Building a Schedule

Once you've identified the tasks that comprise a project, the next step is figuring out how many hours or days of work those tasks entail—and the length of time to allocate for that work. For example, you need to know how long it takes to repair and paint the front of a '67 Mustang Fastback to figure out whether you can hide the evidence before your parents get home from vacation.

In Project, as in life, building good relationships is a key to success. When you define relationships between tasks in a Project file—called *task dependencies* or *task links*—the program calculates task start and finish dates based on those relationships. Some tasks have to finish before others can start. For example, the law of gravity requires that you finish a building's foundation before you start pouring the concrete for the first floor's walls. With all the task dependencies in place, tasks nestle into sequence, and you can finally see the entire project schedule from the start date for the first task to the finish date of the last task. Placing tasks in sequence is what turns a task list into a project schedule.

In this chapter, you'll learn different ways to estimate time and duration, how to improve estimates, and how to avoid estimation landmines. You'll also learn how to create spreadsheets for collecting estimated numbers from team members, and how to import those numbers into Microsoft Project.

Once your Project file includes tasks with estimated values, you can start transforming the file into a true schedule. This chapter describes the different types of task dependencies, the pros and cons of each one, and how to create and modify these links. Also, although task dependencies let Project adjust task start and finish dates automatically, some situations call for specific dates for tasks. In this chapter, you'll learn two ways to specify when tasks can start or finish: manual scheduling

and date constraints. More importantly, you'll find out how to use date constraints and deadlines to handle specific dates *without* limiting Project's ability to calculate the schedule.

> **NOTE** *Before* you dig into defining the relationships between tasks, you should build a list of all project tasks and milestones (and, ideally, organize those tasks into a work breakdown structure), as described in the previous chapters. Otherwise, you won't have all the information you need to put tasks into a logical sequence.

■ Estimating Task Work and Duration

You'll never predict project duration with total accuracy. However, estimating work time and task duration as closely as you can is the goal, because both high and low estimates can cause problems. Overestimate how long your project will take, and the project might get squelched before it begins. Underestimate, and you might run into disappointment, extensions, and financial consequences. This section explains the difference between work and duration and then describes several methods for obtaining estimates.

Understanding Work and Duration

In Project, *work* and *duration* are both ways of measuring time, but each term has a specific meaning:

- **Work.** The number of person-hours (or equipment-hours) a task requires. For example, setting up a website may take you (that is, one person) 40 hours.

- **Duration.** The span of work time from the start of a task to the finish. Duration varies according to how many resources (people or equipment) you use, and when those resources are available. If you have other things to do and can't spend more than 4 hours each day on the website, you may need 10 workdays for that 40-hour task. On the other hand, if you convince three colleagues to help (and they share your skills), the duration decreases to a little more than one workday, but the four of you still devote 40 hours of work to the task.

Whether you estimate work, duration, or both depends on whether you know how many people are available to work on tasks. If you don't know how many resources are available, then estimate the hours of work (or days of work for very large projects) and use that work estimate as the duration estimate. When one person is assigned to work full time on a task, the number of hours of work equals the hours of duration. However, if you have multiple resources in mind, you can estimate a duration that differs from hours of work. Up to a point, you can shorten task duration by adding additional resources, as in the website example. Either way, when you assign resources to a task, Project adjusts the task's work and duration accordingly (page 251).

www.it-ebooks.info

Getting Good Estimates

"Guesswork" is the more candid name for estimating, but important project decisions hinge on guesses being good. Project stakeholders care deeply about financial measures like return on investment, cash flow, payback period, and so on. Because time *is* money, the time you estimate for project work translates into the financial measures that make or break your project. Too-high and too-low estimates of time—and therefore costs—can both jeopardize a project, albeit for different reasons, as the box on page 163 explains.

Estimating is part science, part sorcery, so it takes some time to master. You're trying to forecast the future as accurately as possible. Fortunately, you can choose from several methods to make your estimates more precise. This section describes several commonly used estimating methods and one simple technique for improving future estimates.

Why Not to Over- or Underestimate

The temptation to tell people what they want to hear is almost irresistible. Lowering your initial time and cost estimates might make stakeholders happy for a while. Invariably, though, underestimated projects come in late and over budget. The projects don't meet their targets, but worse than that, the money may have been better spent on other projects.

On the other hand, being too pessimistic can be just as bad. Ironically, high estimates tend to come true, even though their lowball relatives hardly ever do. Lavish estimates sometimes lead stakeholders to expect—or demand—more features

or higher quality. Moreover, team members feel flush with time and might embellish their assignments beyond what is required or work at a more leisurely pace. The result could be an unacceptable return on the money invested, which may persuade the stakeholders to can the project—or worse, pass over a good project.

Overly padded estimates can also limit an organization's productivity. When bloated projects commandeer the budget and resources, other worthy projects and their benefits get squeezed out.

■ HOW ACCURATE DO ESTIMATES NEED TO BE?

Before you launch into estimating, find out how good your estimates have to be. If your clients for a custom-built home tell you their budget is $5 million, give or take a million, you have some room to maneuver. On the other hand, the harried parents who are building an addition to house their triplets probably have a tight budget and want the estimate right on the nose.

Objectives, requirements, specifications, and other project-planning details affect the estimates you develop, so accurate estimates require research and planning—and those take time and effort. No one wants to spend a lot of time or money estimating a project that's going to cost too much or finish too late, so sometimes a quick-and-dirty estimate can help determine whether a detailed estimate is called for. There are a couple of ways to trade off up-front effort for accuracy:

- **Estimate based on the required level of accuracy.** If a rough estimate is fine—for example, plus or minus 50 to 75 percent—you can produce a high-level estimate in almost no time. This type of estimate is called a *rough order of magnitude estimate* (also known as SWAG, which stands for "scientific wild-assed guess") and works well for selecting projects. Typically, a second round of estimates for organization-wide budgeting strives for plus or minus 25 percent.

  For the final project budget, you have to spend time up front clarifying project details in order to produce a more accurate estimate (for instance, plus or minus 10 percent).

- **Estimate more accurately as you progress.** Big projects often use *feasibility studies*, small projects whose sole purpose is to determine whether it makes sense to pursue the full-blown project any further. For example, a small team could develop a prototype system to see whether the time savings are sufficient. The time and money spent early on can save the organization from spending orders of magnitude more on a dead-end project. You can use order-of-magnitude estimates to make go/no-go decisions for projects. If a project gets approval to proceed, you perform another round of estimating with more detail. Then, at the end of each project phase, you can review performance and refine your estimate for the next phase to see if the project should continue.

Finally, give yourself enough time to come up with an estimate you feel confident in, even if you have to stall a little while, as the box on page 164 explains. After you complete your initial estimate, look at it with a more critical eye. Does the estimate seem ridiculously high or optimistically low? Either way, dive back in and tweak the estimate until you think it's realistic. Because stakeholders usually hope for good news and balk at higher time and cost estimates, document your reasoning and assumptions. Not only will you be able to defend your results, but you'll also know to rework your estimates if any of your assumptions change.

REALITY CHECK

Know When to Hold 'Em

Managing stakeholders' expectations would be a breeze if they patiently waited for your thoroughly analyzed estimates. But stakeholders and management are an impatient bunch, so the pressure is on for estimates before you're ready. Don't cave in to that pressure, or you may end up making promises you can't keep. Innocent questions like, "What's the finish date looking like?" don't call for a specific, set-in-stone answer on the spot. Indeed, the people asking don't expect you to answer right away (but they are sure to remember your answer if you give them one). And if you provide a date prematurely, your answer may come back to haunt you. (If you're like most people, your off-the-cuff estimates are almost always overly optimistic.)

Without the project plan in hand, it's easy to forget details or even major components. Instead of caving, you're better off saying something like, "I'll have the analysis done by tomorrow (or next week, or next month) and can give you a better answer then."

Of course, if a bigwig is asking for an answer, you might feel queasy about stonewalling. If you feel compelled to give an answer, then deliver a document called a *basis of estimate* (BOE), which documents the elements that go into your current estimate: assumptions, risks, risk mitigation, constraints, and so on.

■ **WAYS TO ESTIMATE WORK**

Estimating is an art form because there are so many ways to approach it. And identifying the best method for estimating a specific project is a matter of experience. Here are a few of the approaches you're most likely to use:

- **Estimating from the bottom up.** With this approach, you estimate each work package for a project; the estimates for work packages total up to produce the estimated numbers for their summary tasks. In turn, the estimates for summary tasks roll up until you have an estimate for the entire project. Microsoft Project is the perfect tool for bottom-up estimating, because summary tasks automatically calculate totals from the values of lower-level tasks.

- **Estimating from the top down.** This approach works best if you have experience with similar projects, because you estimate the project at higher levels (like phases), and then progressively allocate the estimated time to lower levels of work.

> **TIP** Whether you estimate from the bottom up or the top down, don't forget to include time for rework. Deliverables aren't always right the first time around, but most people estimate how long it takes for the first delivery. Be sure to add time to your estimates for correcting first-round shortcomings. Likewise, include time for communication and administrative activities.

- **Parametric estimating.** This method of estimating using historical data along with project variables is common in construction; an example is when your contractor tells you that your home addition will cost $200 per square foot and take 4 months. This approach is helpful only when you have a significant history of documented performance (page 511), so you know what the duration and cost should be for a given unit of output—for example, a square foot of construction, a module of software development, or a page of documentation. In the construction industry, estimating programs use typical construction costs and times to develop estimates, but you can use Microsoft Excel to develop estimating formulas as well. For an example of a parametric estimating tool, check out the software-development tool at *www.costxpert.com*.

> **TIP** Groups of people almost always produce better estimates than any one person. This estimating approach is called the Delphi method. Learn why it works so well by reading the following Wikipedia articles:
>
> - *http://en.wikipedia.org/wiki/The_Wisdom_of_Crowds*
> - *http://en.wikipedia.org/wiki/Delphi_method*
> - *http://en.wikipedia.org/wiki/Wideband_delphi*

■ GETTING ESTIMATES FROM THE RIGHT PEOPLE

Estimates are better when the person estimating has experience in the work involved. (You wouldn't ask your auto mechanic to estimate the time for building an addition to your house, for instance.) Regardless of the type of project you manage, you can track down experts to help you estimate what the work is going to take.

If you know who's likely to work on your project, those resources can produce even better estimates, because they know their strengths and limitations. Besides, when people set targets for themselves, they're often more motivated to meet those targets.

