Chapter 4

Creating the WBS and Communicating the Plan

THE PMP EXAM CONTENT FROM THE PLANNING THE PROJECT PERFORMANCE DOMAIN COVERED IN THIS CHAPTER INCLUDES THE FOLLOWING:

✓ Create the WBS
Now that you have the deliverables and requirements well defined, you'll begin the process of breaking down the work of the project via a work breakdown structure. You'll accomplish this task in the Create WBS process. The WBS defines the scope of the project and breaks the work down into components that can be scheduled and estimated, as well as easily monitored and controlled.

Next I'll talk about how project information is documented and communicated. I've talked a lot about documentation so far, and I will discuss it more in this chapter. Documentation is something you will do throughout the remainder of the project, and the Communications Planning process details how to collect information, how to store it, and when and how to distribute it to stakeholders.

I'll end this chapter by defining the quality plan in the Quality Planning process. This process focuses on determining the quality standards that are necessary for the project and documenting how you'll go about meeting them.

## Creating the Work Breakdown Structure

Have you ever mapped out a family tree? In the Create WBS process, you'll construct something like it called a work breakdown structure (WBS). It maps the deliverables of the project with subdeliverables and other components stemming from each major deliverable in a tree or chart format. The PMBOK Guide describes a WBS as “a deliverable-oriented hierarchical decomposition of the work to be executed by the project team, to accomplish the project objectives and create the required deliverables. The WBS defines the total scope of the project.” Simply put, a WBS is a deliverable-oriented hierarchy that defines and organizes the work of the project and only the work of the project. Like the scope statement, the WBS serves as a foundational agreement among the stakeholders and project team members regarding project scope.

### Exam Spotlight

Subdividing deliverables into smaller components is the purpose of the Create WBS process. The PMBOK Guide calls this decomposition, which is also a tool and technique of this process.

The WBS will be used throughout many of the remaining Planning processes and is an important part of project planning. As you probably have concluded, everything you've done so far builds on the previous step. The project charter and preliminary scope statement outline
the project goals and major deliverables. The project scope statement further refines these deliverables into an exhaustive list and documents the requirements of the deliverables. Now you'll use that comprehensive list of deliverables produced in the project scope statement to build the framework of the WBS.

I can't stress the importance of the work you've done up to this point enough. Your WBS will be only as accurate as your list of deliverables. The deliverables will become the groupings that will form the higher levels of the WBS from which activities will be derived later in the Planning processes.

The WBS should detail the full scope of work needed to complete the project. This breakdown will smooth the way for estimating project cost and time, scheduling resources, and determining quality controls later in the Planning processes. Project progress will be based on the estimates and measurements assigned to the WBS segments. So, again, accuracy and completeness are required when composing your WBS.

Before you begin constructing the WBS, you'll need to gather and review some important project documents. You'll look at those next.

**Gathering the WBS Inputs**

The inputs to the Create WBS process aren't new. They are as follows:

- Organizational process assets
- Project scope statement
- Project scope management plan
- Approved change requests

The important aspect to note about the inputs to this process is that the approved project scope statement is the document you will use to define and organize the work of the project in the WBS. Make certain you're using the most current version of the scope statement. And note also that the WBS, just like the project scope statement, contains the work of the project and only the work of the project.

**Decomposing the Deliverables**

The Create WBS process consists of two tools and techniques. The first is the work breakdown structure templates. Many organizations and application areas (industries) have WBS templates they use for their projects. Keep in mind that you might use a WBS from a previous project as a template for your current project also. If you work in the same organization, and in the same department within the organization, you'll often find yourself working on the same types of projects. WBS templates lend themselves well to this situation because even though a project is unique, it might be similar to projects you've worked on in the past and might have similar life cycle phases. Check with your PMO because it might also have WBS templates.
The next tool and technique is called *decomposition*. This technique involves breaking down the deliverables into smaller, more manageable components of work. The idea here is to break down the deliverables to a point where you can easily plan, execute, monitor and control, and close out the project deliverables. Decomposition typically pertains to breaking deliverables down into smaller deliverables, or component deliverables, where each level of the WBS (or each level of decomposition) is a more detailed definition of the level above it.

This breaking-down or decomposing process will accomplish several tasks for you, one of which is improving estimates. It’s easier to estimate the costs, time, and resources needed for individual work components than it is to estimate them for a whole body of work or deliverable. Using smaller components also makes it easier to assign performance measures and controls. These give you a baseline to compare against throughout the project or phase. And finally, assigning resources and responsibility for the components of work makes better sense because several resources with different skills might be needed to complete one deliverable. Breaking them down assures that an assignment, and the responsibility for that assignment, goes to the proper parties.

According to the *PMBoK Guide*, decomposition is a five-step process:

1. Identify the deliverables and work. This step involves identifying all the major project deliverables and related work. The *PMBoK Guide* makes a point of noting that you can use the expert judgment technique to analyze the project scope statement and identify the major deliverables.
2. Organize the WBS. This step involves organizing the work of the project and determining the WBS structure.
3. Define the WBS components. This step involves decomposing the WBS levels into lower-level components. WBS components, like the deliverables and requirements, should be defined in tangible, verifiable terms so that performance and successful completion (or delivery) are easily measured and verified. Each component must clearly describe the product, service, or result in verifiable terms, and it must be assigned to a unit in the organization that will take responsibility for completing the work and making certain of its accuracy.
4. Assign identification codes. This step is a process where you assign identification codes or numbers to each of the WBS components.
5. Verify the WBS. This step is a verification step. Examine the decomposition to determine whether all the components are clear and complete. Determine whether each component listed is absolutely necessary to fulfill the requirements of the deliverable, and verify that the decomposition is sufficient to describe the work.

I’ll talk more about the process in step 4 in the section “Unique WBS Identifiers” later in this chapter.
You can now plug the components you’ve identified into the WBS. This all sounds like a lot of work. I won’t kid you—it is, but it’s essential to project success. If you don’t perform the WBS process adequately and accurately, you might end up setting yourself up for a failed project at worst or for lots of project changes, delayed schedules, and increased costs at best, not to mention all those team members who’ll throw up their hands when you return to them for the third or fourth time to ask that they redo work they’ve already completed. I know you won’t let this happen, so let’s move on to constructing the WBS.

The Create WBS process has several outputs, one of which is the WBS. You’ll look at the specifics of how to create the WBS next.

**Constructing the WBS**

There is no “right” way to construct a WBS. In practice, the chart structure is used quite often. (This structure resembles an organization chart with different levels of detail.) But a WBS could be composed in outline form as well. The choice is yours. You’ll look at both ways shortly, along with some figures that depict the different levels of a WBS.

According to the *PMBOK Guide*, you can organize the WBS in several ways:

- **Major deliverables and subprojects** The major deliverables of the project are used as the first level of decomposition in this structure. If you’re opening a new store, for example, the deliverables might include determining location, store build-out, furnishings, product, and so on. I’ll talk about subprojects in the next section.

- **Subproject executed outside the project team** Another way to organize the work is by subprojects. Perhaps you’re expanding an existing highway, and several subprojects are involved. Some of your first level of decomposition might include these subprojects: demolition, design, bridgework, and paving. Each of the subproject managers will develop a WBS for their subproject that details the work required for that deliverable. When subproject work is involved, often times the subproject work is contracted out. In this example, if you contracted out the bridgework deliverable, this subproject requires its own WBS, which the seller (the bridgework subcontractor) is responsible for creating as part of the contract and contract work.

- **Project phases** Many projects are structured or organized by project phases. For example, let’s say you work in the construction industry. The project phases used in your industry might include project initiation, planning, design, build, inspection, and turnover. A feasibility study might be a deliverable under the project initiation phase, blueprints might be a deliverable under the planning phase, and so on. Each phase listed here would be the first level of decomposition (that is, the first level of the WBS), their deliverables would be the next level, and so on.

- **Combination approach** This approach combines some or all of the methods I’ve discussed. You might use the project phases and major deliverables together as the first level of decomposition. Or you could have subprojects listed with major deliverables. You can use this approach in other levels of the WBS structure as well, not just the first level.

You’ll take a look at some example WBS structures next.
Understanding the Various WBS Levels

Although the project manager is free to determine the number of levels in the WBS based on the complexity of the project, all WBS structures start with the project itself. Some WBS structures show the project as level one. Others show the level under the project, or the first level of decomposition, as level one. The PMBOK Guide notes that level one is the first level of decomposition, so I'll follow that example here.

