Resource Planning

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

- Identify Project Team and Define Roles and Responsibilities
You're closing in on finishing up the Planning group processes. You're at a place where I need to talk about some processes that aren't necessarily related to each other but need to be completed before you can construct the project schedule and budget. So, you'll start out this chapter with two procurement processes—Plan Purchases and Acquisitions and Plan Contracting—and then move on to Human Resource Planning, where you will develop the staffing management plan. This plan will help guide you later on in acquiring your project team members.

Then you'll get back on track with a theme by finishing up the chapter with two processes that will start you off on the right foot toward estimating and scheduling activities. They are the Activity Definition process and the Activity Sequencing process.

All the processes I'll talk about in this chapter are used to develop both the project schedule and the budget, which are two of the most important documents in the project plan (I'll discuss those in the next chapter). Let's get going.

**Understanding Purchases and Acquisitions**

*Plan Purchases and Acquisitions* is a process of identifying what goods or services you're going to purchase from outside the organization and which project the project team needs can meet. Part of what you'll accomplish in this process is determining whether you should purchase the goods or services and, if so, how much and when. Keep in mind that I'm discussing the procurement from the buyer's perspective, because this is the approach used in the *PMBOK Guide*.

The Plan Purchases and Acquisitions process can influence the project schedule, and the project schedule can influence this process. For example, the availability of a contractor or special-order materials might have a significant impact on the schedule. And conversely, your organization's business cycle might have an impact on the Plan Purchases and Acquisitions process if the organization is dependent on seasonal activity. The Activity Resource Estimating process, which I'll cover in Chapter 7, also can be influenced by this process, as will make-or-buy decisions (I'll get to those shortly).
You need to perform each process in the Project Procurement Management Knowledge Area (beginning with Plan Purchases and Acquisitions and ending with Contract Closure) for each product or service that you're buying outside the organization. If you're procuring all your resources from within the organization, the only process you'll perform in this Knowledge Area is the Plan Purchases and Acquisitions process.

Sometimes, you'll procure all the materials and resources for your project from a vendor. In cases like these, the vendor will have a project manager assigned to the project. Your organization might choose to have an internal project manager assigned as well to act as the conduit between your company and the vendor and to provide information and monitor your organization's deliverables. When this happens, the vendor or contracting company is responsible for fulfilling all the project management processes as part of the contract. In the case of an outsourced project, the seller—also known as the vendor, supplier, or contractor—manages the project and the buyer becomes the stakeholder. If you're hiring a vendor, don't forget to consider permits or professional licenses that might be required for the type of work you need them to perform.

Several inputs are needed when planning for purchases. You'll look at them next.

**Plan Purchases and Acquisitions Inputs**

The Plan Purchases and Acquisitions process has six inputs:

- Enterprise environmental factors
- Organizational process assets
- Project scope statement
- Work breakdown structure
- WBS dictionary
- Project management plan

The project management plan can include risk register, risk-related contractual agreements, resource requirements, project schedule, activity cost estimates, and cost baseline.

Marketplace conditions are the key element of enterprise environmental factors you should consider for this process. The organization's guidelines, policies, and organizational policies (including any procurement policies) are the elements of the organizational process assets you should pay attention to here.
Many organizations have procurement departments that are responsible for procuring goods and services and writing and managing contracts. Some organizations also require all contracts be reviewed by their legal department prior to signing. These are organizational process assets that you should consider when you need to procure goods and services.

It's important for the project manager to understand organizational policies because they might impact many of the Planning processes, including the Procurement Planning processes. For example, the organization might have purchasing approval processes that must be followed. Perhaps orders for goods or services that exceed certain dollar amounts need different levels of approval. As the project manager, you need to be aware of policies like this so you're certain you can execute the project smoothly. It's frustrating to find out later that you should have followed a certain process or policy and now, because you didn't, you've got schedule delays or worse. You could consider using the "Sin now, ask forgiveness later" technique in extreme emergencies, but you didn't hear that from me. (By the way, that's not a technique that's authorized by the PMBOK Guide.)

The project manager and the project team will be responsible for coordinating all the organizational interfaces for the project, including technical, human resource, purchasing, and finance. It will serve you well to understand the policies and politics involved in each of these areas in your organization.

My organization is steeped in policy. (A government organization steeped in policy? Go figure!) It’s so steeped in policy that we have to request the funds for large projects at least two years in advance. There are mounds and mounds of request forms, justification forms, approval forms, routing forms—you get the idea. But my point is if you miss one of the forms or don’t fill out the information correctly, you can set your project back by a minimum of a year, if not two. Then once the money is awarded, there are more forms to fill out and policies to follow. Again, if you don’t follow the policies correctly, you can jeopardize future project funds. Many organizations have a practice of not giving you all the project money up front in one lump sum. In other words, you must meet major milestones or complete a project phase before they’ll fund your next phase. Know what your organizational policies are well ahead of time. Talk to the people who can walk you through the process and ask them to check your work to avoid surprises.

The project scope statement lists the deliverables and the acceptance criteria for the product or service of the project. Obviously, you’ll want to consider these when thinking about procuring goods and services. You’ll also want to consider the constraints (issues such as availability and timing of funds, availability of resources, delivery dates, and vendor availability) and assumptions (issues such as reliability of the vendor, assuming availability of key resources, and adequate stakeholder involvement). The product scope description is included in the project scope statement as well and might alert you to special considerations (services, technical requirements, and skills) needed to produce the product of the project.
Understanding Purchases and Acquisitions

The WBS and WBS dictionary identify the deliverables and describe the work required for each element of the WBS. The project management plan will provide you with guidance for procuring goods and services. For example, the risk-related contractual agreements component of this plan describes the types of services of goods needed for risk management. The transference strategy might require the purchase of insurance. You should review each of these elements when determining which goods and services will be performed within the project and which will be purchased.

Tools and Techniques for Plan Purchases and Acquisitions

The Plan Purchases and Acquisitions process consists of three tools and techniques. They are make-or-buy analysis, expert judgment, and contract types. I've already covered expert judgment, so you'll look at make-or-buy analysis next, and then I'll cover contract types.

Make-or-Buy Analysis

The main decision you’re trying to get to in make-or-buy analysis is whether it’s more cost effective to buy the products and services or more cost effective for the organization to produce the goods and services needed for the project. Costs should include both direct costs—in other words, the actual cost to purchase the product or service—and indirect costs, such as the salary of the manager overseeing the purchase process or ongoing maintenance costs. Costs don't necessarily mean the cost to purchase. In make-or-buy analysis, you might weigh the cost of leasing items versus buying them. For example, perhaps your project requires using a specialized piece of hardware that you know will be outdated by the end of the project. In a case like this, leasing might be a better option so that when the project is ready to be implemented, a newer version of the hardware can be tested and put into production during rollout.

Other considerations in make-or-buy analysis might include elements such as capacity issues, skills, availability, and trade secrets. Strict control might be needed for a certain process, and thus the process cannot be outsourced. Perhaps your organization has the skills in-house to complete the project but your current project list is so backlogged that you can’t get to the new project for months, so you need to bring in a vendor.

Make-or-buy analysis is considered a general management technique and concludes with the decision to do one or the other.

Contract Types

A contract is a compulsory agreement between two or more parties and is used to acquire products or services from outside the organization. Typically, money is exchanged for the goods or services. Contracts are enforceable by law and require an offer and an acceptance.

There are different types of contracts for different purposes. The PMBOK Guide divides contracts into three categories:

- Fixed price or lump sum
- Cost reimbursable
- Time and materials (T&M)
Within the fixed price and cost reimbursable categories are different types of contracts. You’ll look at each in the following sections. Keep in mind that several factors will impact the type of contract you should use. The product requirements (or service criteria) might drive the contract type. The market conditions might drive availability and price—remember back in the year 2000 when there wasn’t a programmer to be found for less than $200 an hour? And the amount of risk—for the seller, the buyer, and the project itself—will help determine contract type.

**Exam Spotlight**

There might be an exam question or two regarding contract types, so spend some time getting familiar with them.