> **TIP** When several people provide estimates, you have to make sure you know what their numbers represent. Suppose someone tells you that developing a brochure takes 2 weeks. Is that 80 hours of work, or is it a 2-week duration for a writer, a copy editor, and a graphic artist? Spelling out tasks in work-package documents (page 154) is one way to obtain clarity.

Duration estimates can be dramatically different from the estimated work hours if team members plan to work on tasks during their "spare time"—that is, when they get time away from their regular work duties. They might estimate the work to be only 8 hours, but they give you an estimated 2-week duration. Unfortunately, spare time often doesn't materialize, which means they may end up cranking the work out at the last possible moment or finish later than planned. If you suspect that team members are counting on spare time in their estimates, negotiate with them and their managers to get *dedicated* time for your project tasks. That way, the duration and work estimates you get are more realistic. In addition, when work starts, team members are more likely to get their tasks done when they're supposed to.

■ DON'T ASK FOR ONLY ONE NUMBER

In project-management circles, the Program Evaluation and Review Technique (PERT) uses *best*, *worst*, and *most-probable* estimates to get a better idea of how projects might play out. Packing the contents of a house might usually (that is, most probably) take 3 days. But if the owners live with Zen simplicity or reminisce over every tchotchke, then packing could take only a day (best) or weeks (worst). You can borrow the concept of PERT to get better estimates from your team members, even if you don't use PERT to manage the project.

> **TIP** PERT is a statistical approach that uses Monte Carlo simulation, a mathematical technique that helps analyze risk by calculating numerous possible project outcomes using sets of randomly generated values (in this case, task durations). The result is a probability of a project finishing on time given combinations of optimistic, pessimistic, and expected values. If you want to use PERT, consider a third-party program that integrates with Project, such as @RISK for Project (*www.palisade.com*).

Simply by asking for best, worst, and most-probable estimates, as shown in Figure 7-1, you start your estimators thinking about what could go wrong, what could go right, and what's happened most often during similar efforts. You still use the most-probable estimate in Project, but PERT can increase your confidence in that number.
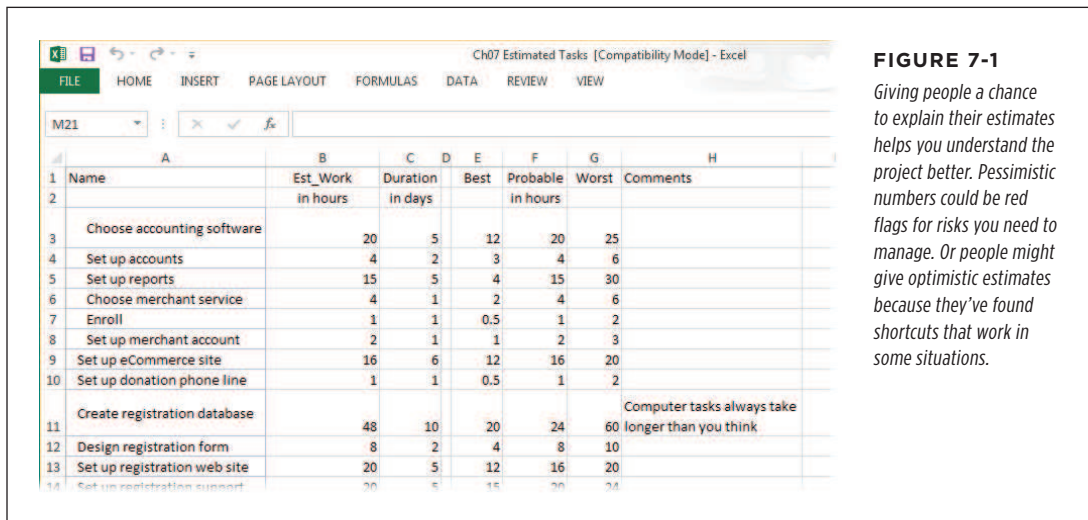
FIGURE 7-1

Giving people a chance to explain their estimates helps you understand the project better. Pessimistic numbers could be red flags for risks you need to manage. Or people might give optimistic estimates because they've found shortcuts that work in some situations.

■ DON'T PAD ESTIMATES

People want to look good and deliver results that match their estimates, so they often decide to build in extra time (known as *padding*) to cover problems that might arise with their work. This hidden padding happens all too often and is tough to get rid of because it's hard to see. But padding can lead to some problems:

- **Bloated estimates.** If everyone slips in some padding, estimates get bigger as they move up the food chain. By the time estimates get to the top-level management, they're as engorged as well-fed ticks and so inaccurate that no one knows how long the project will really take.

- **Padding games.** Some project managers try to eliminate hidden padding by trimming each of the estimates they get. If team members see their estimates cut, they simply plump their padding more the next time. With games like these, no one knows whether they can trust one another's estimates, and the relationship between the project manager and the team members worsens each time around.

- **Lack of feedback.** Without feedback, the estimators never get to find out whether their estimates were high, low, or somewhere in between. As you'll learn on page 169, estimators need feedback if you want them to improve.

That said, you need *some* kind of insurance to protect your project's finish date and cost. Rather than having individuals slip padding into their estimates, a better approach is to create a *safety margin* that the entire team can share. That way, if something goes seriously wrong, you can dole out some of that margin to the tasks

that need it. (The box below explains different ways to handle time for administrative tasks.)

Adding Admin Time to Estimates

Project team members spend time on a variety of administrative tasks, like preparing status reports, attending meetings, and so on. Although you can add admin work to a Project schedule in several ways, each method has its pros and cons.

The *easiest* way to include admin work in a Project schedule is to increase tasks' estimated hours by a small percentage. The hard part of this approach is figuring out the average percentage of time people spend on admin work. The percentage you choose depends on your organization, the amount of admin work in your project, where team members are located, and so on. If you don't know how to choose a percentage, then ask other project managers what number they use.

Another approach is to create recurring tasks (page 135) in Project for admin time. However, those short, repeating tasks make a schedule hard to manage. If you schedule admin work with recurring tasks, your resources will end up with overallocations whenever their work and admin tasks overlap. Adding splits to work tasks to remove the overallocations becomes a recurring chore, keeping you from more important project-management duties.

You might think about adding one long task for admin work to your project. But this approach gets in the way if you try to use Project's resource leveling feature (page 339). The program can't figure out how to eliminate the resource overallocations that the long task creates. So don't use this method if you plan to do any resource leveling in Project.

As you learned in Chapter 2 (page 41), *contingency funds* and *management reserve* are two types of safety margins that produce a more honest and cooperative scenario. Instead of pockets of personal padding throughout the project, everyone shares a communal pot of time and money and receives something from the pot only if they need it. This way, the project is likely to contain less padding, and the leeway is more likely to go to the people who need it most. Because the safety margins are public, people must ask permission to draw on them.

Savvy project managers and management teams use two types of safety margins:

- **Contingency funds and hours.** Project contingency funds and hours are set aside to cover problems and risks that might crop up (page 38), so you can dip into the pot if something goes wrong. If it's smooth sailing, then the project might come in early or under budget. For example, banks make construction companies set aside money for problems so that buildings don't end up half-built because the companies ran out of money.

  The amount of contingency padding is based on the risks involved. If you're estimating a project that isn't well defined or represents unfamiliar work, then the contingency could be 50 to 75 percent or more. For projects you can perform with your eyes closed, the contingency might be only 5 to 10 percent. Contingency funds and hours are part of the project plan, so you, as project manager, can hand them out as you see fit.

- **Management reserve.** A second level of public padding is management reserve. As its name implies, this safety margin *isn't* at the project manager's discretion. It's a pool of time and money that management can distribute if unexpected events occur—risks that aren't in the risk management plan (page 41). While you have to ask management for a piece of management reserve, the benefit is that you don't have to beg the project's sponsor or customer for time or money.

■ GIVE FEEDBACK ON ESTIMATES

In a common scenario, you ask people for estimates. You use those estimates, perform the project, and then discover that the tasks take more or (occasionally) less time than the estimate. If you don't tell the estimators how their estimates compared to what actually happened, then you'll get the same incorrect estimate the next time you ask. If you want estimates that keep getting better, you have to track actual results (page 401) *and* share the comparisons of estimated vs. actual performance (page 431) with the people who estimate. In addition, these results go into a project archive (page 511) so managers of future projects can learn from previous projects and achieve more accurate estimates. As the box on page 169 describes, accounting systems don't always track a project's actual performance the way you need to see it, so you need to track that detail within your projects.

REALITY CHECK

The Problem with Accounting Numbers

Some companies juggle numbers in corporate accounting systems—sometimes to keep costs for different parts of a project within the limits set by a customer or to satisfy some esoteric financial requirement. Moving numbers between parts of a project means you have no idea what the actual performance was. To make matters worse, timesheet categories might not gather the project data you need.

If you work in an organization that uses SharePoint or Project Server, you can use those products' timesheet and status-update features to collect the information you need and update your projects. For small organizations with only a few projects, you might have to ask team members to fill out a second timesheet.

No one likes filling out extra forms, so it's best to minimize your imposition on team members. For instance, you can request time at a summary-task level instead of individual work packages, or request weekly totals instead of daily ones. When you ask for team members' time, collect not only the hours worked, but also the hours that the people estimate are remaining (page 393). If their numbers don't match your plan, you can act on that early warning sign to figure out how to bring the tasks back on track (page 429).

Getting Estimates into Project

Although you *can* type estimates directly into task fields in Project, using an Excel spreadsheet to compile estimates instead has several advantages. First of all, many people who estimate tasks are familiar with Excel but not Project. (In fact, estimators may not even have Project on their computers, but they almost certainly have Excel.) And Excel makes it easier to adjust estimates than Project; for instance, it can calculate the average of several estimates.

The first step in compiling estimates in Excel is to export work-package tasks from Project to build a simple estimating spreadsheet in Excel. Because WBS codes are unique, export the WBS field *and* the task name so you have a link between tasks in the Excel spreadsheet and the corresponding tasks in Project. If you ask for three estimates (page 166), you can then use Excel functions to calculate your estimated values or simply choose the value that seems most realistic. You can divvy up the tasks for each estimator into a separate Excel workbook and then reassemble the results in one master spreadsheet that you import back into Project. This section guides you through the steps.