The first level of decomposition might be the deliverables, phases, or subprojects, as I talked about earlier. The levels that follow show more and more detail and might include more deliverables, followed by requirements, and so on. Each of these breakouts is called a level in the WBS. The lowest level of any WBS is called the work package level. (I’ll talk more about this in “Defining Work Packages” later in this chapter.) The goal is to construct the WBS to the work package level where you can easily and reliably estimate cost and schedule dates.

Exam Spotlight

Remember that each descending level of the WBS is a more detailed description of the project deliverables than the level above it. Each component of the WBS should be defined clearly and completely and should describe how the work of the project will be performed and controlled.

There is some controversy among project managers over whether activities should be listed on the WBS. The PMBOK Guide doesn't have a rule regarding this; it's up to the project manager to determine how far to break the deliverables down and whether to include activities. In practice, I often include activities on my work breakdown structure for small projects because it facilitates other Planning processes later. In this case, the activities are the work package level. However, you should realize that large, complex projects will not likely list activities on the WBS. And for the exam, remember that you will decompose activities during the Activity Definition process that I'll talk about in Chapter 6, “Resource Planning,” and that activities are not part of the WBS.

The easiest way to describe the steps for creating a WBS is with an example. Let’s suppose you work for a software company that publishes children’s games. You’re the project manager for the new Billy Bob’s Bassoon game, which teaches children about music, musical rhythm, and beginning sight reading. The first box on the WBS is the project name; it appears at the top of the WBS, as shown in Figure 4.1.

The next level is the first level of decomposition and should describe the major deliverables for the project. In this example, some of the deliverables might be requirements definition, design specifications, and programming. This isn’t an exhaustive list of deliverables; in practice, you would go on to place all of your major deliverables into the WBS as level-one content.
For illustration purposes, just look at a slice of the WBS for this project. Refer to Figure 4.1 to see the WBS with level-one detail added.

Level-two content might be the component deliverables that are further broken out from the major deliverables of level one, or it might be products, results, or activities that contribute to the deliverable. The Billy Bob’s Bassoon example shows further deliverables as level-two content. See Figure 4.2 for an illustration of the WBS so far.

The goal here is to eventually break the work out to the point where the responsibility and accountability for each work package can be assigned to an organizational unit or a team of people. I’ve decomposed this WBS to the activity level because it’s a small project. An easy way to differentiate between deliverables and activities in the WBS is to use nouns as the deliverable descriptors and verbs as activity descriptors. Reaching way back to my grade-school English, I recall that a noun is a person, place, or thing. In this example, the deliverables in level one and level two are described using nouns. The activity level, level three in the example in Figure 4.3, is described using verbs, or action words. Some of the verbs used in level three are define, design, and determine. Many more activities would go with these deliverables, but for the sake of illustration, I’ve listed just a few for each deliverable to give you an idea of how you construct the WBS.
You can see from these illustrations how a poor scope definition or inadequate list of deliverables will lead to a poorly constructed WBS. Not only will this make the WBS look sickly, but the project itself will suffer and might even succumb to the dreaded premature project demise. The final cost of the project will be higher than estimated, and lots of rework (translation: late nights and weekends) will be needed to account for the missing work not listed on the WBS. You can construct a good WBS and maintain a healthy project by taking the time to document all the deliverables during the Scope Definition process.

**WBS Templates**

Don’t forget that work breakdown structures can be constructed using WBS templates or the WBS from a similar completed project. A bit earlier, I mentioned that WBS templates are a tool and technique of the Create WBS process. Although every project is unique, many companies and industries perform the same kind of projects repeatedly. The deliverables are similar from project to project, and they generally follow a consistent path. The WBS templates can be used in a case like this as a tool to simplify the WBS process, saving the project manager time.
Creating the Work Breakdown Structure

Large, complex projects are often composed of several subprojects that collectively make up the main project. The WBS for a project such as this would show the subprojects as level-one detail. These subprojects’ major deliverables would then be listed as level-two content, perhaps more deliverables as level three, and so on.

Don’t get too carried away when creating a WBS. The object is to define the work of the project so you can easily plan, manage, monitor, and control the work. But, you don’t want to take this too far. If you decompose the work to the point that you’re showing every minute detail, you’ve ventured into inefficiency and will find it more difficult to plan and manage. In addition, you’re potentially stifling the creativity of the people working on the project because everything is so narrowly defined.

Sometimes, particularly when working on large projects that consist of several subprojects, some of the subprojects might not be scheduled to be worked on until a future date. Obviously, it makes sense to develop the WBS in detail at that future date when the deliverables and subprojects are better known and more details are available. This technique is called rolling wave planning. The idea behind this technique is that you elaborate the work of the project to the level of detail you know about at the time. If a subproject or deliverable is scheduled sometime in the future, the only component that might appear on the WBS today is the subproject itself. As you get closer to the subproject, you’ll elaborate the details of the subproject and record them on the WBS.

Exam Spotlight

Understand that rolling wave planning is a process of elaborating deliverables, project phases, or subprojects in the WBS to differing levels of decomposition depending on the expected date of the work. Work in the near term is elaborated in more detail than work to be performed in the future.

Understanding the Unique WBS Identifiers

Each element at each level of the WBS is generally assigned a unique identifier according to The PMBOK Guide. This unique identifier is typically a number, and it’s used to sum and track the costs, schedule, and resources associated with the WBS elements. These numbers are usually associated with the corporation’s chart of accounts, which is used to track costs by category. Collectively, these numeric identifiers are known as the code of accounts. The unique identifiers for the requirements definition branch of the WBS might look something like this:

- 10 Requirements Definition
- 10-1 Game Requirements
  - 10-1-1 Define Characters
  - 10-1-2 Define Instruments
10-2 Software Requirements
10-2-1 Determine Language
10-2-2 Define Systems

Defining Work Packages

As mentioned earlier, the project manager is free to determine the number of levels in the WBS based on the complexity of the project. You need to include enough levels to accurately estimate project time and costs but not so many levels that it's difficult to distinguish between the components. Regardless of the number of levels in a WBS, the lowest level in a WBS is called the work package level.

Work packages are the components that can be easily assigned to one person, or a team of people, with clear accountability and responsibility for completing the assignment. Assignments are easily made at the work package level; however, assignments can be made at any level in the WBS. The work package level is where time estimates, cost estimates, and resource estimates are determined.

Work package levels on large projects can represent subprojects that are further decomposed into their own work breakdown structures. They might also consist of project work that will be completed by a vendor, another organization, or another department in your organization. If you're giving project work to another department in your organization, you'll assign the work packages to individual managers, who will in turn break them down into activities during the Activity Definition process later in the Planning process group.

Work packages might be assigned to vendors or others external to the organization. For example, perhaps one of the deliverables in your project is special packaging and a vendor is responsible for completing this work. The vendor will likely treat this deliverable as a project within its own organization and construct its own WBS with several levels of decomposition. However, for your project, it's a deliverable listed at the work package level of the WBS.

Understanding Other Breakdown Structures

One point that the PMBOK Guide makes that I want you to be aware of is that you should not confuse the WBS with other types of breakdown structures. I'm not sure why you would confuse them, but the team who wrote the guide makes a point of telling you about it, so you
Real World Scenario

The Lincoln Street Office Building

Flagship International has just purchased a new building to house its growing staff. The folks at Flagship consider themselves very lucky to have won the bid on the property located in a prime section of the downtown area. The building is a historic building and is in need of some repairs and upgrades to make it suitable for office space. Constructing the renovations will require special handling and care, as outlined in the *Historical Society Building Revisions Guide*.

Alfredo Martini is the project manager assigned to the renovation project. Alfredo has already determined the deliverables for this project. In so doing, he has discovered that he will not be able to manage all the work himself. He will need several subproject managers working on individual deliverables, all reporting to him. Alfredo calls a meeting with the other project managers to develop the WBS. Let's eavesdrop on the meeting.

“As you all know, we’re planning to move into the Lincoln Street building by November 1. There is quite a bit of work to do between now and then, and I’m enlisting each of you to manage a segment of this project. Take a look at this WBS.”