**Fixed-Price or Lump-Sum Contracts**

*Fixed-price contracts* (also referred to as *lump-sum contracts*) set a specific, firm price for the goods or services rendered. The buyer and seller agree on a well-defined deliverable for a set price. In this kind of contract, the biggest risk is borne by the seller. The seller—or contractor—must take great strides to assure they’ve covered their costs and will make a comfortable profit on the transaction. The seller assumes the risks of increasing costs, nonperformance, or other problems. However, to counter these unforeseen risks, the seller builds in the cost of the risk to the contract price.

Fixed-price contracts can be disastrous for both the buyer and the seller if the scope of the project is not well defined or the scope changes dramatically. It’s important to have accurate, well-defined deliverables when you’re using this type of contract. Conversely, fixed-price contracts are relatively safe for both buyer and seller when the original scope is well defined and remains unchanged. They typically reap only small profits for the seller and force the contractor to work productively and efficiently. This type of contract also minimizes cost and quality uncertainty.

*Fixed-price plus incentive contracts* are another type of fixed-price contract. The difference here is that the contract includes an incentive—or bonus—for early completion or for some other agreed-upon performance criterion that’s exceeded according to contract specifications. The criteria for early completion, or other performance enhancements, must be spelled out in the contract so both parties understand the terms and conditions.

Another aspect of fixed-price plus incentive contracts to consider is that some of the risk is borne by the buyer as opposed to the firm fixed-price contract, where most of the risk is borne by the seller. The buyer takes some risk, albeit minimal, by offering the incentive to, for example, get the work done earlier. Suppose the buyer really would like the product delivered 30 days prior to when the seller thinks they can deliver. In this case, the buyer assumes the risk for the early delivery via the incentive.
Cost-Reimbursable Contracts

Cost-reimbursable contracts are as the name implies. The allowable costs—allowable is defined by the contract—associated with producing the goods or services are charged to the buyer. All the costs the seller takes on during the project are charged back to the buyer; thus, the seller is reimbursed.

Cost-reimbursable contracts carry the highest risk to the buyer because the total costs are uncertain. As problems arise, the buyer has to shell out even more money to correct the problems. However, the advantage to the buyer with this type of contract is that scope changes are easy to make and can be made as often as you want—but it will cost you.

Cost-reimbursable contracts have a lot of uncertainty associated with them. The contractor has little incentive to work efficiently or be productive. This type of contract protects the contractor's profit because increasing costs are passed to the buyer rather than taken out of profits, as would be the case with a fixed-price contract. Be certain to audit your statements when using a contract like this so that charges from some other project the vendor is working on don't accidentally end up on your bill.

Cost-reimbursable contracts are used most often when the project scope contains a lot of uncertainty, such as for cutting-edge projects and research and development. They are also used for projects that have large investments early in the project life. I'll now discuss the three kinds of cost-reimbursable contracts:

Cost plus fee (CPF) or cost plus percentage of cost (CPPC) In the cost plus fee (CPF) contract, also called cost plus percentage of cost (CPPC), the seller is reimbursed for allowable costs plus a fee that's calculated as a percentage of the costs. The percentage is agreed upon beforehand and documented in the contract. Since the fee is based on costs, the fee is variable. The lower the costs, the lower the fee, so the seller doesn't have a lot of motivation to keep costs low.

Cost plus fixed fee (CPFF) Cost plus fixed fee (CPFF) contracts charge back all allowable project costs to the seller and include a fixed fee upon completion of the contract. This is how the seller makes money on the deal; the fixed fee portion is the seller's profit. The fee is always firm in this kind of contract, but the costs are variable. The seller doesn't necessarily have a lot of motivation to control costs with this type of contract, as you can imagine. And one of the strongest motivators for completing the project is driven by the fixed fee portion of the contract.

Cost plus incentive fee (CPIF) The next category of cost reimbursable contract is cost plus incentive fee (CPIF). This is the type of contract in which the buyer reimburses the seller for the seller's allowable costs and includes an incentive for exceeding the performance criteria laid out in the contract. An incentive fee actually encourages better cost performance by the seller, and there is a possibility of shared savings between the seller and buyer if performance criteria are exceeded. The qualification for exceeded performance must be written into the contract and agreed to by both parties, as should the definition of allowable costs; the seller can possibly lose the incentive fee if agreed-upon targets are not reached.
There is moderate risk for the buyer under the cost plus incentive fee contract, and if well-written, it can be more beneficial for both the seller and then buyer than a cost-reimbursable contract.

**Time and Materials (T&M) Contracts**

*Time and materials (T&M) contracts* are a cross between fixed-price and cost-reimbursable contracts. The full amount of the material costs is not known at the time the contract is awarded. This resembles a cost-reimbursable contract because the costs will continue to grow during the contract’s life and are reimbursable to the contractor. The buyer bears the biggest risk in this type of contract.

T&M contracts can resemble fixed-price contracts when unit rates are used, for example. Unit rates might be used to preset the rates of certain elements or portions of the project. For example, a contracting agency might charge you $135 per hour for a Java programmer, or a leasing company might charge you $2,000 per month for the hardware you’re renting during the testing phase of your project. These rates are preset and agreed upon by the buyer and seller ahead of time.

---

**Exam Spotlight**

Understand the difference between a fixed-price contract and a cost-reimbursable contract for the exam. Also know when each type of contract should be used, and know which party bears the most risk under each type of contract.

---

**Plan Purchases and Acquisitions Outputs**

The Plan Purchases and Acquisitions process consists of four outputs. The first is the *procurement management plan*. You’ve seen a lot of other outputs whose names end with the words *management plan*, so you’re probably already ahead of me on this one. But hold the phone—I’ll make sure to touch on the important points. The other outputs are the contract statement of work, make-or-buy decisions, and requested changes.

**Procurement Management Plan**

The procurement management plan details how the procurement process will be managed. It includes the following information:

- The types of contract to use
- The authority of the project team
- How the procurement process will be integrated with other project processes
- Where to find standard procurement documents (provided your organization uses standard documents)
- How many vendors or contractors are involved and how they’ll be managed
• How the procurement process will be coordinated with other project processes, such as performance reporting and scheduling
• How the constraints and assumptions might be impacted by purchasing
• How multiple vendors or contractors will be managed
• The coordination of purchasing lead times with the development of the project schedule
• The schedule dates that are determined in each contract
• Identification of prequalified sellers (if known)

The procurement management plan, like all the other management plans, becomes a subsidiary of the project management plan.

**Real World Scenario**

**Streamlining Purchases**

Russ is a project manager for a real estate development company in Hometown, USA. Recently he transferred to the office headquarters to develop a process for streamlining purchases and purchase requests for the construction teams in the field. His first step was to develop a procurement management plan for the construction managers to use when ordering materials and equipment. Russ decided the procurement management plan could be used as a template for all new projects. That meant the project managers in the field didn’t have to write their own procurement management plan when starting a new construction project. They could use the template, which had many of the fields populated with corporate headquarters processes, and then they could fill in the information specific to their project. For example, the Types of Contracts section states that all equipment and materials purchases require fixed-price contracts. When human resources are needed for the project on a contract basis, a T&M contract should be used with the unit rates stated in the contract. A “not to exceed” amount should also be written into the contract so that there are no surprises as to the total amount of dollars the company will be charged for the resources.

**Contract Statement of Work**

A contract statement of work (SOW) contains the details of the procurement item in clear, concise terms. It includes the following elements:
• The project objectives
• A description of the work of the project and any postproject operational support needed
• Concise specifications of the product or services required
• The project schedule, time period of services, and work location

The contract SOW might be prepared by either the buyer or the seller. Buyers might prepare the contract SOW and give it to the sellers, who in turn rewrite it so that they can price the
work properly. If the buyer does not know how to prepare a contract SOW or the seller would be better at creating the SOW because of their expertise about the product or service, the seller might prepare it and then give it to the buyer to review. In either case, the contract statement of work is developed from the project scope statement and the WBS and WBS dictionary.