> **NOTE**   If you create Auto Scheduled tasks without filling in their Duration fields, Project sets the duration to "1 day?" to indicate that it's an *estimated* duration. That question mark rolls up to summary tasks, so your project duration will contain a question mark if even one task has an estimated duration. (To quickly track down the tasks with estimated durations, in the View tab's Data section, click the Filter down arrow, and then choose Tasks With Estimated Durations. Project displays only tasks with question marks in their Duration fields.) If you like, you can tell Project to fill in regular durations instead of estimated ones when you create an Auto Scheduled task without a Duration. Choose File→Options. On the left side of the Project Options dialog box, choose Schedule. In the "Scheduling options for this project" section, turn off the "New scheduled tasks have estimated durations" checkbox. With this setting, Project sets the duration to "1 day." The downside to this setting is that you have to remember which tasks' durations you still need to fill in with your estimated values.

■ EXPORTING WORK PACKAGES TO EXCEL

If you're estimating from the bottom up, the only tasks you estimate are the work packages—the lowest-level tasks in the Project outline. You don't have to export summary tasks because Project calculates their values from the tasks below them. In Project, you use a *filter* (page 642) to display only the tasks that pass the tests you specify—in this case, work-package tasks for a project. Then you load those tasks into an Excel spreadsheet, using a set of instructions called an *export map* to set up the column names. This section shows you how to export tasks to an Excel estimating spreadsheet. In the next section, you'll learn how to import the estimates back into Project. (If you're estimating a small project, the box on page 171 describes a simpler way to get a few estimated values into your Project file.)

Here are the steps for exporting work-package tasks to Excel, assuming that you've copied the export map from *ProjectMM_Customizations.mpp* into your Project global template, as explained in the box on page 141 (the following steps also explain how to use a new map):

1. **Open the Project file you want to estimate and then choose File→Save As.**

   On the Save As screen, select where you want to save the file. When you click a folder, the Save As dialog box opens.

2. **In the "Save as type" drop-down list, choose Excel Workbook. In the "File name" box, type the name for the file, and then click Save.**

   Project launches the Export Wizard.

The Easy Way to Export Tasks

If you're finding the terms *filter* and *export map* hard to grasp, fear not. These tools will make much more sense when you see them in action in the following steps. In fact, there's a ready-made filter and export map you can download from this book's Missing CD page at *www.missingmanuals.com/cds*. The *ProjectMM_Customizations.mpp* file contains a filter called "Work packages," which shows only work-package tasks (see Figure 7-2). The export map called "Estimate worksheet" exports the Name, Work, and Scheduled Duration fields from Project to Excel—just the ones you need for estimates. After you download the file, use the Organizer to copy the maps into your Project *global.mpt* file. (Why? Because, for maps to appear in the Export Wizard or Import Wizard—which you'll use in the following sections—they have to be in your Project global template, not your Project file.)

Here's how to copy the map and filter into your global template:

1. With the *ProjectMM_Customizations.mpp* file already open, choose File→Info, and then click the Organizer button on the Info page.

2. Select the Maps tab.

3. In the list on the right, select the "Estimate worksheet" map, and then click Copy to copy the map to your global template.

4. Select the Filters tab.

5. In the list on the right, select the "Work packages" filter, and then click Copy to copy the filter to your global template.

6. Click the Close button.

---

3. **Click Next to start the wizard.**

   On the "Export Wizard - Data" screen, the wizard automatically chooses the Selected Data option, which means you can define the export map you want to use. That's what you want to do, so simply click Next to continue.

4. **On the "Export Wizard - Map" screen, select the "Use existing map" option, and then click Next.**

   If you *haven't* copied the export map from the *ProjectMM_Customizations.mpp* file into your global template, select the "New map" option instead, click Next, and then skip to step 6 to define the export mapping.

5. **On the "Export Wizard - Map Selection" screen, select the "Estimate worksheet" map, and then click Next.**

   Stepping through the next few screens lets you review or change the map's settings before you export.

6. **On the "Export Wizard - Map Options" screen, review the checkboxes that specify the data you're exporting, and then click Next.**

   Because your Project file is still in its infancy, the only checkbox that should be turned on is Tasks. In this example (like most of the time), you want the Project field names to become column names in Excel, so make sure the "Export includes headers" checkbox is also turned on.

7. **On the "Export Wizard - Task Mapping" screen, in the "Export filter" drop-down list, choose "Work packages," as shown in Figure 7-2. If you *haven't* copied the "Work packages" filter from the *ProjectMM_Customizations.mpp* file into your global template, leave the "Export filter" box set to All Tasks.)**

The "Destination worksheet name" box automatically names the Excel worksheet you're about to create *Task_Table1*. You can stick with that or change the name to something more meaningful.

The fields you export include WBS (which uniquely identifies each task), Name (so you know which task you're estimating), Work, and Scheduled Duration. Because WBS codes are unique, exporting the WBS field to the estimate spreadsheet simplifies importing your estimates, as you will learn on page 176.

As you can see in this example, you can name the columns in Excel whatever you want. For example, to clearly show that the workbook is for estimating, change the field's name in the "To: Excel Field" column corresponding to Work to *Estimated_Work*. For extra credit, you can also export a text field, such as *Text1*, which you can use to capture estimating comments in your Excel work-book. That way, when you import estimates back into Project, your assumptions and reasoning will be readily accessible in the Text1 field in your Project file.
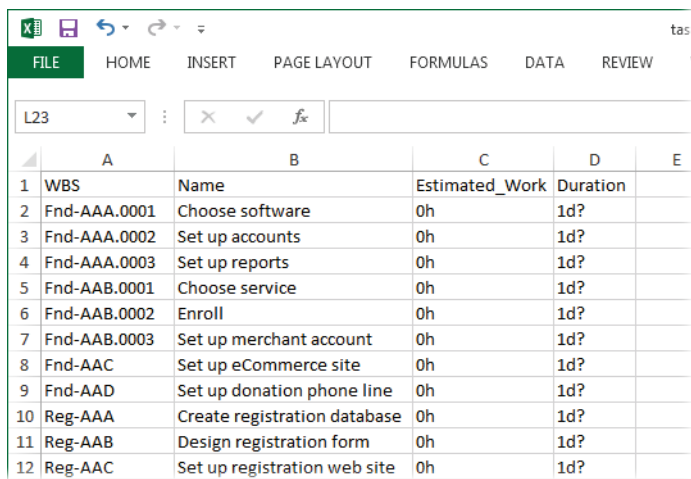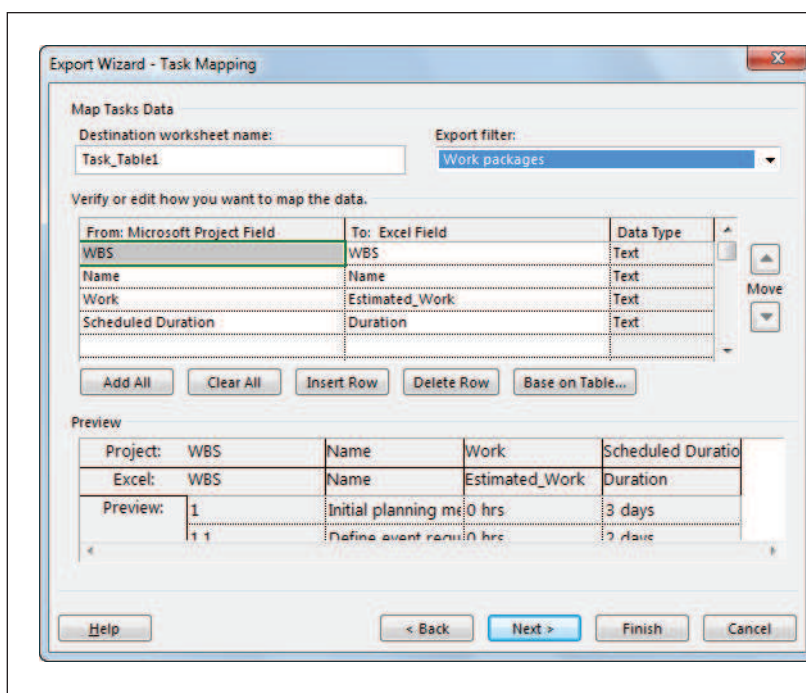

FIGURE 7-2

The "Work packages" filter hides both summary tasks (whose Summary field values equal No) and milestones (whose Scheduled Durations equal 0d). Summary tasks obtain their values by rolling up the values of their subtasks, so you don't have to estimate them. Tasks that represent milestones have a duration of zero, so they, too, require no estimating. (The Preview area shows all the tasks in your project, not just the filtered list. It isn't an accurate preview of the tasks that will be exported, but you can look at the preview to make sure that the mapping between the Project and Excel fields is correct.)

8. **Click Finish.**

Project exports the tasks into a new workbook, shown in Figure 7-3, but you have to launch Excel and then open the file to see it. (The workbook is saved wherever you told Project to save it in step 1.)

If clicking Finish displays a message about trying to save a file in an older file format, then you haven't set up Project to work with older Microsoft file formats. To instruct Project to play nicely with older Microsoft file formats (as well as other file formats Project doesn't initially recognize), choose File→Options. On the left side of the Project Options dialog box, click Trust Center and then click Trust Center Settings. Click Legacy Formats on the left side of the dialog box, select the "Prompt when loading files with legacy or non-default file format" option or the "Allow loading files with legacy or non-default file formats" option, and then click OK.

FIGURE 7-3

You can add additional columns in the Excel workbook for best- and worst-case estimates, or a column for the name of the person responsible for estimating the task. Add whatever columns you need to make your work in Excel easier: You don't have to import those columns back into your Project file.

WORKAROUND WORKSHOP

Copying Estimates from Excel to Project

If you're estimating a small project and tasks employ only one resource, then you can copy estimate cells in an Excel spreadsheet directly into cells in the Work or Duration column in the Project table area. To copy cells from a spreadsheet into cells in a Project file, follow these steps:

1. Open the Excel spreadsheet and select the cells that contain your work estimates (work or duration).

2. Press Ctrl+C to copy the cells to the Clipboard.

3. Switch to Project, and click the first blank cell in the Work or Duration column in the table area. (If the Work column isn't visible, right-click the table heading area, and then choose Insert Column. In the drop-down menu that appears, choose Work, and then click OK.)

4. Press Ctrl+V to paste the estimated values. Project copies each cell from the spreadsheet into the selected cell and the ones below it.

---

www.it-ebooks.info

■ IMPORTING ESTIMATES INTO PROJECT

Unlike importing a WBS (page 140), when you import estimates into a Project file, the tasks already exist. So instead of adding new tasks to the project, you want your estimated values to slip into the fields for the appropriate tasks. The Import Wizard includes an option to do just that.