A portion of the WBS Alfredo constructed looks like this:

**Lincoln Street Building Renovation**

1.0 Facility Safety  
   1.1 Sprinkler System  
   1.2 Elevators  
   1.3 Emergency Evacuation Plans  
2.0 Asbestos Abatement  
   2.1 Inspection and Identification  
   2.2 Plans for Removal  
3.0 Office Space  
   3.1 Building Floor Plans  
   3.2 Plans for Office Space Allocation  
   3.3 Plans for Break Room Facilities  
   3.4 Plans for Employee Workout Room
Alfredo continues, “I’m going to manage the Facility Safety project. Adrian, I’d like you to take the Asbestos Abatement project, and Orlando, you’re responsible for the Office Space project.”

“Alfredo,” Adrian says. “Asbestos abatement is going to take contractors and specialized equipment. We don’t have staff to do these tasks.”

“I understand. You’ll need to take charge of securing the contractor to handle this. Your responsibility will be to manage the contractor and keep them on schedule,” Alfredo answers.

Orlando reminds Alfredo that he has missed a deliverable on the WBS. “Part of the Office Space project needs to include the network communications and telecommunications equipment rooms. I don’t see that on here.”

“Good point, Orlando,” Alfredo says. “The level-two and level-three elements of this WBS are not complete. Each of you has been assigned to the subproject level, level one. Your first assignment is to meet back here in two weeks with a WBS for your subproject. And I’d like to see some ideas about the staff assignments you’d make at the work package level and how long you think these components will take. We’ll refine those after we meet next.”

should be aware of it for the exam. Here are the other structures they point out that you’ll see as you proceed through the remaining project processes:

**Organization breakdown structure (OBS)** This is an organization chart that describes the hierarchical nature of the organization, what departments exist, and who reports to whom. It can be used to identify the organizational units responsible for the work package levels of the WBS.

**Bill of materials (BOM)** BOMs are typically used in the manufacturing industry and identify the components needed to produce the product.

**Risk breakdown structure (RBS)** This is a hierarchical picture of the risks identified on the project arranged by risk category.

**Resource breakdown structure (RBS)** This is a hierarchical description of the resources, arranged by type, that will work on the project.

Now you’ll move on to the remaining outputs of the Create WBS process.

**Creating WBS Process Outputs**

The Create WBS process has six outputs:

- Project scope statement updates
- Work breakdown structure
- WBS dictionary
- Scope baseline
- Project scope management plan updates
- Requested changes
I've covered the WBS in detail already. Updates to the scope statement and scope management plan might come about as a result of approved changes that occur when you're creating the WBS. You can see from the examples you've walked through in this chapter how new deliverables or requirements might surface as a result of working on the WBS. These requested changes (the last output here) should be reviewed and either approved or denied using your change control processes. (I'll talk about that in Chapter 9, "Measuring and Controlling Project Performance.") The approved changes should be noted in the project scope statement, and the project management plan should be updated to reflect the new approved project scope statement.

You'll look at the remaining outputs next.

**WBS Dictionary**

The WBS dictionary is where work component descriptions are documented. According to the PMBOK Guide, the WBS dictionary should include the following elements for each component of the WBS:

- Code of accounts identifier
- Statement of work, which describes the work of the component
- Organization responsible for completing the component
- List of schedule milestones

Here are some other elements that you might include in the WBS dictionary for each component:

- Contract information
- Quality requirements for the component
- Technical references that assist the responsible party with defining performance of the work

Let's look at an example of what a WBS dictionary entry might look like. You'll use the work package level defined in the sidebar “The Lincoln Street Office Building” earlier called Inspection and Identification. The WBS dictionary entry for this might look like the following:

2.1 Inspection and Identification

**Statement of work:** Inspect the building for asbestos, and identify all areas where it's found. Update the plan for removal (WBS 2.2) with each location identified.

**Responsible organization:** Adrian in Facilities will hire and oversee a contractor to perform this work.

**Schedule milestones:** Inspection and identification to start after contractor is identified and hired (no later than July 1). Work should be completed no later than September 15.

**Contract information:** Two contractors have been identified as qualified and experienced in this type of work. Contract process should close no later than June 12.

**Scope Baseline**

Remember how I said that everything you've done so far has built upon itself? This is an important concept you should know for this output. The scope baseline for the project is the approved project scope statement, the WBS, and the WBS dictionary. (You'll recall from Chapter 3 that
the project scope statement serves as a baseline for future project decisions because it helps the team determine whether requested changes are inside or outside of scope.) In other words, these documents together describe in detail all the work of the project. From these documents, you’ll document schedules, assign resources, and monitor and control the work of the project according to what’s described here.

### Exam Spotlight

The scope baseline is defined as the detailed project scope statement, the WBS, and the WBS dictionary. Understand this concept for the exam.

If the WBS is constructed well, you’ve given yourself a huge helping hand with the remaining Planning processes. The completion of many of the remaining processes depends on the project scope statement and WBS being accurate and complete. In Chapter 6, for example, you’ll use the work packages created here to further elaborate the work into activities. From there, you can estimate costs, develop schedules, and so on. Before we get there, though, you’ll take a little breather and look at some of the other Planning processes important to your project. Don’t forget about the WBS! You’ll return to this in the later planning chapters of this book.

### Communicating the Plan

I’ve talked a lot about documentation so far, and this topic will continue to come up throughout the remainder of the book. Keeping good documentation should become the motto of all good project managers. “Is that documented?” should be an ever-present question on the mind of the project manager. Documentation can save your bacon, so to speak, later in the project. Documentation is only one side of the equation, though—communication is the other. You and your stakeholders need to know who gets what information and when.

The Communications Planning process involves determining the communication needs of the stakeholders by defining the types of information needed, the format for communicating the information, how often it’s distributed, and who prepares it. All of this is documented in the communications management plan, which is the only output of this process.

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**Pop quiz: Do you remember where else the communications management plan belongs? I’ll give you the answer later in the section “Communications Management Plan.”**
Communicating the Plan

Communications Planning Inputs

The inputs to the Communications Planning process will look familiar to you. They are as follows:

- Enterprise environmental factors
- Organizational process assets
- Project scope statement
- Constraints and assumptions elements of the project management plan

The *PMBOK Guide* notes that all the elements described in the enterprise environmental factors and in the organizational process assets are inputs to this process. However, special note is made of the lessons learned and historical information elements of the organizational process assets input. Information you learn as you’re progressing through the project is documented as lessons learned. This information is helpful for future projects of similar scope and complexity. Historical information is also useful to review when starting the Communications Planning process. Either of these documents might contain information about communication decisions on past projects and their results. Why reinvent the wheel? If something didn’t work well on a past project, you’d want to know that before implementing that procedure on this project, so review past project documentation.

The project scope management plan (I talked about this in Chapter 3) provides a common understanding of project scope among the stakeholders and serves as a basis for future project decisions. (I’m sure you have this definition memorized by now—that’s good.) Since you performed stakeholder analysis as part of the Scope Definition process (which produced the project scope statement as an output that became an input to this process), you should review the stakeholder analysis and refresh your memory on their communication needs.

The project management plan defines how the subsidiary plans will be defined and integrated into the overall project management plan. As such, it’s rich with constraints and assumptions that you should review as they pertain to stakeholder communication needs.

Tools and Techniques for Communications Planning

The Communications Planning process concerns defining and documenting the types of information you’re going to deliver, the format it will take, to whom it will be delivered, and when. The process consists of two tools and techniques to help determine these elements. They are communications requirements analysis and communications technology. You’ll look at both of these next.

Communications Requirements Analysis

Communications requirements analysis involves analyzing and determining the communication needs of the project stakeholders. According to the *PMBOK Guide*, there are several sources of information you can examine to help determine these needs, including the following:

- Company and departmental organizational charts
- Stakeholder relationships
- Other departments and business units involved on the project
- The number of resources involved on the project and where they’re located in relation to project activities
- External needs that organizations such as the media, government, or industry groups might have that require communication updates
- Communication needs that are internal to the organization
- Stakeholder information (a lot of this was documented during stakeholder analysis)

This tool and technique requires an analysis of the items in the preceding list to make certain you’re communicating information that’s valuable to the stakeholders. Communicating valuable information doesn’t mean you always paint a rosy picture. Communications to stakeholders might consist of either good or bad news—the point is that you don’t want to bury stakeholders in too much information, but you want give them enough so that they’re informed and can make appropriate decisions.

Project communication will always involve more than one person, even on the tiniest of projects. As such, communication network models have been devised to try to explain the relationships between people and the number or type of interactions needed between project participants. What you need to remember for the exam is that network models consist of nodes with lines connecting the nodes that indicate the number of communication channels, also known as *lines of communication*. Figure 4.4 shows an example of a network communication model with six channels of communication.