The seller uses the contract SOW to determine whether they are able to produce the goods or services as specified. In addition, it wouldn't hurt to include a copy of the WBS with the contract SOW. Any information the seller can use to properly price the goods or services helps both sides understand what’s needed and how it will be provided.

Projects might require some or all of the work of the project to be provided by a vendor. The Plan Purchases and Acquisitions process determines whether goods or services should be produced within the organization or procured from outside, and if goods or services are procured from outside, it describes what will be outsourced and what kind of contract to use and then documents the information in the contract SOW and procurement management plan.

You prepared a SOW during the Develop Project Charter process. You can use that SOW as the contract SOW during this process if you’re contracting out the entire project. Otherwise, you can use just those portions of the SOW that describe the work for which you’re contracted.

Make-or-Buy Decisions

The make-or-buy decision is a document that outlines the decisions made during the process regarding which goods and or services will be produced by the organization and which will be purchased. This can include any number of items, including services, products, insurance policies, performance, and performance bonds.

Requested Changes

Like many of the other processes I’ve discussed so far, requested changes might come about as a result of the Plan Purchases and Acquisitions process. Those changes, like all the others, should be administered through the Integrated Change Control process.

Once you’ve determined which goods and services you’re going to procure and decided on the best type of contract to use for your situation, you can move into the Plan Contracting processes to prepare the information needed for choosing a vendor.

Plan Contracting

The purpose of Plan Contracting is to prepare the documents you’ll use in the Request Seller Responses and Select Sellers processes. I’ll discuss these processes in Chapter 9, “Measuring and Controlling Project Performance.” The inputs to this process are the procurement management plan, contract statement of work, make-or-buy decisions, and the project management
plan (with special attention to the risk register, risk-related contractual agreements, resource requirements, project schedule, activity cost estimates, and cost baseline, which I will cover in coming chapters).

The tools and techniques of Plan Contracting are standard forms and expert judgment. Standard forms are used to facilitate the procurement process. These are forms that are standardized for your organization and for the types of goods or services typically procured by the organization. Your organization might or might not have standard forms. They are usually found in organizations that write a lot of contracts and procure a significant number of goods and services. They might include standard contract forms, nondisclosure agreements, proposal evaluation criteria, and so on.

**Plan Contracting Outputs**

The three outputs of the Plan Contracting process are procurement documents, evaluation criteria, and contract statement of work updates. You'll now take a quick look at each.

**Procurement Documents**

*Procurement documents* are used to solicit vendors and suppliers to bid on your procurement needs. You're probably familiar with some of the titles of procurement documents. They might be called request for proposal (RFP), request for information (RFI), invitation for bid (IFB), request for quotation (RFQ), and so on.

Procurement documents should clearly state the description of the work requested, they should include the contract SOW, and they should explain how sellers should format and submit their responses. These documents are prepared by the buyer to assure as accurate and complete a response as possible from all potential bidders. Any special provisions or contractual needs should be spelled out as well. For example, many organizations have data concerning their marketing policies, new products introductions planned for the next few years, trade secrets, and so on. The vendor will have access to this private information, and in order to ensure they maintain confidentiality, you should require that they sign a nondisclosure agreement.

A few terms are used during this process—usually interchangeably even though they have distinct definitions—that you should understand. When your decision is going to be made primarily on price, the terms *bid* and *quotation* are used, as in IFB or RFQ. When considerations other than price (such as technology or specific approaches to the project) are the deciding factor, the term *proposal* is used, as in RFP. These terms are used interchangeably in practice, even though they have specific meanings in the *PMBOK Guide*.

---

**NOTE**

In my organization, all solicitation requests are submitted as RFPs, even though our primary decision factor is price.

Procurement documents are posted or advertised according to your organizational policies. This might include ads in newspapers and magazines or ads/posts on the Internet.
Exam Spotlight

Understand the difference between bid and/or quotation and proposal for the exam. Bids or quotations are used when price is the only deciding factor among bidders. Proposals are used when there are considerations other than price.

Evaluation Criteria

Evaluation criteria refers to the method your organization will use to choose a vendor from among the proposals you receive. The criteria might be subjective or objective. In some cases, price might be the only criteria, and that means the vendor that submits the lowest bid will win the contract. You should use purchase price (which should include costs associated with purchase price, such as delivery and setup charges) as the sole criteria only when you have multiple qualified sellers from which to choose.

Other projects might require more extensive criteria than price alone. In this case, you might use scoring models as well as rating models, or you might utilize purely subjective methods of selection. I described an example weighted scoring method in Chapter 2, “Creating the Project Charter and Preliminary Scope Statement.” You can use this method to score vendor proposals.

Sometimes, the evaluation criteria are made public in the procurement process so that vendors know exactly what you want in a vendor. This approach has pros and cons. If the organization typically makes known the evaluation criteria, you’ll find that almost all the vendors that bid on the project meet every criteria you’ve outlined (in writing, that is). When it comes time to perform the contract, however, you might encounter some surprises. The vendor might have done a great job of writing the bid based on your criteria, but in reality they don’t know how to put the criteria into practice. On the other hand, having all the criteria publicly known beforehand gives ground to great discussion points and discovery later in the procurement processes.

The following list includes some of the criteria you can consider using for evaluating proposals and bids:

- Comprehension and understanding of the needs of the project as documented in the contract SOW
- Technical ability of vendor and their proposed team
- Experience on projects of similar size and scope, including references
- Project management approach
- Management approach
- Financial stability and capacity
- Intellectual and proprietary rights

You could include these in a weighted scoring model and rate each vendor on how well they responded to these issues.
Contract SOW Updates

You might find that changes to the contract statement of work are needed as a result of developing the procurement documents. These updates are usually made at the end of the Plan Contracting process.

I'll switch gears now and explain how you plan for the types of resources you'll need on the project in the Human Resource Planning process.

The Customer Relationship Management System Response

Ryan Hunter is preparing the evaluation criteria for an RFP for a customer relationship management (CRM) software system. After meeting with key stakeholders and other project managers in the company who've had experience working on projects of this size and scope, he devised the first draft of the evaluation criteria. A partial list is as follows:

- Successful bidder's response must detail how business processes (as documented in the RFP page 24) will be addressed with their solution.
- Successful bidder must document their project management approach, which must follow PMI's PMBOK Guide project practices. Must provide an example project management plan based on a previous project experience of similar size and scope to the one documented in the RFP.
- Successful bidder must document previous successful implementations, including integration with existing organization's PBX and network operating system, and must provide references.
- Successful bidder must provide financial statements for the previous three years.

Human Resource Planning

All projects require human resources, from the smallest project to the largest. The Human Resource Planning process documents the roles and responsibilities of individuals or groups for various project elements and then documents the reporting relationships for each. Reporting relationships can be assigned to groups as well as to individuals, and the groups or individuals might be internal or external to the organization or a combination of both. Communications Planning goes hand in hand with Human Resource Planning, because the organizational structure affects the way communications are carried out among project participants and the project interfaces.

The three outputs of this process include the roles and responsibilities document, the staffing management plan, and the project organization chart.
Human Resource Planning Inputs

Human Resource Planning has three inputs: enterprise environmental factors, organizational process assets, and project management plan (particularly the activity resource requirements). You'll look at the key elements of each of these next.

Key Environmental Factors for Human Resource Planning

Enterprise environmental factors play a key role in determining human resource roles and responsibilities. The type of organization you work in, the reporting relationships, and the technical skills needed to complete the project work are a few of the factors you should consider when developing the staffing management plan. These are the factors the PMBOK Guide details:

Organizational factors Consider what departments or organization units will have a role in the project, the interactions between and among departments, and the level of formality in these working relationships.

Technical factors Consider the types of specialized skills needed to complete the work of the project (for example, programming languages, engineering skills, knowledge of pharmaceuticals) and any technical considerations during handoff from phase to phase or from project completion to production.

Interpersonal factors Interpersonal factors have to do with potential project team members. You should consider their experience, skills, current reporting relationships, cultural considerations, and perceptions regarding their levels of trust and respect for co-workers and superiors.