The following steps show you how to create a map to import estimates into Project. These steps also tell you where to find the instructions for using the existing map from the *ProjectMM_Customizations.mpp* file. Here's how you import estimated effort into the tasks already in your Project file:

1. **If you want to use an existing import map, download the *ProjectMM_Customizations.mpp* file from this book's Missing CD page at *www.missingmanuals.com/cds*.**

   This Project file contains a map called "Import estimates" that maps fields in an Excel workbook to Project fields. You can use the Organizer to copy that map into Project's *global.mpt* template (page 703).

2. **In Project, open the Project file that you want to import the Excel data into.**

   The Project file must be open to import estimates into it.

3. **Choose File→Open. On the Open page, navigate to the folder that contains your estimating workbook (the one you created in the previous section, for example), and click it.**

   The Open dialog box opens set to open Projects (the button to the right of the "File name" box), which represents Microsoft Project files. But you want to open an Excel file, so choose "Excel Workbook" or "Excel Workbook (*.xslx)" instead.

4. **In the file list, double-click the name of your estimate workbook. (Alternatively, select the file, and then click Open.)**

   Project launches the Import Wizard. Click Next to get started.

5. **On the "Import Wizard - Map" screen, the wizard automatically selects the New Map option, which is what you want if you don't have a map defined. Click Next.**

   If you've saved a map to import estimates into Project, select the "Use existing map" option instead, as described on page 547.

6. **On the "Import Wizard - Import Mode" screen, select the "Merge the data into the active project" option, and then click Next.**

   This option will stuff the values from your Excel workbook into fields in existing tasks in Project.

7. **On the "Import Wizard - Map Options" screen, turn on the Tasks checkbox and then click Next.**

   If the first row of the workbook includes column names, as the Excel spreadsheet exported in the previous section does, then make sure the "Import includes headers" checkbox is also turned on.

8. **On the "Import Wizard - Task Mapping" screen, in the "Source worksheet name" drop-down list, choose the worksheet that contains the information you want to import.**

   If the Excel file contains only one worksheet, Project selects it automatically. If the file contains multiple worksheets, you can choose a specific worksheet if Project doesn't select the one you want.

9. **On the same wizard screen, match the values in the workbook to Project fields, as shown in Figure 7-4.**

   In addition to WBS and Name, you want to map the columns for work and duration in the workbook to the Work and Duration fields in Project.
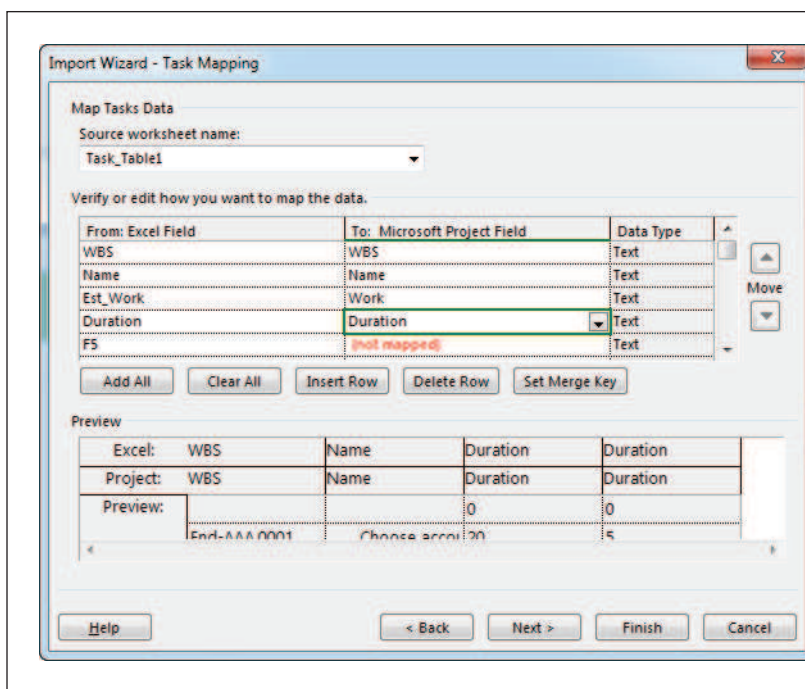
FIGURE 7-4

After you open an exported spreadsheet in Excel, you can add additional columns for best- and worst-case estimates. If you added other columns to your Excel workbook, such as Best and Worst, you might see the words "(not mapped)" in the "To: Microsoft Project Field" column. That's Project's way of saying that the information in those columns will remain in the workbook instead of transferring over to Project (which may be exactly what you want).

10. **When all the fields you want to import are mapped and the Preview area shows values coming into the correct Project fields, click Next.**

    A message box might appear telling you that Project needs a primary key before it can merge the data. (If you don't see that message box, then skip to step 12.) In English, this means you have to tell Project which fields in the Excel workbook and the Project file contain unique identifiers for tasks. WBS codes make a perfect primary key, since each task has one code and no two codes are alike. Click OK to close the message box.

    > **NOTE** If you didn't export the WBS field with the tasks when you created the estimate worksheet, you may be able to use the Name field, which contains task names. (The one caveat for using the Name field as a merge key is that your task names must be unique.)

11. **On the "Import Wizard - Task Mapping" page, in the table of matched fields, select the first WBS cell, and then click Set Merge Key.**

    In the table, both WBS cell values change to MERGE KEY:WBS to indicate that the import process will use the WBS values to match up tasks.

12. **Click Next, and then click Finish to merge the estimates into your Project file. (If you want to save the map, then click Save Map *before* you click Finish. In the Save Map dialog box, name the map in the "Map name" box, and then click Save.)**

    The estimated values appear in the Work and Duration cells in Project. (The Entry table that comes with Gantt Chart view doesn't include the Work column. To see the imported Work values in the Gantt Chart table area, insert the Work column by right-clicking a table heading and then choosing Insert Column. In the drop-down list that appears, choose Work, and then click OK.)

    > **NOTE** Sharp-eyed readers may notice that Project imports work estimates as hours, regardless of whether you create estimates in days, weeks, hours, or minutes. Remember, the "Work is entered in" option (File→Options→Schedule) tells Project the units you want to use for work (page 234). Unless you change the "Work is entered in" setting, it's set to hours, so that's what Project uses when it imports the estimates from Excel.

◼ Linking Tasks

Task dependencies (a.k.a. *task links* or *task relationships*) are what transform a ragtag group of tasks into a well-mannered project schedule, so Project offers several ways to create and modify all types of task dependencies. This section describes your options and the pros and cons of each one, and then walks you through several methods for creating task dependencies, starting with the most common type—finish-to-start.
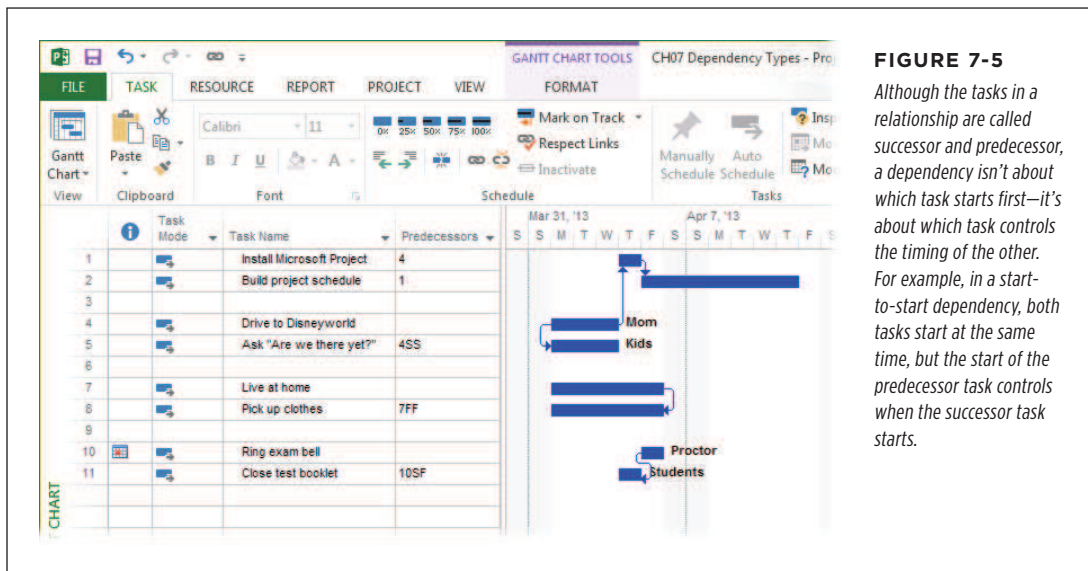
How Tasks Affect One Another

Clearly defined task dependencies are essential to creating an easy-to-maintain schedule. Like a baton passed from one relay runner to the next, the start or finish date of one task (the *predecessor*) determines when the second task (the *successor*) starts or finishes. (That doesn't necessarily mean the predecessor task starts *before* the successor—the predecessor task is just the one that triggers the start or finish of the successor.)

When you get your task dependencies in place (and use Project's automatic scheduling), project tasks snuggle cozily into sequence, and the program can automatically calculate task start and finish dates—and from those, the end date of the entire project.

As Figure 7-5 illustrates, Project indicates task dependencies with small arrows showing how the start or end point of each task relates to the start or end of another.

FIGURE 7-5

Although the tasks in a relationship are called successor and predecessor, a dependency isn't about which task starts first—it's about which task controls the timing of the other. For example, in a start-to-start dependency, both tasks start at the same time, but the start of the predecessor task controls when the successor task starts.

Task dependencies come in four flavors, listed here from the most to least common:

- **Finish-to-start (FS)** dependencies are the most common by far. In this relationship, the predecessor task comes first. When it finishes, the successor task begins—for example, when you finish installing a program on your computer, you can start using the program to do your real work.

- **Start-to-start (SS)** dependencies come in handy when the start of one task triggers the start of another. For instance, as soon as you start driving to your vacation destination (the predecessor task), your kids start asking, "Are we there yet?" (the successor task).

  Start-to-start dependencies often come with a delay (called a *lag*) between the predecessor and successor tasks (page 184). On that vacation drive, if your son starts poking his sister (the predecessor), she might not start crying (the successor) until 2 minutes have passed.

- **Finish-to-finish (FF)** dependencies are the mirror image of start-to-start relationships. The successor task continues only as long as the predecessor does. For instance, as long as your teenagers live at home (the predecessor), you pick up their clothes from the bathroom floor (the successor).