**Figure 4.4** Network communication model

Nodes = participants
Lines = lines of communication between participants
Bill is an information technology manager working on an enterprise resource planning project. He's one of the key stakeholders on this project. Bill reports to the CIO who in turn reports to the executive vice president, who also happens to be the project sponsor. Bill is close friends with the human resources director but doesn't get along so well with the accounting department director. This project requires heavy involvement from the accounting department and medium-level involvement from the human resources department.

You are the project manager for this project and are new to the organization. You know Bill's relationship with both the accounting and human resource directors. What you don't know is the relationship the two directors have with each other. Since all three stakeholders are key to the success of this project, it's important that all three communicate with you as well as with each other. You set up an interview with each of these stakeholders to determine several pieces of information: other departments that might need to be involved on the project, stakeholder communication needs and timing, external needs, timing of status updates for the company newsletter, and other department members aside from the stakeholders who need to be involved in the project. You also plant a few surreptitious questions that will give you some insight into the relationships the stakeholders have with each other and with the project sponsor.

You discover that the human resources and accounting directors have known each other for several years and worked together at another organization prior to coming to work here. This tells you that if you can get one of them to buy in on project decisions, the other will likely follow suit. They both have the utmost respect for Bill and his technical capabilities, even though the accounting director doesn't care for his abrupt, direct communication style. You also learn that although they both have respect for the position of the executive vice president, they don't believe the person filling that role is competent to do the job. They question his decision-making ability—or lack thereof—and warn you that you need to write down his answers and direction so that he doesn't change his story halfway through the project. Although you won't formally document this valuable piece of information, you'll definitely put it into action right away.

The nodes are the participants, and the lines show the connection between them all. You'll need to know how to calculate the number of communication channels when you take the exam. You could draw them out as in this example and count up the lines, but there's an easier way. The formula for calculating the lines of communication is as follows:

\[
\text{(number of participants} \times \text{(number of participants less 1)}) \div 2
\]
Here’s the calculation in mathematical terms:
\[ n (n - 1) / 2 \]

Figure 4.4 shows six participants, so let’s plug that into the formula to determine the lines of communication:

\[ 6 (6 - 1) / 2 = 15 \]

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**Exam Spotlight**

I recommend you memorize the communications channel formula before taking the exam.

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**Communications Technology**

The second tool and technique of this process is communications technology. This examines the methods (or technology) used to communicate the information to, from, and among the stakeholders. Methods of communicating can take many forms, such as written, spoken, email, formal status reports, meetings, online databases, online schedules, and so on. This tool and technique examines the technology elements that might affect project communications.

You should consider several factors before deciding what methods you’ll choose to transfer information. The timing of the information exchange or need for updates is the first factor. The availability of the technology you’re planning on using to communicate project information is important as well. Do you need to procure new technology or systems, or are there systems already in place that will work? Staff experience with the technology is another factor. Are the project team members and stakeholders experienced at using this technology, or will you need to train them? Finally, consider the duration of the project and the project environment. Will the technology you’re choosing work throughout the life of the project, or will it have to be upgraded or updated at some point? And how does the project team function? Are they all located together or spread out across several campuses or locations?

The answers to these questions should be documented in the communications management plan. I’ll cover that next.

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**Communications Management Plan**

All projects require sound communication plans, but not all projects will have the same types of communication or the same methods for distributing the information. The **communications management plan**, which is the only output of the Communications Planning process, documents the types of information needs the stakeholders have, when the information should be distributed, and how the information will be delivered. The answer to the earlier pop quiz is the communications management plan, which is a subsidiary plan of the project management plan I talked about in Chapter 3.
The type of information you will typically communicate includes project status, project scope statements and scope statement updates, project baseline information, risks, action items, performance measures, deliverable acceptance, and so on. I’ll cover all these topics in greater detail in the remaining chapters of this book. What’s important to know now is that the information needs of the stakeholders should be determined as early in the Planning process group as possible so that as you and your team develop project planning documents, you already know who should receive copies of them and how they should be delivered.

According to the *PMBOK Guide*, the communications management plan typically describes the following elements:

- Name of the item to be communicated
- Purpose for communication
- Frequency of communications
- Time frame for distribution, including starting and ending dates
- Format of the communication and method of transmission
- Person responsible for distributing the information

The information that will be shared with stakeholders and the distribution methods are based on the needs of the stakeholders, the project complexity, and the organizational policies. Some communications might be informal—a chat by the coffee maker, for instance—while other communications are written and a copy is filed with the project files.

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**Exam Spotlight**

The communications management plan documents how the communication needs of the stakeholders will be met, including the types of information that will be communicated, who will communicate it, who receives the communication, the methods used to communicate, the timing and frequency, the method for updating this plan as the project progresses, the escalation process, and a glossary of common terms.

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You might consider setting up an intranet site for your project and posting the appropriate project documentation there for the stakeholders to access anytime they want. If you use this method, make sure to document it in the communications management plan and notify your stakeholders when updates or new communication is posted.

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**NOTE**

Chapter 8, “Developing the Project Team,” discusses communication methods in more depth.
Identifying Quality Standards

Quality is affected by the triple constraints (project scope, schedule, and cost), and quality concerns are found in all projects. Quality typically defines whether stakeholder expectations were met. Being on time and on budget is one thing; if you deliver the wrong product or an inferior product, on time and on budget suddenly don’t mean much.

The Quality Planning process is concerned with targeting quality standards that are relevant to the project at hand and devising a plan to meet and satisfy those standards. The quality management plan is an output of this process that describes how the quality policy will be implemented by the project management team during the course of the project. Another key output of this process is the process improvement plan, which documents the actions for analyzing processes to ultimately increase customer value. Everything discussed in this section, including the inputs and tools and techniques of this process, will be used to help develop these two primary outputs.

Exam Spotlight

Quality Planning is a key process performed during the Planning processes and when developing the project management plan. It should be performed in conjunction with other Planning processes. According to the PMBOK Guide, “quality is planned, designed, and built in—not inspected in.”

Quality Inputs

The Quality Planning process has several inputs:
- Enterprise environmental factors
- Organizational process assets
- Project scope statement
- Project management plan

The two key elements I’ll cover regarding inputs are standards and regulations (which are part of the enterprise environmental factors input) and the quality policy (which is part of the organizational process assets input).

Standards and Regulations

The project manager should consider any standards, regulations, guidelines, or rules that exist concerning the work of the project when writing the quality plan. A standard is something that’s approved by a recognized body and that employs rules, guidelines, or characteristics that should be followed. For example, the Americans with Disabilities Act (ADA) has established standards for web page designers that outline alternative viewing options of web pages.
for people with disabilities. PMI guidelines regarding project management are another example of standards.

Standards aren’t legally mandatory, but it’s a good idea to follow them. Many organizations (or industries) have standards in place that are proven best practice techniques. Disregarding accepted standards can have significant consequences. For example, if you’re creating a new software product that ignores standard protocols, your customers won’t be able to use it. Standards can be set by the organization, independent bodies or organizations such as the International Organization for Standardization (ISO), and so on.

A regulation is mandatory. Regulations are almost always imposed by governments or institutions like the American Medical Association. However, organizations might have their own self-imposed regulations that you should be aware of as well. Regulations require strict adherence, particularly in the case of government-imposed regulations, or stiff penalties and fines could result—maybe even jail time if the offense is serious enough. Hmm, it might be tough to practice project management from behind bars—not a recommended career move.

If possible, it’s a good idea to include information from the quality policy (I’ll cover this in the next section) and any standards, regulations, or guidelines that affect the project in the quality management plan. If it’s not possible to include this information in the quality management plan, then at least make reference to the information and where it can be found. It’s the project management team’s responsibility to be certain all stakeholders are aware of and understand the policy issues and standards or regulations that might impact the project.

Contracts might have certain provisions for quality requirements that you should account for in the quality management plan. These provisions will also be discussed during the Procurement Planning processes. If the quality management plan has already been written by the time these processes are performed, you should update the quality plan to reflect it.

Quality Policy

The quality policy is part of the organizational process assets input. It’s a guideline published by executive management that describes what quality policies should be adopted for projects the company undertakes. It’s up to the project manager to understand this policy and incorporate any predetermined company guidelines into the quality plan. If a quality policy does not exist, it’s up to the project management team to create one for the project.