Location and logistics Consider where the project team is physically located and whether they are all located together or at separate facilities (or cities or countries).

Political factors Political factors involve your stakeholders. Consider the amount of influence the stakeholders have, their interactions and influence with each other, and the power they can exert over the project.

In addition to these factors, you should also consider project constraints. The topic of constraints seems to come up a lot, so you probably remember that constraints are factors that limit the options available to the project team. These typically involve time, costs, scope, and quality. However, you should know about a few new constraints regarding project teams:

Organizational structures Organizational structures can be constraints. For example, a strong matrix organization provides the project manager with much more authority and power than the weak matrix organization does. Functional organizations typically do not empower their project managers with the proper authority to carry out a project. If you work in a functional organization as I do, it's important to be aware that you'll likely face power struggles with other managers and, in some cases, a flat-out lack of cooperation. Don't tell them I said this, but
functional managers tend to be territorial and aren’t likely to give up control easily. The best advice I have for you in this case is as follows:

- Establish open communications early in the project.
- Include all the functional managers with key roles in important decisions.
- Get the support of your project sponsor to empower you (as the project manager) with as much authority as possible. It’s important that the sponsor makes it clear to the other managers that their cooperation on project activities is expected.

**Collective bargaining agreements**  Collective bargaining agreements are actually contractual obligations of the organization with employees. Collective bargaining is typically associated with unions and organized employee associations. Other organized employee associations or groups might require specialized reporting relationships as well—especially if they involve contractual obligations. You will not likely be involved in the negotiations of collective bargaining agreements, but if you have an opportunity to voice opinions regarding employee duties or agreements that would be helpful to your project or future projects, by all means take it.

**Economic conditions**  These conditions refer to the availability of funds for the project team to perform training, hire staff, and travel. If funds are severely limited and your project requires frequent trips to other locations, you have an economic constraint on your hands.

---

**Exam Spotlight**

Understand the key environmental factors and the three constraints that can impact the Human Resource Planning process for the exam.

**Organizational Process Assets in Human Resource Planning**

You should consider two primary elements of the organizational process assets input during this process. They are templates and checklists.

The term *templates*, in this case, refers to documentation such as project descriptions, organizational charts, performance appraisals, the organization’s conflict management process, and so on.

Checklists might include elements such as training requirements, project roles and responsibilities, skills and competency levels, safety issues, and so on.

---

**Exam Spotlight**

According to the *PMBOK Guide*, using templates and checklists is one way to ensure that you don’t miss any key responsibilities when planning the project and will help reduce the amount of time spent on project planning.
Project Management Plan
You've examined the project management plan as an input to other Planning processes. In the Human Resource Planning process, you'll want to pay particular attention to the activity resource requirements because they outline the types and quantities of resources needed for project activities. (Activity resource requirements are an output of the Activity Resource Estimating process, which I'll talk about in Chapter 7, "Creating the Project Schedule and Budget.")

Human Resource Planning Tools and Techniques
The Human Resource Planning process consists of three tools and techniques. Remember that your goal is to produce the organizational chart, roles and responsibilities document, and staffing management plan outputs at the end of this process. You'll see that the tools and techniques directly contribute to these outputs. They are organization charts and position descriptions, networking, and organizational theory. You'll look at each of these in the following sections.

Organization Charts and Position Descriptions
We've all seen an organization chart. It usually documents your name, your position, your boss, your boss's boss, your boss's boss's boss, and so on. The important point to note about this tool and technique is that this information might be presented in one of three ways: hierarchical (which describes most organization charts), matrix, and text.

Hierarchical Charts
Hierarchical charts, like a WBS, are designed in a top-down format. For example, the organization or department head is at the top, the management employees who report to the organization head are next, and so on, descending down the structure. An organization breakdown structure (OBS) is a form of organization chart that shows how the WBS elements relate to the organization's departments, work units, or teams rather than individuals.

A resource breakdown structure (RBS) is another type of hierarchical chart that breaks down the work of the project according to the types of resources needed. (RBS also stands for risk breakdown structure, as you learned in the previous chapter.) For example, you might have programmers, database analysts, and network analysts as resource types on the RBS. However, they won't all necessarily work on the project team. You might have programmers reporting to the project team, the finance department, and the customer service department, for example. An RBS can help track project costs because it ties to the organization's accounting system. Let's suppose you have programming resources in the RBS at the junior, advanced, and senior levels. Each of these levels of programmer has an average hourly salary recorded in the accounting system that makes it easy for you to track project costs. Ten senior programmers, 14 advanced, and 25 junior-level programmers are easy to calculate and track.
Matrix-Based Charts

Matrix-based charts are used to show the type of resource and the responsibility they have on the project. Many times a project manager will use a responsibility assignment matrix (RAM) to graphically display this information. A RAM is usually depicted as a chart with resource names listed in each row (for example, programmers, testers, and trainers) and project phases or WBS elements listed as the columns. (It can also be constructed using team member names.) Indicators in the intersections show where the resources are needed. However, the level of detail is up to you. One RAM might be developed showing only project phases. Another RAM might show level-two WBS elements for a complex project, with more RAMs subsequently produced for the additional WBS levels. Or a RAM might be constructed with level-three elements only.

Exam Spotlight

According to the *PMBoK Guide*, the RAM relates the OBS to the WBS to assure that every component of the work of the project is assigned to an individual.

Table 6.1 shows a sample portion of a type of RAM called a RACI chart for a software development team. In this example, the RACI chart shows the level of accountability each of the participants has on the project. The letters in the acronym RACI are the designations shown in the chart:

- **R** = Responsible for performing the work
- **A** = Accountable, the one who is responsible for producing the deliverable or work package and approves or signs off on the work
- **C** = Consult, someone who has input to the work or decisions
- **I** = Inform, someone who must be informed of the decisions or results

**TABLE 6.1** Sample RAM

<table>
<thead>
<tr>
<th></th>
<th>Karen</th>
<th>Rae</th>
<th>Melinee</th>
<th>JoJo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td>R</td>
<td>A</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td>I</td>
<td>R</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td><strong>Implement</strong></td>
<td>C</td>
<td>I</td>
<td>R</td>
<td>A</td>
</tr>
</tbody>
</table>

*R = Responsible, A = Accountable, C = Consult, I = Inform*
In this example, Karen is responsible for design, meaning she creates the software programming design document, but Rae is accountable and is the one who must make certain the work of the project is completed and approved. This is a great tool because it shows at a glance not only where a resource is working but what that resource’s responsibility level is on the project.

Text-Oriented Formats
Text-oriented formats are used when you have a significant amount of detail to record. These are also called position descriptions or role-responsibility-authority forms. These forms detail (as the name implies) the role, responsibility, and authority of the resource, and they make great templates to use for future projects.

Don’t forget that other subsidiary plans of the project management plan might also describe roles and responsibilities. For example, you’ll recall from Chapter 5, “Risk Planning,” that the risk register lists the risk owners and their responsibility, so be certain to check these documents when outlining roles and responsibilities as well.

Networking
Networking in this process doesn’t refer to the technical kind of networking with servers, switches, and fiber. It means human resource networking; that is, you know someone who knows someone who knows someone. According to the PMBOK Guide, several types of networking activities exist: proactive communication, lunch meetings (my personal favorite), informal conversations (ah, the information you learn by hanging out at the espresso machine), and trade conferences (another favorite because they get you out of the office). Networking might help when you have a specific resource need on the project but can’t seem to locate someone with that set of skills.

Organizational Theory
Organizational theory refers to all the theories that attempt to explain what makes people, teams, and work units perform the way they do. I’ll talk more about motivation techniques (which are a type of organizational theory) in Chapter 8, “Developing the Project Team.” Organizational theory improves the probability that planning will be effective and helps shorten the amount of time it takes to produce the Human Resource Planning outputs.

Human Resource Planning Outputs
The Human Resource Planning process has three outputs: roles and responsibilities, project organizational charts, and the staffing management plan. I’ve already covered organizational charts in detail, so I’ll cover the other two outputs now.