  These dependencies also tend to come with lag between the tasks. When a road crew inches along painting the lines on a highway, the folks who pick up the traffic cones finish a little while after the paint has dried.

- **Start-to-finish (SF)** dependencies are rare, which is for the best, since this relationship can be confusing. To better grasp the relationship, avoid the terms "predecessor" and "successor," and simply remember that the start of one task controls the finish of another. For example, when an exam proctor rings the bell (the predecessor) to indicate that time is up, the students have to close their test booklets (the successor), whether or not they've answered all the questions.

All of these examples are pretty straightforward. In real life, it may not always be so clear what kind of dependency you're dealing with. See the box on page 179 for advice on figuring out which kind of dependency you should use.

Creating Finish-to-Start Task Dependencies

Finish-to-start dependencies are so common that the Task tab's "Link the Selected Tasks" command (it's in the Schedule section) is dedicated to creating them. When your tasks follow one another like elephants, with one's trunk connecting to the next one's tail, this "Link the Selected Tasks" command is the fastest way to create those finish-to-start links. It's also the easiest way to link two tasks when you can't see both task bars in the Gantt Chart simultaneously.

Choosing the Right Relationship

For your project schedule to be accurate, you have to use the right type of dependency to link tasks. Simply put, if you don't connect tasks in the right way, the schedule won't reflect how work really proceeds once the project begins. Fortunately, the relationships between tasks are usually easy to identify. Most of the time, you're dealing with finish-to-start dependencies. But if you have trouble figuring out which relationship to use, ask yourself the following questions:

1. **Does the start or finish of one task control the other task?** When you answer this question, you know which task is the predecessor and which is the successor. You also know whether the dependency begins with "finish-to" or "start-to," in the list on page 177.

2. **Does the predecessor control the start or finish of the successor?** The answer to this question settles the type of dependency. Simply add the answer to this question to the answer to question 1. For example, if the predecessor determines when the successor task *starts*, then "finish-to" becomes "finish-to-start."

Another way to sort out the relationship is to complete the following sentence: This task must (start/finish) before I can (start/finish) that task.

In addition to choosing the right type of dependency, it's important to identify *all* the dependencies between tasks. Find relationships you missed by reviewing each task and asking yourself which other tasks affect it. Once you've identified all the predecessor tasks, you can identify the relationship between those tasks and the current task.

Here's how to create a finish-to-start task dependency:

1. **Select the predecessor task, and then select the successor task you want to link it to.**

   If the predecessor and successor aren't adjacent, click the predecessor first, and then Ctrl-click the successor.

   If the predecessor and successor appear one after the other in the table area of the Gantt Chart, simply drag across the two tasks to select both. When you link the tasks, the one higher in the list will become the predecessor to the one immediately following it.
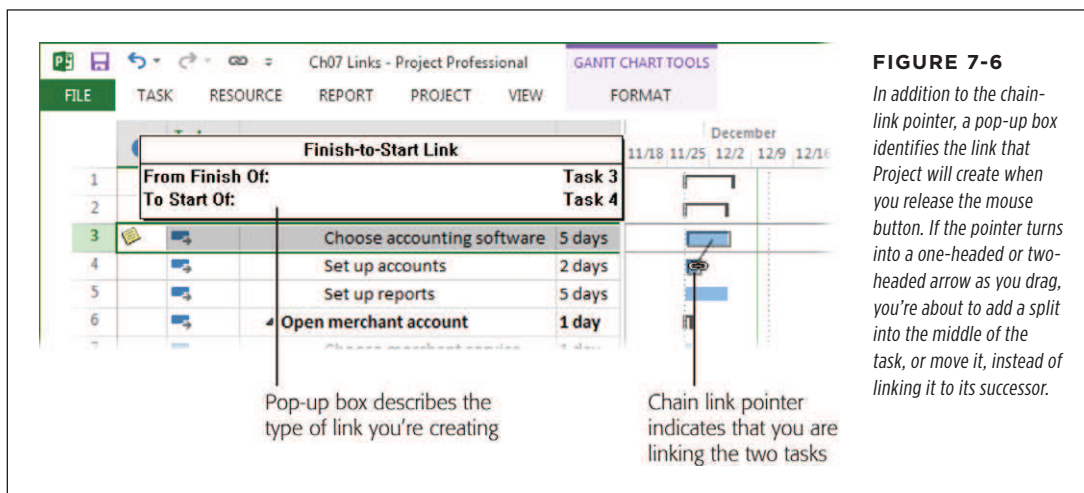
2. **In the Task tab's Schedule section, click the "Link the Selected Tasks" icon (which looks like links of chain) to create the relationship.**

   Project creates finish-to-start dependencies between the selected tasks. The timescale of the Gantt Chart shows the link lines, as illustrated back in Figure 7-5, but you can also see predecessors and successors in Task Form view, the table area of the Gantt Chart, and the Task Information dialog box, as you'll learn shortly.

When the task bars for two related tasks are visible in the Gantt Chart timescale, you can also create a finish-to-start link by dragging from the predecessor task bar to the successor task bar. This approach can be a perilous path and is advisable only if you pay close attention to what you're doing. If you don't select the first task correctly, you'll move the task instead of linking it, which creates an unintended date constraint (page 190). When you position the pointer over the first task, make sure you see a four-headed arrow. Then, as you drag the pointer to the second task, make sure the pointer changes to a link of a chain, as illustrated in Figure 7-6.

FIGURE 7-6

In addition to the chain-link pointer, a pop-up box identifies the link that Project will create when you release the mouse button. If the pointer turns into a one-headed or two-headed arrow as you drag, you're about to add a split into the middle of the task, or move it, instead of linking it to its successor.

Creating and Modifying All Types of Task Links

When you want to create, modify, or delete any kind of task dependency, you can take your pick from several locations in Project. This section is your guide to where you can define task links in Project, and the advantages or drawbacks of each. If Project automatically adds links you don't want, see the box on page 185 to learn how to prevent them.

■ **FILLING IN LINKS IN GANTT CHART VIEW**

Project's Task Form (to display it in the Details pane, in the View tab's Split View section, turn on the Details checkbox) includes fields for specifying predecessors, successors, types of links, and lag (page 184). It shows the values for the task that you select in the top view pane, so you can define, modify, or delete a task link.

NOTE Out of the box, Project turns on the "Update Manually Scheduled tasks when editing links" setting, which tells Project to change the dates for manually scheduled tasks if you link auto-scheduled tasks to them as predecessors. This setting is great when you create manually scheduled tasks because you don't know their durations but you want their dates scheduled based on their predecessors. (If you link manually scheduled tasks, Project creates the task link but doesn't change the task dates.) But if you want manually scheduled tasks to stay put, regardless of how you link them to other tasks (for example, for a training class that's scheduled for specific dates), turn this setting off. To do so, choose File→Options. On the left side of the Project Options dialog box, choose Schedule, and then look in the "Scheduling options for this project" section.

To link the selected task to its predecessor, do the following:

1. **Display Gantt Chart view in the top pane and Task Form view in the Details pane.**

   In the View tab's Task Views section, click the top half of the Gantt Chart button. In the View tab's Split View section, turn on the Details checkbox. The Details box automatically chooses Task Form.

2. **In Gantt Chart view in the top pane, select the successor task.**

   Task Form view shows the values for the selected task.

3. **In Task Form view, click a blank Predecessor Name cell and then, from the drop-down list, choose the predecessor task, as demonstrated in Figure 7-7.**

   If the Details pane contains a different view, you can switch it to Task Form view by clicking the View tab and then, in the Split View section, choosing Task Form in the Details drop-down list. If you don't see the Predecessor or Successor tables in Task Form view, right-click the form's heading, and then choose Predecessors & Successors.
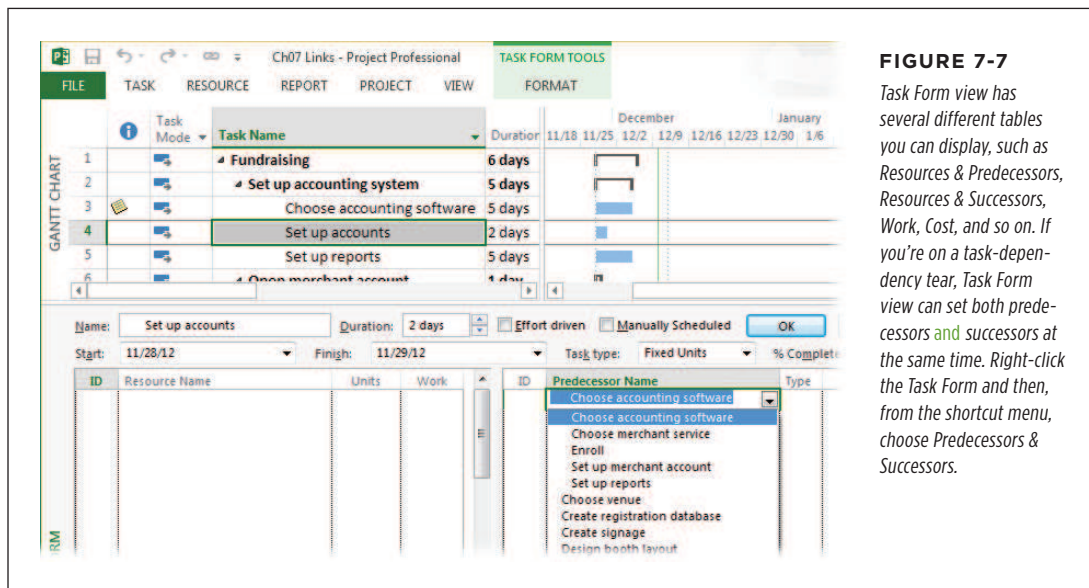
FIGURE 7-7

Task Form view has several different tables you can display, such as Resources & Predecessors, Resources & Successors, Work, Cost, and so on. If you're on a task-dependency tear, Task Form view can set both predecessors and successors at the same time. Right-click the Task Form and then, from the shortcut menu, choose Predecessors & Successors.

4. **In the Type cell's drop-down list, choose the task dependency.**

   The names are abbreviated to initials: FS for finish-to-start, SS for start-to-start, FF for finish-to-finish, and SF for start-to-finish.

   > **TIP** If you want to introduce a delay or overlap the tasks, then enter a time value or a percentage in the Lag box. (For more details on how lag time works, see page 184.)

