REMEMBER

Think of a resource-loaded schedule as the marriage between the work required to complete a project and the resources needed to complete the work. This kind of schedule assigns resources to activities. You essentially tell the schedule model which resources are needed by which activities (these are known as resource assignments).

Thus, your schedule serves as a picture of the resource demand. Now you must make sure you can satisfy this demand by having sufficient resources. To carry the marriage analogy one step further, in a perfect marriage, you have harmony — the activity's demand for resources perfectly matches the resources you have available.

In the real world, though, harmony is a rarity. If you can't match resources with activities, you have two options:

- Try to find more resources to satisfy the demand (this is time-constrained scheduling).
- Adjust the schedule to accommodate the resource availability (this is resource-constrained scheduling).

Time-constrained scheduling

REMEMBER

Time-constrained scheduling assumes plenty of resources are available, with no constraints. Your objective is to determine how many resources are needed in order to satisfy the timeline. Determine this at the activity level, and then look at the project timeline as a whole, which generates a resource demand curve.

Resource-constrained scheduling

Resource-constrained scheduling is a little more involved. Remember that a CPM analysis is the core scheduling technique used to determine project dates. In this analysis, you check to see whether there are sufficient resources at the particular point in time the activity requires them to fulfill the resource assignment demand.

If there are sufficient resources, then the activity can be executed on the dates calculated by the CPM analysis. If there are not sufficient resources to satisfy demand, the activity must be delayed. This, in turn, has a knock-on effect on subsequent downstream activities. This process for checking resources is commonly known as *resource-leveling,* and it's designed to ensure a schedule that doesn't overconsume the availability of resources.

REMEMBER

Tying this all back to S1 // S5, every time you step up to a higher state along the S1 // S5 scale, you're actually creating a new version of the schedule. For example, at S2, you address the shortcomings of the S1 schedule and create a sounder schedule basis. As part of the schedule update/creation process at S2 all the way through to S5, you should call on your resource planning/leveling/optimization techniques, the same way you applied them at S1.

After you establish your polished S5 schedule, make sure you have accounted for resources, through your time- or resource-constrained resource modeling technique. Remember, there's not much point in creating the perfect timeline if you don't have the resources to execute your plan.

Deriving cost from resource-loaded schedules

There's one additional great thing about resource-loaded schedules. After you assign resource cost rates and quantities, you can derive the total activity costs. And when you can derive total activity costs, it's that much easier to arrive at the cost for the total project.

This is an extremely helpful way to generate true project cash flows (albeit cash flows in one direction — dollars spent). By conducting S1 // S5 analyses and deriving project cash flows from resource-loaded schedules, you can quickly determine the positive or negative rate of spend over time as you update your schedule forecast.

S1 // S5 and Earned Value

Earned value is the topic of countless publications, but it's worth a small mention here. *Earned value* is a technique for tracking project execution performance, comparing the amount actually spent (AC) to the amount of work/value generated (EV), and considering how much you should have spent on this work (PV).

Think of an earned value model as the intersection of a schedule and a project cost estimate, two things that often seem independent of one another. Costs in a cost estimate have no concept of time, while activities in a project schedule have no concept of cost. Earned value brings these together to give you a time-phased view of where and when you'll spend money and earn value.

So what does this have to do with S1 // S5? By now (we hope), this should be fairly clear. In order for your EV model to be realistic, your schedule has to be as accurate as possible. By adhering to S1 // S5, you ensure that the time-phasing of your project costs is as accurate as possible.

Get this wrong and your performance tracking using earned value will be fundamentally flawed. Get it right and you have a highly defendable model against which you can establish your performance management.

Feed the ERP Using Your Schedule

Enterprise resource planning systems (that's ERP for short) are used to collect, store, manage, and analyze business activities. If you're working in a project-led organization, this can mean pulling both project spend and revenue into a bigger-picture, financial-based model that's used to run the overarching business.

ERP systems are powerful, but how nicely will they play with your scheduling system? That depends. Many generic ERP systems have been designed to meet the general needs of all types of businesses, but can't easily track costs and schedules for specific projects. You need an ERP system that's actually designed to integrate with project cost/time data — that is, the work status from a schedule.

When using generic ERP systems a workaround is often required. Many companies must make the standard chart of accounts into a complex project tracking system, and that means trying to match the chart of accounts with the project/WBS/activity hierarchy. No, that's not any easier than it sounds. Doing so creates reporting and auditing nightmares for project businesses, particularly if compliance is vital to success in your situation or industry (such as if your organization is a public company).

The better alternative is a project-centric ERP system like Deltek, and if you're in a project-led organization, that's the best of both worlds. Here's why:

- You can naturally feed detailed project information into your ERP-based cost accounting. No need to fit a square peg (project data) into a round hole (ERP data).

- Your top-down ERP analysis is truly based on accurate information from the projects that are driving your business.