Roles and Responsibilities
This output is the list of roles and responsibilities for the project team. It can take the form of the RAM or RACI chart I talked about earlier, or the roles and responsibilities can be recorded
in text format. The following are the key elements you should include in the roles and responsibilities documentation:

**Roles**  Describes what part of the project the individuals or teams are accountable for. This should also include a description of authority levels, responsibilities, and what work is not included as part of the role.

**Authority**  Describes the amount of authority the resource has to make decisions, dictate direction, and approve the work.

**Responsibility**  Describes the work required to complete the project activities.

**Competency**  Describes the skills and ability needed to perform the project activities.

### Staffing Management Plan

The staffing management plan documents how and when human resources are introduced to the project and the criteria for releasing them. As with the other management plans I've discussed, the level and amount of detail contained in this plan are up to you. It can be formal or informal, and it can contain lots of detail or only high-level detail.

The staffing management plan is a subsidiary plan to the project management plan and should be updated throughout the project. You should consider several elements for inclusion in the staffing management plan, including the following:

**Staff acquisition**  This describes how team members are acquired (from inside or outside the organization), where they're located, and the costs for specific skills and expertise. I'll talk more about staff acquisition in Chapter 8.

**Timetable**  This describes the time frames in which the resources will be needed on the project and when the recruitment process should begin. The resources can be described individually, by teams, or by function (programmers, testers, and so on). Many staffing management plans use a resource histogram. This is usually drawn in chart form, with project time along the horizontal axis and hours needed along the vertical axis. The following example histogram shows the hours needed for an asphalt crew on a construction project:
Release criteria  Attention should be given to how you'll release project team members at the end of their assignment. You should have reassignment procedures in place to move folks on to other projects or back to assignments they had before the project. This reduces overall project costs because you pay them only for the time they work and then release them. You won't have a tendency to simply keep them busy between assignments or until the end of their scheduled end date if they complete their activities early. Having these procedures in place will also improve morale because everyone will be clear about how reassignment will occur. This should reduce anxiety about their opportunity for employment at the conclusion of the project or their assignment.

Training needs  This describes any training plans needed for team members who don't have the required skills or abilities to perform project tasks.

Recognition and rewards  This describes the systems you'll use to reward and reinforce desired behavior. I'll talk more about recognition and rewards in Chapter 8.

Compliance  If your project involves regulations that must be met or contractual obligations (such as union contracts), the staffing management plan should detail these and any human resource policies the organization has in place that deal with compliance issues.

Safety  Any safety policies and procedures that are applicable to the project or industry you work in should be included in the staffing management plan.

Exam Spotlight

Make certain you understand the roles and responsibilities and the staffing management output and what each of these entails for the exam.

Defining Activities

Now you're off and running toward the development of your project schedule. To develop the schedule, you first need to define the activities, sequence them in the right order, estimate resources, and estimate the time it will take to complete the tasks. I'll cover the Activity Definition here, cover Activity Sequencing processes next, and pick up with the estimating processes in the next chapter.

Activity Definition and Activity Sequencing are separate processes, each with their own inputs, tools and techniques, and outputs. In practice, especially for small- to medium-sized projects, you can combine these processes into one process or step. You'll take a look at the first two activity-related processes now. Chapter 7 describes the remaining Activity-related processes including Activity Resource Estimating, Activity Duration Estimating, and Schedule Development processes.
The Activity Definition process is a further breakdown of the work package elements of the WBS. It documents the specific activities needed to fulfill the deliverables detailed on the WBS. This process might be performed by the project manager, or when the WBS is broken down to the subproject level, this process (and all the Activity-related processes that follow) might be assigned to a subproject manager.

**Activity Definition Process Inputs**

The following are inputs to the Activity Definition process and the key elements that you should consider as inputs to this process:

- Enterprise environmental factors (project management information systems and scheduling software tools)
- Organizational process assets (existing guidelines and policies)
- Project scope statement (deliverables, constraints, and assumptions)
- WBS (this is the primary input to this process)
- WBS dictionary
- Project management plan (schedule management plan)

**Tools and Techniques for Defining Activities**

The tools and techniques of the Activity Definition process are as follows:

- Decomposition
- Templates
- Rolling-wave planning
- Expert judgment
- Planning component

Decomposition is the process of breaking the work packages into smaller, more manageable units of work called schedule activities. These are not deliverables but the individual units of work that must be completed to fulfill the deliverables. Activity lists (which are one of the outputs of this process) from prior projects can be used as templates in this process. Rolling-wave planning involves planning near-term work in more detail than future-term work. Expert judgment, in the form of project team members with prior experience developing project scope statements and WBSs, can help you define activities.

The planning component is a new tool and technique you haven’t seen before. Two of the planning components discussed in the PMBOK Guide are the control account and the planning package. The idea with this tool and technique is that you might have WBS elements that really can’t be broken down much further. In that case, the work package level in those branches of the WBS can be used to develop high-level schedules and plan future work at higher levels of the WBS. You can use a control account within the WBS to assign a management control point anywhere above the work package level to use as a basis for planning when the work package level
hasn’t been planned. The planning package is any element on the WBS that’s below the control account but still above the work package level used for planning purposes.

**Exam Spotlight**

The purpose of the Activity Definition process is to decompose the work packages into schedule activities where the basis for estimating, scheduling, executing, and monitoring and controlling the work of the project is easily supported and accomplished.

**Activity Definition Outputs**

Activity Definition has four outputs:

- Activity list
- Activity attributes
- Milestone list
- Requested changes

You’ll be happy to know that you aren’t going to create an Activity Definition management plan at the end of this process. You’ve looked at requested changes before. You’ll examine the rest of the outputs here.

**Activity List**

One primary output of the Activity Definition process is an activity list. The activity list should contain all the schedule activities that will be performed for the project, with a scope of work description of each activity and an identifier (such as a code or number) so that team members understand what the work is and how it is to be completed. The schedule activities are individual elements of the project schedule, and the activity list is a subsidiary of the project management plan.

In practice, when you’re working on a small project or projects that aren’t that complex, you might accomplish Activity Definition during the construction of the WBS, and the activities themselves become the work package level. However, for the exam, remember that activities are elements of the project schedule, but they are not part of the WBS.

**Activity Attributes**

Activity attributes describe the characteristics of the activities and are an extension of the activity list. Activity attributes might describe information such as the activity identifier or code, descriptions, constraints and assumptions associated with the activity, activities that
come before this activity (predecessor activities) and after this activity (successor activities), resource requirements, the individual responsible for completing the work, and so on. The activity attributes are used in the schedule model tool and technique of the Schedule Development process (I'll talk about this in the next chapter).

**Milestone Lists**

*Milestones* are typically major accomplishments of the project and mark the completion of major deliverables or some other key event in the project. For example, approval and sign-off on project deliverables might be considered milestones. Other examples might be the completion of a prototype, system testing, contract approval, and so on. The milestone list records these accomplishments and documents whether the milestone is mandatory or optional. The milestone list is part of the project management plan and is also used to help develop the project schedule.

**Understanding the Activity Sequencing Process**

Now that you've identified the schedule activities, you need to sequence them in a logical order and find out whether dependencies exist among the activities. The interactivity of logical relationships must be sequenced correctly in order to facilitate the development of a realistic, achievable project schedule in a later process.

Consider a classic example. Let's say you're going to paint your house, but, unfortunately, it's fallen into a little disrepair. The old paint is peeling and chipping and will need to be scraped before a coat of primer can be sprayed on the house. After the primer dries, the painting can commence. In this example, the primer activity depends on the scraping. You can't—OK, you shouldn't—prime the house before scraping off the peeling paint. The painting activity depends on the primer activity in the same way. You really shouldn't start painting until the primer has dried.

During *Activity Sequencing*, you will use a host of inputs and tools and techniques to produce the primary output, project schedule network diagrams. You've already seen all the inputs. They are project scope statement, activity list, activity attributes, milestone list, and approved change requests. I discussed them in this and previous chapters. You'll look at several new tools and techniques now.