5. **Click OK to create the link. (If you don't want the link, press Esc or click Cancel.)**

   The link lines for the dependency appear between the task bars in the Gantt Chart timescale.

Task Form view is a great timesaver, because you can use it to add, modify, or remove links with equal ease:

- **Add a link.** First, select a task in the table area of the top view pane. Then, in a blank predecessor row of Task Form view, specify the predecessor task's ID (or name), the type of dependency, and the lag duration (if any); then click OK.

- **Modify a link.** In Task Form view, click the cell you want to change, and then choose a different value. For example, if you created a task as start-to-start and it should be finish-to-finish, then click the link's Type cell and choose FF. You can modify the predecessor task and the lag, as well. When you're done, click OK.

- **Delete a link.** In Task Form view, click anywhere in the link's row, and then press Delete. Then click OK to confirm the deletion.

■ **WORKING ON TASK LINKS IN THE TASK INFORMATION DIALOG BOX**

The Task Information dialog box is full of information about the currently selected task. To use it to create links, first select the successor task and then open the dialog box by pressing Shift+F2; in the Task tab's Properties section, clicking Information; or simply double-clicking the successor task. In the dialog box, select the Predecessors tab to define links between the selected task and its predecessors, as shown in Figure 7-8.

Although the Task Information dialog box is great when you want to see or edit everything about a task, it has a few limitations compared with setting dependencies in the Task Form:

- To work on links, you have to open the dialog box, as opposed to seeing the fields at all times in Task Form view.

- The Task Information dialog box lets you define only predecessors to the selected task, not successors.

- To work on links for another task, you have to close the dialog box, select the other task, and then reopen the Task Information dialog box.
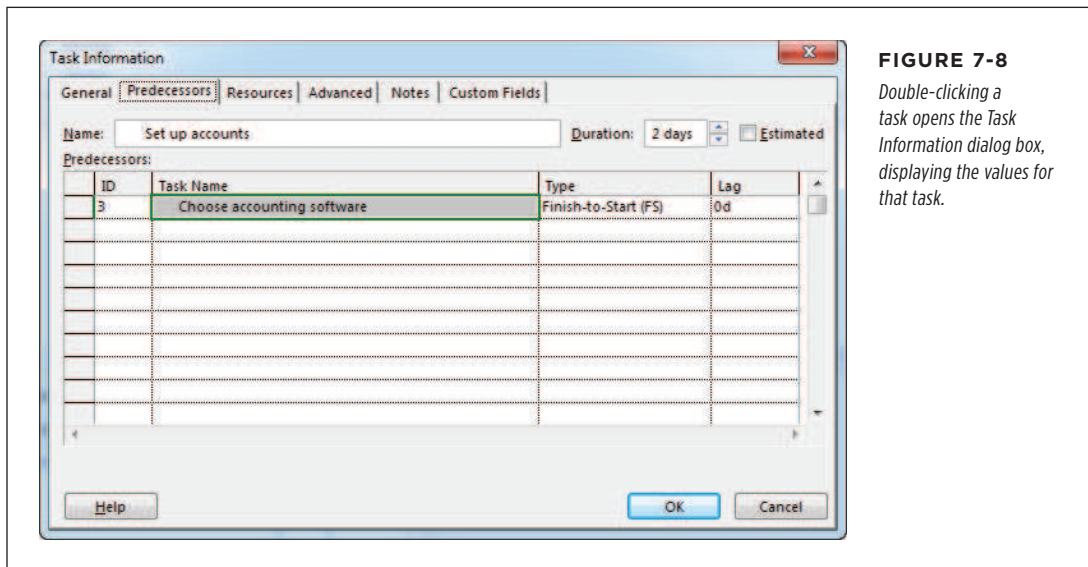
### ■ DEFINING TASK DEPENDENCIES IN THE TABLE AREA

The Entry table, which Gantt Chart view displays out of the box, includes the Predecessors column, which is great if you prefer typing to mousing. You can specify everything about a link in a task's Predecessor cell—as long as you know the code:

- **Create a single finish-to-start link.** All you do is type the ID number (the first column in the table area) of the predecessor and then press Enter.

- **Create several finish-to-start links to the selected task.** Separate each ID number with a comma, like this: *1,2,5,10*. Then press Enter.

- **Create a link other than finish-to-start.** Type the dependency abbreviation immediately after the ID number. For instance, to create a start-to-start link with task number 3, type *3SS*. (The abbreviations for the dependency types are the first letters of each half of the relationship: FS, SS, FF, SF.)

- **Designate the lag or lead time (page 185).** Type a plus sign (+) followed by the length of the delay or a minus sign (–) followed by the length of the lead, such as *3SS+5days*.

■ EDITING LINKS BY DOUBLE-CLICKING THEM

Double-clicking a link line in the Gantt Chart timescale opens a small dialog box, shown in Figure 7-9, for modifying or deleting the link. Needless to say, you can't use the double-click method to *create* a task dependency, because you need a link to double-click. Double-clicking a link is easy, unless you've got link lines splattered all over the Gantt Chart timescale, making finding the right link line a challenge.

www.it-ebooks.info
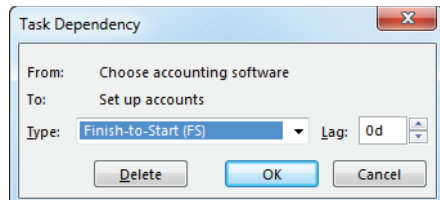
FIGURE 7-9

Before you change any values, make sure that the From and To tasks represent the link you want to modify. Then, in the Type drop-down list, choose the new dependency. The Lag box is where you specify the lag or lead time. If you want to delete the link, click Delete.

Removing Task Links

The Task tab's Unlink Tasks icon (which lives in the Schedule section and looks like a broken link of chain) does different things depending on what's selected when you click it:

- **Remove the link between two tasks.** If you select two linked tasks, then clicking Unlink Tasks removes the dependency between them.

- **Remove all links to a task.** If you select a single task and then click Unlink Tasks, then Project removes *all* the links to that task, not just the task link you probably had in mind.

You can also delete a link by double-clicking its link line in a Gantt Chart timescale (page 183), removing a predecessor in the Task Information dialog box (page 182), or deleting the link in the Predecessor cell in the Entry table (page 183).

Delaying or Overlapping Tasks

Tasks don't always occur in rapid-fire succession. When a company submits an invoice, for example, it usually has to wait 30 days to receive payment. In casual conversation, the delay between linked tasks is called "lag time," because the second task lags for a while before it starts (or finishes). When tasks overlap, the overlap is often called "lead time"—like giving someone a 30-minute head start because you're faster than they are. In Project, the term *lag* refers to both delays *and* overlaps. Typing a positive number in the Lag field creates a delay between dependent tasks, while a negative number overlaps the two tasks.

NOTE Lag is a delay (or overlap) between tasks that comes about no matter what happens. Project also includes a field called Assignment Delay (page 338), which delays a task until an assigned resource is available to work on it.

Automated Dependencies

How can I prevent Project from automatically creating links between tasks?

Sometimes, Project's attempts to be helpful are annoying. One way it may try to help is by automatically modifying task dependencies as you add, move, and delete tasks. For example, if you insert a new task (page 149) between two existing linked tasks, Project removes the existing link and then creates finish-to-start dependencies between all three tasks. Likewise, if you delete a linked task, Project links the tasks above and below the deleted task. And if you move a task, Project deletes the links at the old spot and then links the task to the tasks above and below it in its new location.

Project doesn't automatically link tasks by default. However, if it is adjusting links automatically, the setting that makes it behave that way could be turned on in the Project file you're working on. To regain control of linking, simply turn the setting off in the Project Options dialog box:

1. Choose File→Options, and then, on the left side of the Project Options dialog box, click Schedule.

2. Find the "Scheduling options for this project" heading. If you have more than one project file open, then to the right of this heading, choose the project for which you want to change the setting.

3. Turn off the "Autolink inserted or moved tasks" checkbox. (Because this checkbox sits underneath the heading that specifies a project file, you can rest assured that this setting applies only to the project you chose.)

These automated links can save time when you're building your initial schedule. Turn on this checkbox and you can insert, rearrange, or remove tasks, while Project manages the dependencies. Once the task links are arranged the way you want, go back and turn off the checkbox, so the links are completely under your control.

In Project, you use the Lag field to specify delays and overlaps, which can be durations or percentages:

- **Add a time delay.** If you have to wait 30 minutes after eating to get in the pool, enter *30min* in the Lag field.

- **Add an overlap.** Enter a negative value, such as *–2d* to start testing a website before all the pages are complete.

- **Add a percentage delay or overlap.** Using a percentage tells Project to adjust the length of the delay or overlap if the duration of the predecessor changes—for instance, to increase the amount of overlap based on the length of a design task. To define a delay or overlap as a percentage, simply type a percentage like *75%* in the Lag field.

TIP Whether you use a delay or an overlap depends on the type of task dependency. If you link tasks with a start-to-start link, entering *50%* in the Lag field tells Project to start the second task when 50 percent of the first one is complete. If you link the tasks as finish-to-start, you can obtain the same results by entering *-50%* in the Lag field. For example, consider a task for raking leaves and another for mowing the lawn. You can create a start-to-start link from raking leaves to mowing with a 50 percent delay so your spouse doesn't start mowing until you've raked half the yard. If you create a finish-to-start link between these two tasks instead and enter *−50%* in the Lag field, the yard-mowing task *still* starts halfway through raking leaves.

All methods for creating and modifying task dependencies, except for the "Link the Selected Tasks" command, include a place to specify the delay or overlap. (If you link tasks with the "Link the Selected Tasks" command, you can edit those links later to add a delay or an overlap.) Here's how you set a delay or overlap using each method of defining task links:

- **Task Form.** When you display predecessors or successors in the Task Form, each link includes four fields: ID, Predecessor Name (or Successor Name), Type, and Lag. In the Lag cell, enter the delay (a positive number) or overlap (a negative number).

- **Task Information dialog box.** When you display the Predecessors tab in the Task Information dialog box, the last column is Lag. As in the Task Form, type the duration or percentage you want in the Lag cell.

- **Table area.** In the table area's Predecessor cells, you append the delay or overlap lead to the link information. If the successor task starts 3 days after the end of the predecessor task (whose task ID is 6), the Predecessor cell would read *6FS+3day*.

- **Double-clicking a link line.** The Task Dependency dialog box includes a Lag box for the delay or overlap value (see Figure 7-9).