Tools and Techniques for Quality Planning

The Quality Planning process has five tools and techniques used to help construct the quality management plan:

- Cost-benefit analysis
- Benchmarking
- Design of experiments
Cost of quality
- Additional quality planning tools

Make sure you understand each of these tools and techniques and its purpose for the exam. You'll take a look at them now.

Cost-Benefit Analysis
You've seen the cost-benefit analysis technique before in the Initiating process group. In the case of quality management, you'll want to consider the trade-offs of the cost of quality. It's cheaper and more efficient to prevent defects in the first place than to spend time and money fixing them later. The benefits of meeting quality requirements are as follows:

- Stakeholder satisfaction is increased.
- Costs are lower.
- Productivity is higher.
- There is less rework.

The PMBOK Guide notes that the primary cost of meeting quality requirements for a project is the expense incurred while performing project quality management activities.

**Benchmarking**

*Benchmarking* is a process of comparing previous similar activities to the current project activities to provide a standard to measure performance against. This comparison will also help you derive ideas for quality improvements on the current project. For example, if your current printer can produce 8 pages per minute and you're considering a new printer that produces 14 pages per minute, the benchmark is 8 pages per minute.

**Design of Experiments**

*Design of experiments (DOE)* is a statistical technique that identifies the elements—or variables—that will have the greatest effect on overall project outcomes. It is used most often concerning the product of the project but can also be applied to project management processes to examine trade-offs. DOE designs and sets up experiments to determine the ideal solution for a problem using a limited number of sample cases. It analyzes several variables at once, allowing you to change all (or some of) the variables at the same time and determine which combination will produce the best result at a reasonable cost.

**Exam Spotlight**

For the exam, remember that the key to DOE is that it equips you with a statistical framework that allows you to change the variables that have the greatest effect on overall project outcomes at once instead of changing one variable at a time.
Cost of Quality

The *cost of quality* (COQ) is the total cost to produce the product or service of the project according to the quality standards. These costs include all the work necessary to meet the product requirements whether the work was planned or unplanned. It also includes the costs of work performed because of nonconforming quality requirements.

Three costs are associated with the cost of quality:

**Prevention costs**  Prevention means keeping defects out of the hands of customers. *Prevention costs* are the costs associated with satisfying customer requirements by producing a product without defects. These costs are manifested early in the process and include aspects such as quality planning, training, design review, and contractor and supplier costs.

**Appraisal costs**  *Appraisal costs* are the costs expended to examine the product or process and make certain the requirements are being met. Appraisal costs might include costs associated with aspects such as inspections and testing. Prevention and appraisal costs are often passed on to the acquiring organization because of the limited duration of the project.

**Failure costs**  *Failure costs* are what it costs when things don’t go according to plan. Failure costs are also known as cost of poor quality. Two types of failure costs exist:

- **Internal failure costs**  These result when customer requirements are not satisfied while the product is still in the control of the organization. Internal failure costs might include corrective action, rework, scrapping, and downtime.

- **External failure costs**  These occur when the product has reached the customer who determines that the requirements have not been met. Costs associated with external failure costs might include inspections at the customer site, returns, and customer service costs.

The cost of quality can be affected by project decisions. Let’s say you’re producing a new product. Unfortunately, the product scope description or project scope statement was inadequate to describe the functionality of the product. And, the project team produced the product exactly as specified in the project scope statement, WBS, and other planning documents. Once the product hit the store shelves, the organization was bombarded with returns and warranty claims because of the poor quality. Therefore, your project decisions impacted the cost of quality. Recalls of products can also impact the cost of quality.

Cost of quality is a topic you’ll likely encounter on the exam. The following sections will discuss some of the pioneers in this field. Quality must be planned into the project, not inspected in after the fact to make certain the product or service meets stakeholders’ expectations.

Four people in particular are responsible for the rise of the quality management movement and the theories behind the cost of quality: Philip B. Crosby, Joseph M. Juran, W. Edwards Deming, and Walter Shewhart. Each of these men developed steps or points that led to commonly accepted quality processes that we use today and either developed or were the foundation for the
development of quality processes such as Total Quality Management, Six Sigma, Cost of Quality, and Continuous Improvement. I’ll also cover a quality technique called the Kaizen approach that originated in Japan.

**Philip B. Crosby**

Philip B. Crosby devised the *zero defects* practice, which means, basically, do it right the first time. (Didn’t your dad use to tell you this?) Crosby says that costs will increase when quality planning isn’t performed up front, which means you’ll have to engage in rework, thus affecting productivity. Prevention is the key to Crosby’s theory. If you prevent the defect from occurring in the first place, costs are lower, conformance to requirements is easily met, and the cost measurement for quality becomes the cost of nonconformance rather than the cost of rework.

**Joseph M. Juran**

Joseph M. Juran is noted for his *fitness for use* premise. Simply put, this means the stakeholders’ and customers’ expectations are met or exceeded. This says that conformance to specifications—meaning the product of the project that was produced is what the project set out to produce—is met or exceeded. Fitness for use specifically reflects the customers’ or stakeholders’ view of quality and answers the following questions:

- “Did the product or service produced meet the quality expectation?”
- “Did it satisfy a real need?”
- “Is it reliable and safe?”

Juran also proposed that there could be grades of quality. However, you should not confuse grade with quality. *Grade* is a category for products or services that are of the same type but have differing technical characteristics. *Quality* describes how well the product or service (or characteristics of the product or service) fulfills the requirements. Low quality is usually not an acceptable condition; however, low grade might be. For example, your new Dad’s Dollars Credit Card software tracking system might be of high quality, meaning it has no bugs and the product performs as advertised, but of low grade, meaning it has few features. You’ll almost always want to strive for high quality, regardless of the acceptable grade level.

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**Exam Spotlight**

Understand the difference between quality and grade for the exam.

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**W. Edwards Deming**

W. Edwards Deming suggested that as much as 85 percent of the cost of quality is a management problem. Once the quality issue has hit the floor, or the worker level, the workers have little control. For example, if you’re constructing a new highway and the management team that bid on the project proposed using inferior-grade asphalt, the workers laying the asphalt have little control over its quality. They’re at the mercy of the management team responsible for purchasing the supplies.
Deming also proposed that workers cannot figure out quality on their own and thus cannot perform at their best. He believed that workers need to be shown what acceptable quality is and that they need to be made to understand that quality and continuous improvement are necessary elements of any organization—or project in your case.

Many consider Deming to be the founder (or major contributor) of Total Quality Management (TQM). TQM, like Deming, says that the process is the problem, not people. Every person and all activities the company undertakes are involved with quality. TQM stipulates that quality must be managed in and that quality improvement should be a continuous way of doing business, not a one-time performance of a specific task or process.

Six Sigma is a quality management approach that is similar to TQM and is typically used in manufacturing and service-related industries. Six Sigma is a measurement-based strategy that focuses on process improvement and variation reduction by applying Six Sigma methodologies to the project. There are two Six Sigma methodologies. The first is known as DMADV (define, measure, analyze, design, and verify) and is used to develop new processes or products at the Six Sigma level. The second is called DMAIC (define, measure, analyze, improve, and control) and is used to improve existing processes or products. Another tidbit you should understand about Six Sigma is that it aims to eliminate defects and stipulates that no more than 3.4 defects per million are produced.

**Walter Shewhart**

Some sources say that Walter Shewhart is considered the grandfather of TQM that was further popularized by Deming. Shewhart developed statistical tools to examine when a corrective action must be applied to a process. He invented control chart techniques (control charts are a tool and technique of the Perform Quality Control process) and was also the inventor of the Plan-Do-Check-Act cycle that I talked about in Chapter 1.

**Kaizen Approach**

The Kaizen approach is a quality technique from Japan. In fact, *Kaizen* means *continuous improvement* in Japanese. With this technique, all project team members and managers should be constantly watching for quality improvement opportunities. The Kaizen approach states that you should improve the quality of the people first and then the quality of the products or service.

Continuous improvement involves everyone in the organization watching for ways to improve quality, whether incrementally or by incorporating new ideas into the process. This involves taking measurements, improving processes by making them repeatable and systematized, reducing variations in production or performance, reducing defects, and improving cycle times. TQM and Six Sigma are examples of continuous improvement.