**Activity Sequencing Tools and Techniques**

Activity Sequencing has five tools and techniques, all of which are new to you:

- Precedence diagramming method (PDM)
- Arrow diagramming method (ADM)
Schedule network templates
Dependency determination
Applying leads and lags

I'll switch the order of these and cover dependency determination first. In practice, you'll define dependencies either before or while you're using the PDM or ADM methods to draw your network templates, so to make sure you're on the same page with the PMBOK Guide terminology regarding dependencies, I'll cover them first and then move on to the other tools and techniques.

Dependency Determination

Dependencies are relationships between the activities in which one activity is dependent on another to complete an action, or perhaps an activity is dependent on another to start an action before it can proceed. Dependency determination is a matter of determining where those dependencies exist. Thinking back to the house-painting example, you couldn't paint until the scraping and priming activities were completed. You'll want to know about three types of dependencies for the exam:

- Mandatory dependencies
- Discretionary dependencies
- External dependencies

As you've probably guessed, the PMBOK Guide defines dependencies differently depending on their characteristics:

Mandatory dependencies Mandatory dependencies, also known as hard logic or hard dependencies, are defined by the type of work being performed. The scraping, primer, and painting sequence is an example of mandatory dependencies. The nature of the work itself dictates the order in which the activities should be performed. Activities with physical limitations are a tell-tale sign that you have a mandatory dependency on your hands.

Discretionary dependencies Discretionary dependencies are defined by the project management team. Discretionary dependencies are also known as preferred logic, soft logic, or preferential logic. These are usually process or procedure-driven or “best-practice” techniques based on past experience. For example, both past experience and best practices on house-painting projects have shown that all trim work should be hand-painted while the bulk of the main painting work should be done with a sprayer.

External dependencies External dependencies are, well, external to the project. This might seem obvious, but the PMBOK Guide points out that even though the dependency is external to the project (and therefore a nonproject activity), it impacts project activities. For example, perhaps your project is researching and marketing a new drug. The FDA must approve the drug before your company can market it. This is not a project activity, but the project cannot move forward until approval occurs. That means FDA approval is an external dependency.
Once you’ve identified the dependencies and assembled all the other inputs for the Activity Sequencing process, you’ll take this information and produce a diagram—or schematic display—of the project activities. The project schedule network diagram shows the dependencies—or logical relationships—that exist among the activities. You can use one of the other tools and techniques of this process to produce this output. You’ll now examine each in detail.

**Precedence Diagramming Method (PDM)**

The *precedence diagramming method* (PDM) is what most project management software programs use to do activity sequencing. Precedence diagrams use boxes or rectangles to represent the activities (called *nodes*). The nodes are connected with arrows showing the dependencies between the activities. This method is also called *activity on node* (AON).

The minimum information that should be displayed on the node is the activity name, but you might put as much information about the activity on the node as you’d like. Sometimes the nodes are displayed with activity name, activity number, start and stop dates, due dates, slack time, and so on. (I’ll cover slack time in Chapter 7. For the exam, remember that the ROM uses only one time estimate to determine duration.)

The following graphic shows a PDM—or AON—of the house-painting example.

![Project Schedule Network Diagram](image)

The PDM is further defined by four types of *logical relationships*. The terms *dependencies* and *precedence relationships* also are used to describe these relationships. You might already be familiar with these if you’ve used Microsoft Project or similar project management software program. The four dependencies, or logical relationships, are as follows:

**Finish-to-start (FS)** The finish-to-start relationship is the most frequently used relationship. This relationship says that the predecessor—or from activity—must finish before the successor—or to activity—can start. In PDM diagrams, this is the most often used logical relationship.

**Start-to-finish (SF)** The start-to-finish relationship says that the predecessor activity must start before the successor activity can finish. This logical relationship is seldom used.

**Finish-to-finish (FF)** The finish-to-finish relationship says that the predecessor activity must finish before the successor activity finishes.

**Start-to-start (SS)** I think you’re getting the hang of this. The start-to-start relationship says that the predecessor activity must start before the successive activity can start.

Keep these logical relationships (or dependencies) in mind when constructing your project schedule network diagram. Remember that finish-to-start is the most commonly used dependency in the PDM method.
Chapter 6 • Resource Planning

Arrow Diagramming Method (ADM)
The arrow diagramming method (ADM) is visually the opposite of the PDM. The arrow diagramming method places activities on the arrows, which are connected to dependent activities with nodes. This method is also called activity on arrow (AOA). This technique isn’t used nearly as often as PDM, but some industries prefer the ADM to the PDM. For the record, note that ADM allows for more than one time estimate to determine duration and uses only the finish-to-start dependency. And there’s one more unique note about ADM to tuck away: sometimes dummy activities must be plugged into the diagram to accurately display the dependencies.

The following example shows the ADM method applied to the house-painting example:

Schedule Network Templates
Schedule network templates are like the templates I’ve talked about in other processes. Perhaps the project you’re working on is similar to a project that has been completed in the past. You can use a previous project schedule network diagram as a template for the current project. Or you might be working on a project with several deliverables that are fairly identical. You can use the first network diagram as a template and then modify it for each of the other deliverables.

Applying Leads and Lags
Leads and lags should be considered when determining dependencies. Lags delay successor activities (those that follow a predecessor activity) and require time added either to the start date or to the finish date of the activity you’re scheduling. Leads, conversely, speed up the successor activities and require time to be subtracted from the start date or the finish date of the activity you’re scheduling.

Let’s revisit the house-painting example to put all this in perspective. In order to paint, you first need to scrape the peeling paint and then prime. However, you can’t begin painting until the primer has dried, so you shouldn’t schedule priming for Monday and painting for Tuesday if you need the primer to dry on Tuesday. Therefore, the priming activity requires lag time, so you need to add time to the end of this activity to allow for the drying time needed before you can start painting.

Lead time works just the opposite. Suppose, for this example, you could start priming before the scraping is finished. Maybe certain areas on the house don’t require scraping, so you don’t really need to wait until the scraping activity finishes to begin the priming activity. Priming in this example has lead time subtracted from the beginning of the activity so that this activity begins prior to the previous activity finishing.
Exam Spotlight

I recommend you memorize the following graphic to help you remember the tools and techniques of the Activity Sequencing process and their characteristics for the exam. This might look a little strange, but I think it will work for you now that you understand what each of these diagramming methods is. This is information you need to know for the exam. If this graphic isn’t useful for you, come up with your own mnemonic or sample that will help you remember which of these is which. Don’t say I didn’t warn you.

Activity Sequencing Outputs

Here are the outputs of the Activity Sequencing process:

- Project schedule network diagrams
- Activity list updates
- Activity attributes updates
- Requested changes

You’ve just spent a good deal of time describing the different types of project schedule network diagrams you can construct using PDM or ADM techniques. You can generate project schedule network diagrams on a computer, or you can draw them out by hand. Like the WBS, these diagrams might contain all the project details or might contain only summary-level details, depending on the complexity of the project. Summary-level activities are a collection of related activities also known as hammocks. Think of hammocks as a group of related activities rolled up into a summary heading that describes the activities likely to be contained in that grouping.

Keep in mind that the construction of these project schedule network diagrams might bring activities to light that you missed when defining your activity list, or it might make you break an activity down into two activities in places where you thought one activity might work. If this is the case, you will produce both activity list updates based on this new information as well as activity attributes updates.
After the activities are sequenced, the next steps involve estimating the resources and estimating the durations of the activities so that they can be plugged into the project schedule. You’ll look at these topics in the next chapter.

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

"Thanks everyone for your timely responses. I'll look over your list of roles and responsibilities, skills needed for the activities, and your activity lists." The meeting adjourns, and you head back to your office to review the documents. You’d like to get the project schedule constructed soon and go over it with Dirk.

Ricardo Ramirez from the IT department has outlined his resource needs and activity list. He reminds you that data is sent from each store over a T1 connection, not over satellite as Jill told you originally. Ricardo’s activities are as follows. He has also taken the trouble to write them in sequential order:

1. Procure the T1 connection. This can be done concurrently with the other activities listed here. Ricardo will work on the procurement documents for this activity.