Scheduling Tasks to Accommodate Specific Dates

Anyone who's taken a project-management course knows the monumental tedium of manually calculating start dates, finish dates, slack time, and other schedule values. Letting Project calculate a schedule frees up your time for more important project-management activities, so normally you don't want to hobble the program's scheduling capabilities. From time to time, though, you need more control over task dates. (See Chapter 3 to learn when it makes sense to take control of scheduling and how to do so with Project's manual scheduling feature.) Suppose the backhoe you need isn't available to dig the foundation until after June 1. Or the new database guru you just hired will start work on October 12 so won't start her tasks before that date. Or the tradeshow your company is attending takes place from July 8–12 whether your booth is ready or not.

To keep your schedule low maintenance, let Project calculate it as much as possible. That way, the program recalculates dates automatically when predecessors get delayed or take more (or less) time than planned. However, when you want tasks to occur on or around specific dates, you can make that happen in two ways:

- **Set a task's schedule mode to Manually Scheduled.** When tasks are set to Auto Scheduled mode, Project does what you expect project-management software to do: It calculates when tasks start and finish based on predecessors, resource availability, and so on. Setting a task to Manually Scheduled mode instead (which is the default setting unless you change it) means Project quietly steps aside as you change the task dates to your heart's content. Manually scheduling tasks is perfect when you want to specify both start and finish dates.

- **Add a date constraint to a task.** A *date constraint* (or simply *constraint*) limits when a task either starts or finishes. Every task has a constraint, even if it's the completely flexible As Soon As Possible constraint. On the other hand, completely inflexible constraints like Must Start On make tasks behave a lot like manually scheduled tasks, except that you can specify a date constraint on only one of a task's dates. (For a complete list of Project's date constraints, see page 188.) One reason to use a date constraint instead of manual scheduling is if you want a constraint that's partially flexible—for example, when you want a task to start before a specific date, but you don't care how much before.

This section explains how to use manual scheduling and date constraints to set task dates. You'll learn about the types of date constraints at your disposal and how to use them without forfeiting schedule flexibility. In addition, you'll find out how to use deadlines to spotlight key dates without applying inflexible date constraints.

Manually Scheduling Task Dates

If a task occurs on specific dates—for example, a safety training course scheduled for October 10 and 11—Project's Manually Scheduled mode helps you set task dates in a jiffy. When a task is set to this mode, you're in the driver's seat date-wise. (To learn everything manual scheduling can do, see page 60.)

Here's how to set task dates with manual scheduling:

1. **Select the task whose dates you want to control. Then, in the Task tab's Tasks section, click Manually Schedule.**

   You can also right-click the task and choose Manually Schedule from the short-cut menu. If you display the Entry, Schedule, or Summary table on the left side of Gantt Chart view, click the task's Task Mode cell, click the down arrow that appears, and then choose Manually Scheduled.

2. **In the task table, type the dates you want in the task's Start and Finish cells.**

   In the Gantt Chart timescale, Project places brackets on each end of the task's bar, as shown in Figure 7-10, and changes the bar's color to teal to indicate that the task is manually scheduled (auto-scheduled tasks have blue bars). If the manually scheduled task's predecessors are delayed, then Project draws a red

squiggle below the task's dates to flag that there's a problem. See page 307 to learn what your options are when that happens.
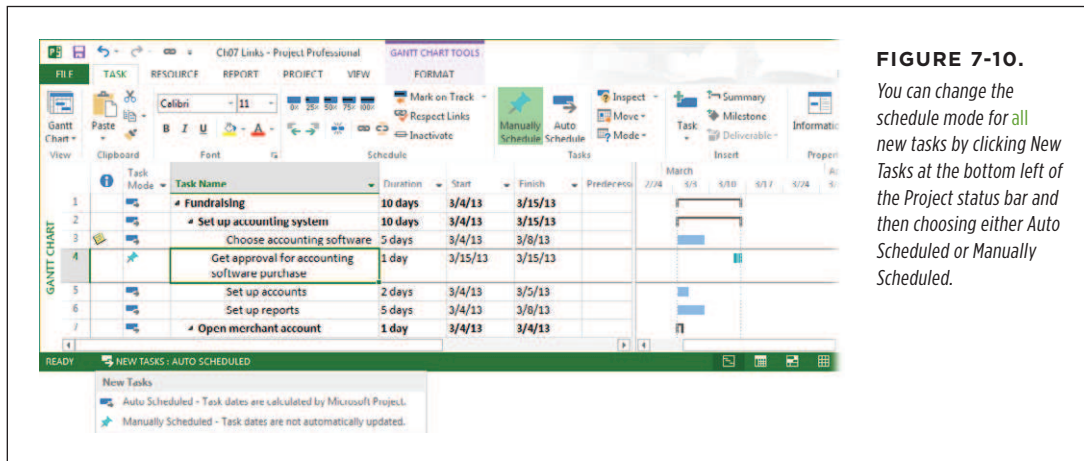
FIGURE 7-10.

You can change the schedule mode for all new tasks by clicking New Tasks at the bottom left of the Project status bar and then choosing either Auto Scheduled or Manually Scheduled.

Types of Constraints

Date constraints run the gamut from totally flexible to totally firm, and each type has its place. Unless a task is associated with a specific date, stick to the most flexible constraints—As Soon As Possible or As Late As Possible. Here are all of Project's constraint types (from most flexible to least flexible) and when to use them:

- **As Soon As Possible.** When you schedule a project from its start date (page 90), Project automatically assigns the As Soon As Possible date constraint to tasks, because this constraint doesn't determine when a task occurs. The start and finish date for the task are scheduled as soon as possible given its task dependencies, duration, assigned resources, and work times.

- **As Late As Possible.** Project automatically applies this constraint to every task when you schedule a project from its finish date (page 92). It's just as flexible as As Soon As Possible. The one problem with As Late As Possible tasks is that they don't leave any wiggle room for delays if something goes wrong. So if you have to delay a task with this type of constraint, its successors (and in many cases, the project's finish date) get delayed as well.

- **Start No Earlier Than.** You use this partly flexible date constraint for tasks that can start only after a certain date. For example, you can't buy concert tickets until they go on sale, but you can buy them any time after that date (until they sell out, that is). If you type a date in a task's Start field in a project that's scheduled from its start date, then Project sets the task to this constraint type.

- **Finish No Earlier Than.** This is another date constraint with some built-in flexibility, and it's ideal for tasks that have to continue until a specific date—for instance, processing event registrations until the cutoff date. If you type a date in a task's Finish field in a project that's scheduled from its start date, Project changes the task's constraint type to this one.

- **Start No Later Than.** This date constraint sets the latest date that a task can begin. You might use this constraint to make sure that construction begins early enough to enclose a house before winter hits, for example. However, construction can begin earlier if everything goes smoothly. If you schedule a project from its finish date, Project uses this constraint type when you type a date in a task's Start field.

- **Finish No Later Than.** You can apply this date constraint to control the latest date for a task to finish. For example, if payments have to be recorded before a specific date, then you can schedule your registration task to finish a few days earlier than that to leave time for processing. If you schedule a project from its finish date, then Project uses this constraint type when you type a date in a task's Finish field.

- **Must Start On.** This date constraint is completely inflexible. It specifies when a task starts—no ifs, ands, or buts. Moreover, this constraint's inflexibility overrides any task dependencies you set, as explained in the box on page 191. Because of that, avoid using this type of constraint unless it's absolutely necessary.

- **Must Finish On.** A control freak when it comes to the finish date, this date constraint specifies the exact date when a task ends. Like Must Start On, it also overrides task dependencies and is best left unused unless absolutely necessary.

NOTE You can only apply one date constraint to a task at a time—for example, Must Start On or Must Finish On. If you change a task's mode to Manually Scheduled, you set both the start and finish date for the task, so it's like applying a Must Start On *and* a Must Finish On date constraint. If you edit task dependencies connected to manually scheduled tasks, Project recalculates the tasks' start and finish dates. However, you can tell Project to leave manually scheduled tasks' dates as they are, regardless of edits you make to task dependencies. To do so, choose File→Options. On the left side of the Project Options dialog box, choose Schedule. Scroll to the "Scheduling options for this project" section and turn off the "Update Manually Scheduled task when editing links" checkbox. Then click OK.

Setting and Changing Constraints

Microsoft has been called a lot of things, but *minimalist* isn't one of them. As with most of its features, Project lets you work with constraints in several locations:

- **Task Details view.** Task Details view includes a Constraint box and a Date box. To set or change a single task's constraint, select the task in the table area of a view like the Gantt Chart. Then, in Task Details view in the Details pane, in the Constraint drop-down list, choose the type of constraint you want. If you select a constraint other than As Soon As Possible or As Late As Possible, choose a date in the Date box, too.

NOTE To display Task Details Form view in the Details pane, head to the View tab's Split View section and turn on the Details checkbox. Next, click the down arrow to the right of the Details box and choose More Views in the drop-down list. In the More Views dialog box, click Task Details Form, and then click Apply.

- **Task Information dialog box.** In the Task Information dialog box, click the Advanced tab. In the "Constraint type" and "Constraint date" boxes, choose the type and date for the constraint. (If you select a manually scheduled task, these two boxes are grayed out.)

- **Table area.** The table area is ideal when you want to change the constraints for many tasks at once. If you've just learned about the evils of inflexible constraints, you may want to change all tasks back to As Soon As Possible. To do so, right-click a column heading, and then choose Insert Column from the shortcut menu. In the drop-down list that appears for the new column, choose Constraint Type. In a Constraint Type cell, choose the new constraint type (As Soon As Possible, in this case). To copy that type to additional tasks, position the pointer over the cell's *fill handle* (the small square in the cell's bottom-right corner) until the pointer changes to a + sign. Then drag down through the Constraint Type cells you want to change.

Preventing Unwanted Date Constraints

Because Project automatically assigns the most flexible constraint to auto-scheduled tasks (As Soon As Possible if you schedule from the start date, As Late As Possible if you schedule from the finish date), the golden rule is to leave the constraint alone unless you have a very good reason to change it. But date constraints have an exasperating way of appearing when you're sure you didn't set them. It turns out that a few seemingly innocent actions on your part can create date constraints in Project.

To make sure your schedule doesn't gain date constraints you didn't intend, heed the following guidelines:

- **Don't type a specific date in a Start or Finish cell for an auto-scheduled task.** If you type a date in one of these cells, Project changes the date constraint to Start No Earlier Than in a project scheduled from its start date or Start No Later Than in a project scheduled from its finish date.