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**Exam Spotlight**

Understand each of these men's theories on the cost of quality for the exam. Here's a key to help you remember:

- **Crosby** = Zero defects and prevention or rework results.
- **Juran** = Fitness for use, conformance. Quality by design.
Deming = Quality is a management problem.
Shewhart = Plan-Do-Check-Act cycle.
TQM = Quality must be managed in and must be a continuous process.
Six Sigma = Six Sigma is a measurement-based strategy; no more than 3.4 defects per million.
Kaizen = Continuous improvement; improve quality of people first.
Continuous improvement = Watch continuously for ways to improve quality.

Additional Quality Planning Tools
The last tool and technique of the Quality Planning process is additional quality-planning tools. The PMBOK Guide lists these additional tools as follows:

- Brainstorming and the Nominal Group Technique (covered in Chapter 5, “Risk Planning”)
- Flowcharts (covered in Chapter 10, “Monitoring and Controlling Change.”)
- Affinity diagrams
- Force field analysis
- Matrix diagram
- Prioritization matrices

Affinity diagrams are used to group and organize thoughts and facts and can be used in conjunction with brainstorming. After you’ve gathered all ideas possible with brainstorming, you group similar ideas together on an affinity diagram.

Force field analysis is a method of examining the pros and cons of a decision. You could use the old T-square approach and list all the pros down the left column and all the cons in the right. Determine which of these elements in the list are barriers and which are enablers to the project. Assign a priority or rank to each, and develop strategies for leveraging the strengths of the high-priority enablers while minimizing the highest-ranked barriers.

Matrix diagrams are also used as a decision-making tool, particularly when several options or alternatives are available. Using a spreadsheet format, you list common elements down the rows in the first column and then list each alternative in its own column to the right of this one. Then rank each alternative in the corresponding cell where the common element and the alternative intersect.

Prioritization matrices are useful when you need to prioritize complex issues that have numerous criteria for decision making. They’re best used in situations where you can use data or inputs to score the criteria. They work similarly to a weighted scoring model (I talked about those in Chapter 2) in that the most important criteria carries the greatest weight.
You should memorize the names of these additional quality planning tools for the exam, but more important, you should understand both the names and concepts of the other tools and techniques I talked about earlier in this chapter.

**Quality Planning Outputs**

Quality Planning uses many techniques to determine the areas of quality improvement that can be implemented, controlled, and measured throughout the rest of the project, as you've seen. These are recorded in the primary output of this process, which is called the *quality management plan*. The following list includes other outputs of this process:

- Quality metrics
- Quality checklists
- Process improvement plan
- Quality baseline
- Project management plan updates

Project management plan updates include the quality management plan and process improvement plan and might come about as a result of changes or corrections resulting from the Perform Quality Assurance process. I'll talk about Perform Quality Assurance in Chapter 9. You'll look at the remaining outputs of Quality Planning next.

**Quality Management Plan**

The *quality management plan* describes how the project management team will enact the quality policy. It should document the resources needed to carry out the quality plan, the responsibilities of the project team in implementing quality, and all the processes and procedures the project team and organization should use to satisfy quality requirements, including quality control, quality assurance techniques, and continuous improvement processes.

The project manager in cooperation with the project staff writes the quality management plan. You can assign quality actions to the activities listed on the WBS based on the quality plan requirements. Isn't that WBS a handy thing? Later in the Perform Quality Control process, measurements will be taken to determine whether the quality to date is on track with the quality standards outlined in the quality management plan.

**Exam Spotlight**

The Quality Management Knowledge Area, which includes the Quality Planning, Perform Quality Assurance, and Perform Quality Control processes, involves the quality management of the project as well as the quality aspects of the product or service the project was undertaken to produce. I'll discuss Quality Assurance and Quality Control in later chapters.
Quality Metrics

A quality metric, also known as operational definition, describes what is being measured and how it will be measured by the Perform Quality Control process. For example, let's say you're managing the opening of a new restaurant in July of next year. Perhaps one of the deliverables is the procurement of flatware for 500 place settings. The operational definition in this case might include the date the flatware must be delivered and a counting or inventory process to ensure you received the number of place settings you ordered. Measurements consist of actual values, not “yes” or “no” results. In our example, receiving the flatware is a “yes” or “no” result (you have it or you don’t), but the date it was delivered and the number of pieces delivered are actual values. Failure rates are another type of quality metric that is measurable, as are reliability, availability, test coverage, and defect density measurements.

Quality Checklists

If you're like me, you start your day at the office with a big to-do list that has so many items on it you won't be able to finish them all. Nevertheless, you faithfully write the list every day and check off the items that you accomplish throughout the day. Checklists are like this in that they provide a means to determine whether the required steps in a process have been followed. As each step is completed, it's checked off the list. Checklists can be activity specific or industry specific and might be very complex or easy to follow. Sometimes, organizations might have standard checklists they use for projects. You might also be able to obtain checklists from professional associations.

Exam Spotlight

Be aware that a checklist shows up as both a process output and a tool and technique. Quality checklists are an output of the Quality Planning process, and checklist analysis is a tool and technique of the Risk Identification process.

Real World Scenario

Candy Works

Juliette Walters is a contract project manager for Candy Works. She is leading a project that will introduce a new line of hard candy drops in various exotic flavors: café latte, hot buttered popcorn, and jalapeño spice, just to name a few.

Juliette is writing the quality management plan for this project. After interviewing stakeholders and key team members, she has found several quality factors of importance to the organization. Quality will be measured by the following criteria:

Candy size  Each piece should measure 3 mm.
Appearance  No visible cracks or breaks should appear in the candy.

Flavor  Flavor must be distinguishable when taste tested.

Number produced  The production target is 9,000 pieces per week. The current machine has been benchmarked at 9,200 candies per week.

Intensity of color  There should be no opaqueness in the darker colors.

Wrappers  Properly fitting wrappers cover the candies, folding over twice in back and twisted on each side. There is a different wrapper for each flavor of candy, and they must match exactly.

The candy is cooked and then pulled into a long cylinder shape roughly 6 feet long and 2 feet in diameter. This cylinder is fed into the machine that molds and cuts the candy into drops. The cylinders vary a little in size, because they’re hand-stretched by expert candy makers prior to feeding them into the drop maker machine. As a result, the end of one flavor batch—the café latte flavor—and the beginning of the next batch—the hot buttered popcorn flavor—merge. This means the drops that fall into the collection bins are intermingled during the last run of the first flavor batch. In other words, the last bin of the café latte flavor run has some hot buttered popcorn drops mixed in. And, there isn’t a way to separate the drops once they’ve hit the bin. From here, the drops go on to the candy-wrapping machine, where brightly colored wrappers are matched to the candy flavor. According to the quality plan, hot buttered popcorn drops cannot be wrapped as café latte drops. Juliette ponders what to do.

As she tosses and turns that night thinking about the problem, it occurs to her to present this problem as an opportunity to the company rather than as a problem. To keep production in the 9,000 candies per week category, the machines can’t be stopped every time a new batch is introduced. So, Juliette comes up with the idea to wrap candies from the intermixed bins with wrappers that say “Mystery Flavor.” This way, production keeps pace with the plan, and the wrapper/flavor quality problem is mitigated.

Process Improvement Plan

The process improvement plan focuses on finding inefficiencies in a process or activity and eliminating them. The idea here is that if you’re doing activities or performing processes that don’t add any value, you’ll want to either stop doing what you’re doing or modify the process so that you are adding value. You should note that the process improvement plan is a subsidiary plan of the project management plan. Some of the elements you should consider when thinking about process improvement are the process boundaries, which describes the purpose for the process and its expected start and end dates; the process configuration so that you know what processes are performed when and how they interact; the process metrics; and any specific elements you want to target for improvement.
Quality Baseline

Almost everything you’ve done throughout this process culminates in the quality baseline. The *quality baseline* is the quality objective of the project. It’s what you’ll use to measure and report quality against as you perform the remaining Quality processes.

One of the results of the Quality Planning process is that your product or process might require adjustments to conform to the quality policy and standards. These changes might result in cost changes and schedule changes. You might also discover that you’ll need to perform risk analysis techniques for problems you uncover or when making adjustments as a result of this process.

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Real World Scenario

**Project Case Study: New Kitchen Heaven Retail Store**

You’re just finishing a phone conversation with Jill, and you see Dirk headed toward your office.

Dirk walks in, crosses his arms over his chest, and stands next to your desk with an “I’m here for answers” look.

“I thought I’d drop by and see whether you have signed a lease and gotten Jake started on that build-out yet,” says Dirk.