2. Run Ethernet cable throughout the building. This activity depends on the lease being signed and must finish before the build-out can start. Ricardo has one person on staff who can complete this specialized activity. His first available date is October 5.

3. Purchase the router, switch, server, and rack for the equipment room and four point-of-service terminals. Delivery time is two weeks. Ricardo will prepare the procurement documents for these items.

4. Install the router and test the connection. Testing depends on the T1 installation at demarcation. Ricardo’s staff will do this activity.

5. Install the switch. Ricardo’s staff will do this activity.

6. Install the server and test. The testing depends on the T1 connection installation. Ricardo’s staff will do this activity.

7. The web team will add the new store location and phone number to the lookup function on the Internet site. Ricardo will assign his applications programming manager to this activity. This activity depends on the lease being signed.

Jake and Jill give you similar activity lists with human resource needs. You use a project management software tool to create a first draft of the project schedule network diagram. As you’re staring at the screen, Dirk walks into your office.

"You look worried," Dirk says.
“Yes, I think we might have a problem. Jill mentioned she needs some lead time to stock shelves and that might interfere with the store build-out activity assigned to Jake’s team. I don’t have enough information yet to finish this. I need to get some time and cost estimates from everyone before I know for sure whether there’s a problem.”

“I’d rather know sooner than later if there’s a problem, so get right on those estimates.”

You toggle over to the calendaring system and see all three stakeholders are free Thursday morning. You set up a meeting time so you can explain to each of them what information you need next.

**Project Case Study Checklist**

- Procurement
  - Make-or-buy analysis
  - Expert judgment
  - Procurement documents prepared

- Human Resource Planning
  - Roles and responsibilities documented

- Activity Definition
  - Decomposition
  - Expert judgment
  - Activity list created

- Activity Sequencing
  - Dependencies determined
  - Leads and lags determined
  - Project schedule network diagram drafted

**Exam Spotlight**

You might find that the Activity Sequencing process gets a lot of coverage on the exam. Be certain you understand its inputs and tools and techniques well. Then again, remember the exam is randomly generated from a pool of questions, so don’t ever concentrate all your memorization efforts on only one or two processes.
Understanding How This Applies to Your Next Project

In my organization, the Plan Purchases and Acquisitions process comes right after finalizing project scope because it takes a great deal of time and effort to procure goods and services. That means we have to start procuring resources as early in the project as possible in order to meet the project deadlines.

Many organizations, including mine, have procurement departments. Don't make the mistake of thinking they'll take care of the procurement for you. At a minimum, you will likely be responsible for writing the statement of work, writing the RFP, writing the contract requirements (as they pertain to the work of the project), creating the vendor selection criteria, and determining the schedule dates for contract work.

In all the organizations I've worked in, someone has always been responsible for procurement—whether it was a single person or an entire department. Typically, the procurement department defines many elements of the procurement management plan. Sure, the project team determines how many vendors need to be involved and how they'll be managed along with the schedule dates, but many other elements are predetermined such as the type of contract to use, the authority of the project team regarding the contract, how multiple vendors will be managed, and the identification of prequalified sellers.

The procurement department also determines what type of procurement document you should use depending on the types of resources you're acquiring and the amount of money you're spending. Typically, they'll have a template for you to use with all the legalese sections prepopulated, and you'll work on the sections that describe the work or resources you need for the project, milestones or schedule dates, and evaluation criteria.

Assumptions and constraints are listed as one of the elements of the procurement management plan. On the job, I include assumptions and constraints in the scope statement. Since procurement is an important factor in most every project I undertake, I know the assumptions and constraints (including procurement assumptions and constraints) can have a serious impact on my overall schedule, budget, and scope.

Human Resource Planning is a process you might not need to complete depending on the size and complexity of the project. I typically work with the same team members over and over again, so I know their skills, capabilities, and availability. However, if you're hiring contract resources for the project or you typically work with new team members on each project, I recommend creating a staffing management plan.

You can accomplish Activity Definition and Activity Sequencing on small- to medium-sized projects of minimal complexity in one step. In fact, I often combine these two processes with the Schedule Development process (I'll get to that one in the next chapter) and create the rough draft of a project schedule that shows all the activities and their sequences. I'll use the project schedule (with its listed activities) to obtain activity estimates and determine resource allocation. On large or complex projects, it isn't quite this easy. Defining every activity on a large
project probably doesn’t make sense because you’ll end up with a schedule so long it can circle the earth twice. Large projects require you decompose the work to a point where you can assign it to an individual or team and you can easily measure progress. That doesn’t mean every single activity needs to show up on the project schedule. Use your judgment when you’re working with the processes leading up to and including Schedule Development. Here’s a rule of thumb: if you’re spending more time decomposing the work into activities than it takes to complete the activities, you’ve probably gone too far. On the other hand, if your team is confused about what needs to be accomplished in order to consider the milestone complete, you probably haven’t decomposed enough.

Summary

This chapter’s focus was on planning for project resources. Several aspects are involved in these planning activities, including procuring goods and services, planning human resource, and defining the activities in which human resources will be involved.

This chapter started with the Plan Purchases and Acquisitions process. This process identifies the goods or services you’re going to purchase from outside the organization and determines which project team needs can meet. This involves tools and techniques such as make-or-buy decisions, expert judgment, and contract types. The procurement management plan is one of the outputs of this process and describes how procurement services will be managed throughout the project. The contract SOW (another output of this process) describes the work that will be contracted.

Plan Contracting creates the documents you’ll use to procure the goods and services needed from outside the organization.

The Human Resource Planning process identifies and assigns roles and responsibilities and reporting relationships. Many times the roles and responsibilities assignments are depicted in a Responsibility Assignment Matrix (RAM) or a RACI chart. The staffing management plan describes how and when project team members will be acquired and is an output of the Human Resource Planning process.

The Activity Definition process involves decomposing the work packages into schedule activities that can be easily assigned and estimated. The output of this process is the activity list, activity attributes, milestone list, and requested changes.

The Activity Sequencing process takes the activities and puts them in a logical, sequential order based on dependencies. Dependencies exist when the current activity relies on some action from a predecessor activity or it impacts a successor activity. Three types of dependencies exist: mandatory, discretionary, and external. PDM (also known as AON) and ADM (also known as AOA) are two methods for displaying project schedule network diagrams. PDM has four logical relationships, or dependencies: finish-to-start, start-to-finish, finish-to-finish, and start-to-start.
Exam Essentials

Be able to name the purpose for the Plan Purchases and Acquisitions process. The purpose of the Plan Purchases and Acquisitions process is to identify which project needs should be obtained from outside the organization. Make-or-buy analysis is used as a tool and technique to help determine this.

Be able to identify the contract types and their usage. Contract types are a tool and technique of the Plan Purchases and Acquisitions process and include fixed price and cost reimbursable contracts. Use fixed price contracts for well-defined projects with a high value to the company, and use cost reimbursable contracts for projects with uncertainty and large investments early in the project life. The three types of cost reimbursable contracts are CPF (or CPPC), CPFF, and CPIF. Time and materials contracts are a cross between fixed-price and cost-reimbursable contracts.

Be able to name the outputs of the Plan Contracting process. The outputs of Plan Contracting are procurement documents, evaluation criteria, and contract statement of work updates.

Be able to name the purpose of the Human Resource Planning process. Human Resource Planning involves determining roles and responsibilities, reporting relationships for the project, and creating the staffing management plan, which describes how team members are acquired and the criteria for their release.

Be able to name the purpose of the Activity Definition process. The Activity Definition process decomposes the work packages into schedule activities and creates an activity list, activity attributes, milestone list, and requested changes as its outputs.

Be able to identify the tools and techniques of Activity Sequencing. The tools and techniques of Activity Sequencing are the precedence diagramming method (PDM), the arrow diagramming method (ADM), schedule network templates, dependency determination, and the application of leads and lags.