- **Don't set the finish date for a task just because that's the deadline.** The whole point of using Project is to find out ahead of time that a task won't finish on time, so you can adjust your plan to bring the finish date back in line.

TIP For a better way to indicate deadlines without adding inappropriate date constraints, read the next section.

- **Don't drag a task bar horizontally in the Gantt Chart timeline.** This action tells Project to change the constraint to Start No Earlier Than or Start No Later Than, depending on whether you've scheduled the project from its start date or finish date. Dragging task bars incorrectly can also link tasks you don't want connected, or split a task into two pieces. Avoid editing tasks in the timescale unless you're completely fastidious and a maestro with the mouse.

NOTE If you set a task's mode to Manually Scheduled, you can safely drag its task bar horizontally to change when it occurs. Project doesn't change the Constraint Type field when tasks are set to Manually Scheduled mode.
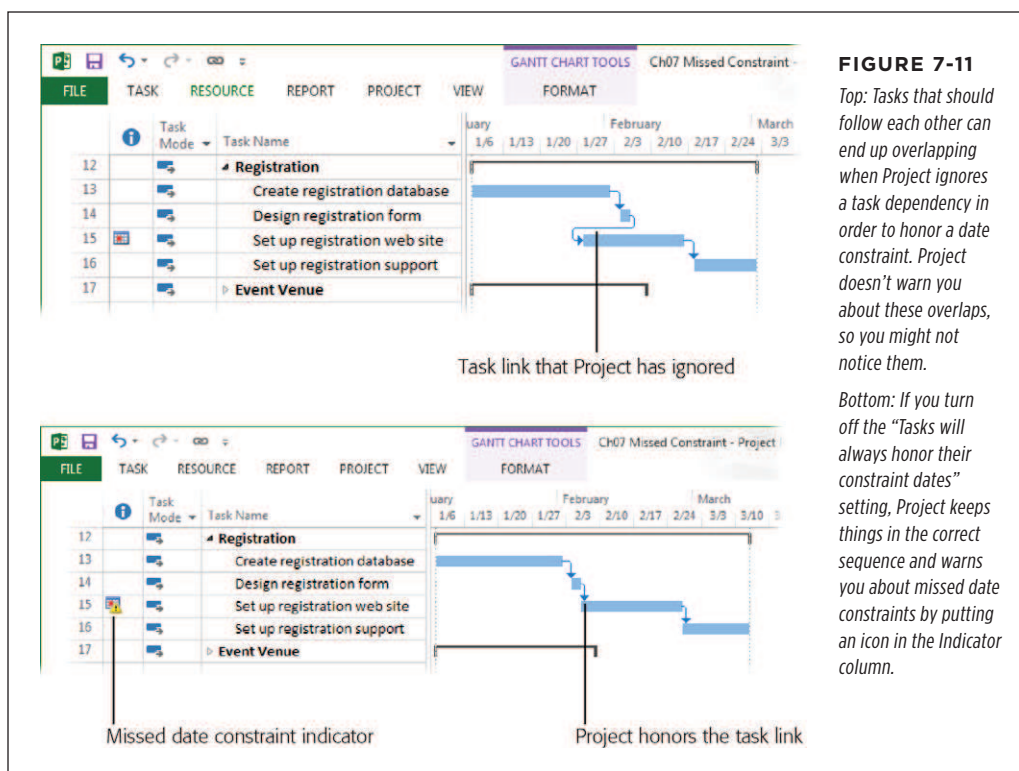
When Constraints and Dependencies Clash

Setting a Must Finish On constraint sounds definite, but that constraint doesn't guarantee on-time completion. Moreover, inflexible constraints, such as Finish No Later Than or Must Start On, can generate subtle and dangerous behavior on Project's part. Suppose a predecessor task runs late and pushes a successor past its must-finish-on date. Project can't keep both the Must Finish On constraint and the finish-to-start task dependency, so it has to pick one. Out of the box, Project honors the date constraint, which seems fine until you notice that the two tasks now overlap instead of following each other, as shown in Figure 7-11, top. When you execute the project, those tasks aren't likely to overlap, which will push the tasks' dates beyond the constraint you see in the Project schedule.

Most of the time, you want Project to warn you when your schedule might miss an important date. To get this type of warning, you have to tell Project to honor task dependencies, *not* date constraints. That way, predecessors and successors interact the way they should, but a task that blows past its constraint date displays a Missed Constraint indicator (shown in Figure 7-11, bottom).

To honor task dependencies over date constraints, click File→Options. On the left side of the Project Options dialog box, click Schedule, and then turn off the "Tasks will always honor their constraint dates" checkbox. If you want this setting to apply to all future projects, then in the "Scheduling options for this project" drop-down list, choose All New Projects, and *then* turn off the checkbox.

FIGURE 7-11

Top: Tasks that should follow each other can end up overlapping when Project ignores a task dependency in order to honor a date constraint. Project doesn't warn you about these overlaps, so you might not notice them.

Bottom: If you turn off the "Tasks will always honor their constraint dates" setting, Project keeps things in the correct sequence and warns you about missed date constraints by putting an icon in the Indicator column.

Setting Deadline Reminders

As their name implies, deadlines are dates that usually have ghastly consequences if you miss them. Yet Project's date constraints don't guarantee that you'll meet your deadlines and, as explained in the previous section, setting constraints can have serious drawbacks. The best way to stay on top of deadlines in Project is to define the deadline date in a task's Deadline field. Meanwhile, schedule the project as you would normally. That way, with the deadlines set for various tasks, you keep on the lookout for Project indicators that a deadline is in jeopardy. If you spot a missed-deadline indicator, you can investigate the issue and develop a plan to pull the task dates in earlier.

> **TIP** As you execute your project plan, remember to check regularly for missed date constraints and missed deadlines.

Here are the steps for setting and tracking a deadline for a task:

1. **Double-click the task to open the Task Information dialog box.**

   You can also select the task, and then, in the Task tab's Properties section, click Information.

2. **In the Task Information dialog box, click the Advanced tab. In the Deadline box, click the arrow to display a calendar, and then choose the deadline date. Then click OK to close the dialog box.**

   In Gantt Chart view's timescale, Project displays a green down-pointing arrow at the task's deadline date. If the task's bar ends before or at this arrow, the task is ahead of its deadline. If the task's bar ends to the right of this arrow, as shown in Figure 7-12, the task is running late.
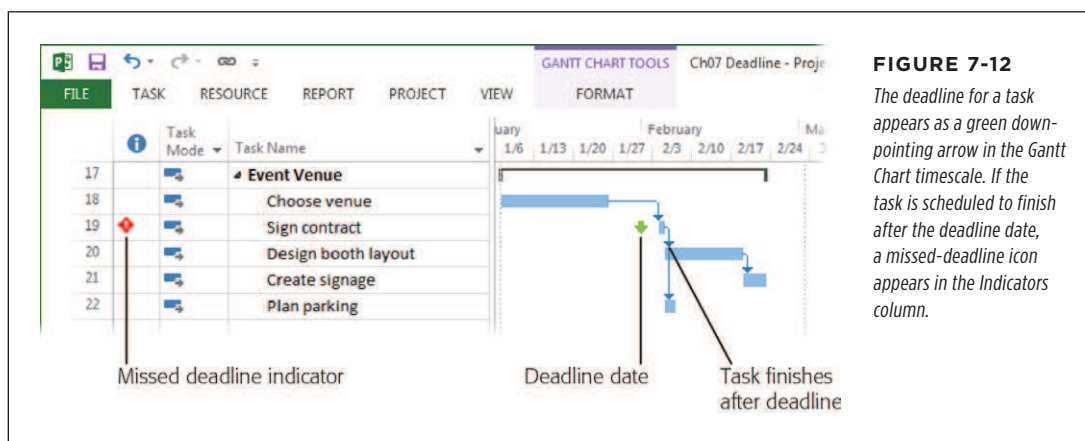
FIGURE 7-12

The deadline for a task appears as a green down-pointing arrow in the Gantt Chart timescale. If the task is scheduled to finish after the deadline date, a missed-deadline icon appears in the Indicators column.

3. **To see whether any tasks have missed their deadlines, review the Indicators column for red diamonds with exclamation points inside.**

   To make missed deadlines easier to see, you can filter the task list to show only tasks with Deadline dates assigned. To do that, in the View tab's Data section, click the Filter drop-down list (its icon looks like a funnel), and then choose More Filters. In the More Filters dialog box, double-click Tasks With Deadlines. Project displays tasks with deadlines assigned, along with the summary tasks to which those tasks belong. If you want to hide the summary tasks, in the Gantt Chart Tools | Format tab's Show/Hide section, turn off the Summary Tasks checkbox.

Scheduling Task Work Time with a Task Calendar

Sometimes tasks must run at specific times of the day or on certain days of the week. For example, scheduling computer maintenance during off-hours keeps complaints from information workers to a minimum. Microsoft Project calendars let you specify working and nonworking time to help schedule tasks on the days and times you want. By applying a calendar to a task, you can specify the hours when the task's work should occur.

You can easily assign a calendar to a task. Here are the steps:

1. **In a view's table area, select the task(s) to which you want to assign a calendar, and then, in the Task tab's Properties section, click Information.**

   If you select only one task, the Task Information dialog box opens. If you select more than one task, you see the Multiple Task Information dialog box, which is identical to the Task Information dialog box, except that fields unique to individual tasks are disabled.

2. **Click the dialog box's Advanced tab and, in the Calendar drop-down list, choose the calendar you want to apply, as illustrated in Figure 7-13.**

   Project comes with three built-in calendars: Standard for an 8-to-5 work schedule, Night Shift for the 11 p.m. to 8 a.m. grind, and 24 Hours for the gerbils on treadmills in your organization. If you want a different calendar, you have to create it (page 108) before opening the Task Information dialog box.

3. **Click OK to close the dialog box and apply the calendar to the task.**

FIGURE 7-13

After you select a calendar in the Calendar drop-down list, the "Scheduling ignores resource calendars" checkbox comes to life, but it's not turned on. With this checkbox turned off, Project schedules work for the working hours shared by the task calendar and calendars for the assigned resources. If the task calendar and resource calendars don't have any mutual work time, a message box warns you that the calendars don't jibe. You can then change the task calendar or the resource calendar to make them overlap. If you want Project to schedule work only by the task calendar (and ignore the resource calendar), turn on this checkbox.

www.it-ebooks.info