Tie Everything Together

Schedule plays a huge part in predicting the financial impact of a contract win (or an investment) at the enterprise level. The resources and the timing of the proposed project will impact all kinds of things — the top-line financials, revenues, earnings before interest and taxes (EBIT), cash, capital expenditure (capex), new orders, personnel, and material needs.

TIP

If you're using a traditional ERP system, these components are disconnected. If, on the other hand, you adopt Deltek's true project-based ERP, every transaction is connected to an account, an organization, and a project. Yes, a project. Doing things this way ensures that the multiple ledgers within the ERP are all the same — no reconciliation required! Learn more about how Deltek's project-based ERP systems can help you plan and execute your projects at www.deltek.com.

That's just one more reason why the lowly project schedule is so incredibly important within the much bigger picture of your organization.

Chapter 8

Ten Thoughts About Schedules, Plans, and S1 // S5

In This Chapter

- Ten things to know about S1 // S5

You already know that CPM scheduling tools are quite effective for building schedule forecasts. Where they fall short is in helping planners generate forecasts that truly are realistic. Here are some thoughts to consider.

No Carts Before Horses

Time is money, of course, so stakeholders often want the job done yesterday. Just don't forget that your project schedule dates are the output, the answer, the end product of your CPM analysis process, not the beginning. You can't start with the answer, but if you don't like the answer, you can go back and create a better one.

Detail-Oriented

There's no right or wrong answer to the question of how many activities your schedule should include. It all depends on what you're doing. If you're having trouble seeing the big picture, you've got too many small details. Not enough activities, though, and you'll have trouble reporting the forecast and tracking performance.

Get Started, Then Get on with It

View the completion of the development of your CPM schedule as the starting point, certainly not the finish. Developing your initial schedule is just the beginning of the development path you should undertake to ensure as realistic and achievable a project plan as possible.

Metrics Are No Replacement for Your Brain

Running checks and balances through the use of metrics makes your schedule structurally sound, but it doesn't replace you as the captain of the ship. Metrics simply can't emulate your expertise and knowledge regarding sequence of work and basis of durations. What metric analysis does give you is time to focus your efforts on leveraging this domain expertise without getting bogged down in the mechanics of a sound schedule. It allows you to use your brain power for bigger things.

Risk Is Not a Four-Letter Word

Actually, it does have four letters, but it's not a bad word. It's okay to have risk as long as you account for it! Putting your head in the sand and hoping bad things won't happen isn't risk management. It's denial! A risk-adjusted schedule is a forecast of planned work accounting for varying degrees of uncertainty along with external factors.

There's Always Room for Improvement

If you don't like the answer, then fix it! If your S3 schedule is unpalatable, then look for better scenarios. Just keep in mind that the best solution is often the one that is the least obvious.

Don't Always Trust a Computer

The process of schedule acceleration at S4 is remarkably clever. Just don't take it as gospel. Challenge the acceleration candidates, review them with the team, and get that buy-in that you are looking for.

Poor Execution Is a Copout

Projects really don't fail because of poor execution. Scheduling gurus have been kidding themselves for far too long during the planning phase, avoiding the hard truth that project forecasts inherently carry risk and uncertainty.

The Team Must Be Onboard

You'll never succeed without full buy-in from the team. S5 is the place you're supposed to work on that, but it's helpful to build that buy-in as you work through earlier stages, too. Plan by consensus earlier, and your S5 buy-in will be a shoo-in.

Realistic Schedules Really Work

The development of S1 // S5 was only the beginning of the journey. The real value has been seeing countless organizations and projects adopt S1 // S5. With S1 // S5, projects achieve higher success rates, along with more and more on-time project deliveries.

Your guide to on-time, on-budget, to-scope project execution through project intelligence

You've got the most powerful, up-to-date project planning tools. So why is it so hard to establish reliable project forecasts? The solution is in your hands! This helpful reference spells out a five-part process for creating schedules that are well-formed, risk-adjusted, and optimized, leading to more realistic and achievable project plans.

- ***Build a sound basis of forecast for your project* — pick the right building blocks when building a project schedule**
- ***Look for hotspots and identify risks* — figure out what roadblocks could derail your project, then adjust accordingly**
- ***Optimize your plan* — adjust your risk-adjusted schedule so your stakeholders can realistically achieve their objectives**
- ***Bring the team on board* — win the buy-in your project needs from the people who will make it succeed**

Open the book and find:

- **The secrets for building a schedule that is truly realistic and achievable**
- **How to account for risk and uncertainties**
- **How to plan properly multiple times and build properly once**

Go to Dummies.com®
for videos, step-by-step examples, how-to articles, or to shop!

For Dummies
A Wiley Brand

ISBN 978-1-118-92950-6
Book not for resale

WILEY END USER LICENSE AGREEMENT