“I just got off the phone with Jill,” you reply. “The realtor found a great location, and we’ve set up a tour at the end of this week.”

“What has been the holdup?” Dirk asks. “I thought we’d be ready to start the build-out about now.”

“I’ve been working on the project plans.”

“Project plans,” Dirk interrupts. “We already have a plan. That scope thing you drew up last week spelled things out pretty clearly.”

“The charter was the project kickoff, and the project scope statement listed all the deliverables and requirements. From there I had to break the work of the project down into manageable units of work. So, I’ve drawn up a work breakdown structure with all the deliverables shown in a tree structure that I’d like to go over with you before showing it to the project team.”

“We aren’t building trees; we’re building a new store. I don’t understand why you’re wasting all this time planning. We all know what the objectives are.”
“Dirk,” you reply, “if we put the right amount of effort and time into planning, the actual work of the project should go pretty smoothly. Planning is probably one of the most important things we can do on this project. If we don’t plan correctly, we might miss something very important that could delay the store opening. That date is pretty firm, I thought.”

“Yes, the date is firm. But I don’t see how we could miss anything. You and I have met several times, and I know you’ve met with Jill and Jake. They’re the other key players on this.”

“You’re right. I have met with Jill and Jake. And that’s a perfect example of why we need to plan. When I met with Jill, she told me how all the store’s data is communicated via a satellite network connection on a nightly basis. That means we need to involve the IT group.”

You glance down at your notes. “Ricardo Ramirez heads up IT. I spoke with him last week about his deliverables, and I’ve included his group as a subproject on the work breakdown structure.”

“Oh,” Dirk replies. “I forgot about IT. You’re right, that’s an important part of the project, and we can’t leave them out. Don’t tell Ricardo I said this, but I’m not very technical myself and don’t really know what you’re going to need from him. I do know he also takes care of wiring and installing the point-of-sale terminals, but you’ll have to work all that out with him. OK, I’m beginning to see why you’re taking planning seriously. Let’s have a look at this work breakdown structure.”

You hand Dirk a copy of the WBS. A partial version is shown here.

“Looks good to me.”
"Great. Two more items, Dirk. After meeting with Jake, Ricardo, and Jill, I’ve also drafted a communication plan and a quality management plan. The communication plan describes the kind of information they need to receive, when, and how. And the quality management plan—well you know the old saying, ‘Do it right the first time.’ It describes the plan for implementing our quality policy. I also took the time to write down the specific quality metrics we’re looking for, including the lease signing date (this one must start and finish on time) and the IT equipment specifications, and Jill has documented the gourmet products and the cookware line specifications."

**Decomposed deliverables into a WBS**

The WBS includes the following:

- Level one is subprojects or deliverables.
- Level two is deliverables or activities.
- Remaining levels are activities.
- Last level of WBS is the work package level, where time and cost estimates can be defined in the next process.

**Documented the communications management plan, including the following:**

- Stakeholder communication needs
- Types of project communication and their format
- Frequency and method of communication
- Person responsible for producing communication

**Documented the quality management plan and quality metrics, including the following:**

- Lease signing start and end dates
- IT equipment specifications
- Gourmet products—availability rates and defects
- Cookware products—availability rates

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**Understanding How This Applies to Your Next Project**

In this chapter, you dealt with the realities of life on the job. The reality is, many project managers I know are managing several projects at once as opposed to one large project. Although every concept presented in this chapter is a sound one, it’s important to note that you have to
balance the amount of effort you'll put into project management processes against the size and complexity of the project.

Decomposing the deliverables is the first step toward determining resource requirements and estimates. A WBS is always a good idea, no matter the size of the project. I have to admit I have cheated a time or two on small projects and used the project schedule as both the WBS and the schedule. And in all fairness that's worked out fine when the team is small and there aren't more than three or four people working on the project. If you get many more than four people on the project team, it can be a little cumbersome to track deliverables with a schedule only. The WBS is the perfect tool to use to assign names to work packages, and it's the foundation for determining estimates for the work of the project.

The five-step process outlined by the *PMBOK Guide* works very well. Starting with the 50,000-foot view, the team determines the major deliverables of the project. From there, the deliverables are decomposed into ever smaller units of work. The trick here is to break the work down into measurable units so that you can verify the status of the work and the completion and acceptance of the work when you're finished. If you have “fuzzy” WBS levels or work packages, you won't be able to determine status accurately. In the information technology field, we have a saying about the status of projects: “It's 90 percent complete.” The problem is it always seems that the last 10 percent takes twice as long to complete as the first 90 did. If you've taken the time to document a WBS, you'll have a much better idea of what that 90 percent constitutes. The last step is the verification step where you determine whether everything you've identified in the WBS is absolutely necessary to fulfill the work of the project and whether it's decomposed enough to adequately describe the work. It has been my experience that documenting the WBS will save you time later in the Planning processes, particularly developing the project schedule and determining the project budget.

The communication management plan is a must-have for every project. I can't stress enough how often I've seen the root cause of project issues end up being communication problems. Never assume keeping the stakeholders informed is an easy job. Even if you know the stakeholders well, always create a communication plan. Document how you'll communicate status, baseline information, risks, and deliverables acceptance. That way there's no question as to how information will be relayed, who's going to receive it, or when it will be delivered.

The quality baseline is another important element of your project plan. Again, you should take into consideration the final result or product of the project and the complexity of the project. You might not necessarily need a multipage document with detailed specifications. Depending on the project complexity, a few sentences stating the measurements or criteria you'll use to determine the quality objective might be all that's needed.

### Summary

A WBS is a deliverable-oriented group of project essentials. The highest levels of the WBS are described using nouns, and the lowest levels are described with verbs. Each element in the WBS has its own set of objectives and deliverables that must be met in order to fulfill the deliverables of the next highest level and ultimately the project itself. In this way, the WBS validates the completeness of the work.
The lowest level of the WBS is known as work packages. This breakdown allows the project manager to determine cost estimates, time estimates, resource assignments, and quality controls.

The purpose of the communications management plan is determining the communication needs of the stakeholders by defining the types of information needed, the format for communicating the information, how often it's distributed, and who prepares it. This plan is a subsidiary plan of the project management plan.

Quality Planning targets the quality standards that are relevant to your project. The quality management plan outlines how the project team will enact the quality policy.

You need to consider the cost of quality when considering stakeholder needs. Four men led to the rise of the cost of quality theories. Crosby is known for his zero defects theory, Juran for the fitness for use theory, Deming for attributing 85 percent of cost of quality to the management team, and Shewhart for the Plan-Do-Check-Act cycle (he's also considered the grandfather of TQM). The Kaizen approach says that the project team should continuously be on the lookout for ways to improve the process and that people should be improved first and then the quality of the products or services. TQM and Six Sigma are examples of continuous improvement techniques.

Cost-benefit analysis considers trade-offs in the Quality Planning process. Benchmarking compares previous similar activities to the current project activities to provide a standard to measure performance against. Design of experiments is an analytical technique that determines what variables have the greatest effect on the project outcomes. This technique equips you with a statistical framework, allowing you to change all the important variables at once instead of changing one variable at a time.

Cost of quality involves three types of costs: prevention, appraisal, and failure costs; the latter is also known as the cost of poor quality. Failure costs include both internal and external costs.

The process improvement plan is a subsidiary plan of the project management plan and targets inefficiencies in a process or activity. The quality baseline is used to document the quality objectives of the project and is used as a basis for future Quality processes.

**Exam Essentials**

Be able to define a WBS and its components. The WBS is a deliverable-oriented hierarchy. It uses the deliverables from the project scope statement or similar documents and decomposes them into logical, manageable units of work. Level one is the major deliverable level or sub-project level, level two is a further elaboration of the deliverables, and so on. The lowest level of any WBS is called a work package.

Be able to describe the purpose of the communications management plan. The communications management plan determines the communication needs of the stakeholders. It documents what information will be distributed, how it will be distributed, to whom, and the timing of the distribution.

Be able to identify the benefits of meeting quality requirements. The benefits of meeting quality requirements include increased stakeholder satisfaction, lower costs, higher productivity, and less rework and are discovered during the Quality Planning process.
**Key Terms**

In this chapter, you began to see just how important communication is to every successful project. You learned about planning what work needs to be done, how you will communicate during the project, and how you will judge whether the project is successful. The processes that follow allow you to accomplish those portions of project planning. Understand them well, and know each process by the name used in the *PMBOK*:

Create WBS

Communications Planning

Quality Planning

Before you take the exam, also be certain you are familiar with the following terms:

- appraisal costs
- benchmarking
- checklists
- code of accounts
- communications management plan
- continuous improvement
- cost of quality (COQ)
- decomposition
- design of experiments (DOE)
- failure costs
- fitness for use
- Kaizen
- operational definition
- prevention costs
- process improvement plan
- quality baseline
- quality management plan
- quality metric
- regulation
- rolling wave planning
scope baseline
Six Sigma standard
Total Quality Management (TQM)

WBS dictionary
work breakdown structure (WBS)
work package
zero defects
Review Questions

1. Which of the following makes up the project scope baseline?
   A. The project scope statement
   B. The scope management plan and WBS
   C. The WBS, project scope statement, and WBS dictionary
   D. The scope management plan, the WBS, and the WBS dictionary

2. You are working on a project that is similar in scope to a project performed last year by your company. You might consider which of the following?
   A. Using the previous project’s alternatives identification as a template
   B. Reusing the previous project’s cost-benefit analysis as justification for this project
   C. Using the previous project’s WBS as a template
   D. Reusing the previous project’s product description when writing the scope statement

3. Your company, Kick That Ball Sports, has appointed you project manager for its new Cricket product line introduction. This is a national effort, and all the retail stores across the country need to have the new products on the shelves before the media advertising blitz begins. The product line involves three new products, two of which will be introduced together and a third one that will follow within two years. You are ready to create the WBS. All of the following are true except for which one?
   A. Each of the three products should be elaborated to the same number of levels. This is known as rolling wave planning.
   B. The WBS should be elaborated to a level where costs and schedule are easily estimated. This is known as the work package level.
   C. The WBS can be structured using each product as a level-one entry.
   D. Each level of the WBS represents verifiable products or results.
4. Your company, Kick That Ball Sports, has appointed you project manager for its new Cricket product line introduction. This is a national effort, and all the retail stores across the country need to have the new products on the shelves before the media advertising blitz begins. The product line involves three new products, two of which will be introduced together and a third one that will follow within two years. Product number three will be elaborated in more detail closer to the product’s release date, while the first two products will be elaborated in great detail now. The scope management plan has just been completed. Which of the following is true? (Choose the best response.)

A. Only the deliverables associated with the work of the project should be listed on the WBS. Since product number three isn’t being released until a later date it should not yet be included on the WBS.

B. The WBS template from a previous project, a tool and technique of the Create WBS process, was used to create the WBS for this project. The WBS encompasses the major deliverables for the project.

C. The WBS should be created next, and it encompasses the full scope of work for the project. Only the work of the project is listed on the WBS.

D. The WBS encompasses the full scope of work for the project and the technique in the question is called rolling wave planning.

5. You work for a large manufacturing plant. You are working on a new project to release an overseas product line. This is the company’s first experience in the overseas market, and it want to make a big splash with the introduction of this product. The project entails producing your product in a concentrated formula and packaging it in smaller containers than the U.S. product uses. A new machine is needed in order to mix the ingredients into a concentrated formula. To complete the Create WBS process sufficiently, you decide to do which of the following?

A. Use the organizational breakdown structure and the WBS together, and present this scope baseline to stakeholders.

B. Record the code of account identifier, an SOW, responsible organization, and milestone schedule in the WBS dictionary for the components of the WBS.

C. Elaborate the WBS to the point where the new machine specifications are clear and highly detailed.

D. Record the approved change requests as one of the outputs of this process.

6. You are the project manager for Lucky Stars nightclubs. They specialize in live country and western band performances. Your newest project is in the Planning process group. You’ve published the scope statement and scope management plan. The document that describes who will receive copies of this information as well as future project information, how it should be distributed, and who will prepare it is which of the following?

A. Scope management plan

B. Communications management plan

C. Information distribution plan

D. Project charter
7. You are the project manager for Lucky Stars nightclubs. They specialize in live country and western band performances. Your newest project is in the Planning processes group. You are working on the WBS. The finance manager has given you a numbering system to assign to the WBS. Which of the following is true?
   A. The numbering system is a unique identifier known as the code of accounts, which is used to track the costs of the WBS elements.
   B. The numbering system is a unique identifier known as the WBS dictionary, which is used to track the descriptions of individual work elements.
   C. The numbering system is a unique identifier known as the code of accounts, which is used to track time and resource assignments for individual work elements.
   D. The numbering system is a unique identifier known as the WBS dictionary, which is used to assign quality control codes to the individual work elements.

8. You've constructed the WBS for your recent project. You've requested that the subproject managers report to you in three weeks with each of their individual WBSs constructed. Which statement is not true regarding the subproject managers' WBS?
   A. The work package level facilitates resource assignments.
   B. The work package level is the lowest level in the WBS.
   C. The work package level defines the agreed-upon deliverables.
   D. The work package level facilitates cost and time estimates.

9. Which of the following statements about decomposition is the least true?
   A. Decomposition involves structuring and organizing the WBS so that deliverables are always listed at level one.
   B. Decomposition requires a degree of expert judgment and also requires close analysis of the project scope statement.
   C. Decomposition is a tool and technique used to create a WBS.
   D. Decomposition subdivides the major deliverables into smaller components until the work package level is reached.

10. Which of the following is not a major step of decomposition?
    A. Identify major deliverables.
    B. Identify components.
    C. Determine adequate cost and schedule estimates.
    D. Verify correctness of decomposition.
11. You have eight key stakeholders to communicate with on your project. Which of the following is true?
   A. There are 36 channels of communication, and this should be a consideration when using the communications technology tool and technique.
   B. There are 28 channels of communication, and this should be a consideration when using the communications requirements analysis tool and technique.
   C. There are 28 channels of communication, and this should be a consideration when using the communications technology tool and technique.
   D. There are 36 channels of communication, and this should be a consideration when using the communications requirements analysis tool and technique.

12. All of the following are true regarding Communications Planning except for which one?
   A. It's the only output of the Communications Planning process.
   B. It should be completed as early in the project phases as possible.
   C. It's tightly linked with enterprise environmental factors and organizational influences, and lessons learned and historical information are two inputs that should get a lot of attention during this process.
   D. Communications requirements analysis, communications technology, and PMIS are tools and techniques of this process.

13. All of the following are true regarding the Quality Planning process except for which one?
   A. DOE is a tool and technique of this process that provides statistical analysis for changing product or process elements one at a time to optimize the process.
   B. This is one of the key processes performed during the Planning process group and during the development of the project management plan.
   C. Changes to the product as a result of meeting quality standards might require cost or schedule adjustments.
   D. The tools and techniques of this process are cost-benefit analysis, benchmarking, DOE, COQ, and additional quality planning tools.

14. Four people are responsible for establishing cost of quality theories. Crosby and Juran are two of them, and their theories respectively are
   A. grades of quality, fitness for use
   B. fitness for use, zero defects
   C. zero defects, fitness for use
   D. cost of quality, zero defects

15. The theory that 85 percent of the cost of quality is a management problem is attributed to which of the following?
   A. Deming
   B. Shewhart
   C. Juran
   D. Crosby
16. All of the following are benefits of meeting quality requirements except which one?
   A. An increase in stakeholder satisfaction
   B. Less rework
   C. Low turnover
   D. Higher productivity

17. Which of the following describes the cost of quality associated with scrapping, rework, and downtime?
   A. Internal failure costs
   B. External failure costs
   C. Prevention costs
   D. Appraisal costs

18. The quality management plan documents how the project team will implement the quality policy. It must address all of the following except which one?
   A. Quality control
   B. Quality checklists
   C. Quality assurance
   D. Continuous process improvement

19. You work for a furniture manufacturer. Your project is going to design and produce a new office chair. The chair will have the ability to function as a regular chair and also the ability to transform its occupant into an upright, kneeling position. The design team is trying to determine the combination of comfort and ease of transformation to the new position that will give the chair the best characteristics while keeping the costs reasonable. Several different combinations have been tested. This is an example of which of the following tools and techniques of Quality Planning?
   A. Benchmarking
   B. Quality metrics
   C. COQ
   D. DOE

20. Which of the following best characterizes Six Sigma?
   A. Stipulates that quality must be managed in
   B. Focuses on process improvement and variation reduction by using a measurement-based strategy
   C. Asserts that quality must be a continuous way of doing business
   D. Focuses on improving the quality of the people first, then improving the quality of the process or project