Be able to discuss the difference between PDM and ADM. PDM (also known as AON) displays activity on nodes with connecting arrows showing dependencies. PDM has four logical relationships and uses the finish-to-start relationship most often. ADM (also known as AOA) displays activities on arrows with connecting nodes showing dependencies and uses only the finish-to-start relationship.
Key Terms

You're almost finished with the Planning process. The processes you worked with in this chapter help you make your case for the resources you need to complete project work. To be successful as a project manager, you'll need to thoroughly understand each of these processes. To be successful on the exam, you need to know them by the names used in *A Guide to the PMBOK*:

- Activity Definition
- Activity Sequencing
- Human Resource Planning
- Plan Contracting
- Plan Purchases and Acquisitions

You've learned a lot of new key words in this chapter. PMI has worked hard to develop and define standard project management terms that apply across industries. Here is a list of some of the terms you came across in this chapter:

<table>
<thead>
<tr>
<th>term</th>
<th>definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>activity list</td>
<td>fixed-price contracts</td>
</tr>
<tr>
<td>Activity On Arrow (AOA)</td>
<td>fixed-price plus incentive contracts</td>
</tr>
<tr>
<td>Activity On Node (AON)</td>
<td>hammocks</td>
</tr>
<tr>
<td>Arrow Diagramming Method (ADM) contract</td>
<td>hard dependencies</td>
</tr>
<tr>
<td>contract statement of work (SOW)</td>
<td>hard logic</td>
</tr>
<tr>
<td>cost plus fee (CPF)</td>
<td>lags</td>
</tr>
<tr>
<td>cost plus fixed fee (CPFF)</td>
<td>leads</td>
</tr>
<tr>
<td>cost plus incentive fee (CPIF)</td>
<td>logical relationships</td>
</tr>
<tr>
<td>cost plus percentage of cost (CPCC)</td>
<td>lump-sum contracts</td>
</tr>
<tr>
<td>cost-reimbursable contracts dependencies</td>
<td>make-or-buy analysis</td>
</tr>
<tr>
<td>discretionary dependencies</td>
<td>mandatory dependencies</td>
</tr>
<tr>
<td>external dependencies</td>
<td>milestones</td>
</tr>
<tr>
<td></td>
<td>Organization breakdown structure (OBS)</td>
</tr>
<tr>
<td></td>
<td>precedence diagramming method (PDM)</td>
</tr>
<tr>
<td>Precedence relationships</td>
<td>Resource breakdown structure (RBS)</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Preferential logic</td>
<td>Responsibility assignment matrix (RAM)</td>
</tr>
<tr>
<td>Preferred logic</td>
<td>Soft logic</td>
</tr>
<tr>
<td>Procurement documents</td>
<td>Successor activities</td>
</tr>
<tr>
<td>Procurement management plan</td>
<td>Time and materials (T&amp;M) contracts</td>
</tr>
<tr>
<td>RACI chart</td>
<td></td>
</tr>
</tbody>
</table>
1. You are the project manager for an upcoming outdoor concert event. You're working on the procurement plan for the computer software program that will control the lighting and screen projections during the concert. You're comparing the cost of purchasing a software product to the cost of your company programmers writing a custom software program. You are engaged in which of the following?
   A. Procurement planning
   B. Using expert judgment
   C. Creating the procurement management plan
   D. Make-or-buy analysis

2. You are the project manager for an outdoor concert event scheduled for one year from today. You're working on the procurement plan for the computer software program that will control the lighting and screen projections during the concert. You've decided to contract with a professional services company that specializes in writing custom software programs. You want to minimize the risk to the organization, so you'll opt for which contract type?
   A. Fixed price plus incentive
   B. Cost plus fixed fee
   C. Fixed price
   D. Cost plus incentive

3. You are the project manager for the Heart of Texas casual clothing company. It's introducing a new line of clothing called Black Sheep Ranch Wear. You will outsource the production of this clothing line to a vendor. The vendor has requested a contract SOW. All of the following statements are true except for which one?
   A. The SOW contains a description of the new clothing line.
   B. As the purchaser, you are required to write the SOW.
   C. The SOW contains the objectives of the project.
   D. The vendor requires a SOW to determine whether it can produce the clothing line given the detailed specifications of this product.

4. You are the project manager for the Heart of Texas casual clothing company. It's introducing a new line of clothing called Black Sheep Ranch Wear. You will outsource the production of this clothing line to a vendor. Your legal department has recommended you use a contract that reimburses the seller's allowable costs and builds in a bonus based on performance criteria they've outlined in their memo. Which of the following contract types will you use?
   A. CPIF
   B. CPFF
   C. CPF
   D. CPPC
5. All of the following statements are true regarding the Human Resource Planning process except for which one?
   A. Human Resource Planning involves determining roles and responsibilities.
   B. One of the Human Resource Planning outputs includes project organization charts that show the project's reporting relationships.
   C. The staffing management plan created in this process describes how and when resources will be acquired and released.
   D. A RAM (or RACI chart) is an output of this process that allows you to see all the people assigned to an activity.

6. Sally is a project manager working on a project that will require a specially engineered machine. Only three manufacturers can make the machine to the specifications Sally needs. The price of this machine is particularly critical to this project. The budget is limited, and there's no chance of securing additional funds if the bids for the machine come in higher than budgeted. She's developing the evaluation criteria for the bidders' responses and knows all of the following are true except for which one?
   A. Sally will use standard contract forms provided by her procurement department to write the contract for this machine.
   B. Sally will review the project management plan, including the risk register, as inputs to this process.
   C. Sally will base the evaluation criteria on price alone since the budget is a constraint.
   D. Sally will update the contract statement of work with any new information.

7. Which of the following are constraints that you might find during the Human Resource Planning process?
   A. Organizational structures, collective bargaining agreements, and economic conditions
   B. Organizational structures, technical interfaces, and interpersonal interfaces
   C. Organizational interfaces, collective bargaining agreements, and economic conditions
   D. Organizational interfaces, technical interfaces, and interpersonal interfaces

8. You are the project manager for a scheduled version release of your company's software tracking product. You have identified resources according to their activities. You might want to display this information in which of the following?
   A. AON
   B. PDM
   C. AOA
   D. RAM
9. All of the following statements describe the activity list except which one?
   A. The activity list is an output of the Activity Definition process.
   B. The activity list includes all activities of the project.
   C. The activity list is an extension of and a component of the WBS.
   D. The activity list includes an identifier and description of the activity.

10. You are the project manager for Design Your Web Site, Inc. Your company is designing the website for a national grocery store chain. You have your activity list in hand and are ready to diagram the activity dependencies using the PDM technique. Which of the following statements is true?
   A. PDM is also the AON diagramming method.
   B. PDM is also the AOA diagramming method.
   C. PDM is also the ADM diagramming method.
   D. PDM is also the AND diagramming method.

11. You are the project manager for Design Your Web Site, Inc. Your company is designing the website for a national grocery store chain. You have your activity list in hand and several alternative time estimates for each activity and are ready to diagram the activity dependencies. You should use which of the following?
   A. PDM techniques
   B. PDM or ADM techniques
   C. AON techniques
   D. ADM techniques

12. You are the project manager for Changing Tides video games. You have produced a project schedule network diagram and have updated the activity list. Which process have you just finished?
   A. The Activity Sequencing process, which identifies all the specific activities of the project
   B. The Activity Sequencing process, which identifies all the activity dependencies
   C. The Activity Definition process, which diagrams project network time estimates
   D. The Activity Definition process, which identifies all the activity attributes

13. You are working on a project that requires resources with expertise in the areas of hospitality management and entertainment. You are preparing your project schedule network diagram and know that you will use only finish-to-start dependencies. Which of the following diagramming methods does this describe?
   A. PDM
   B. ADM
   C. AON
   D. Network template
14. You have been hired as a contract project manager for Grapevine Vineyards. Grapevine wants you to design an Internet wine club for its customers. Customers must register before being allowed to order wine over the Internet so that legal age can be established. You know that the module to verify registration must be written and tested using data from Grapevine’s existing database. This new module cannot be tested until the data from the existing system is loaded. This is an example of which of the following?
   A. Preferential logic
   B. Soft logic
   C. Discretionary dependency
   D. Hard logic

15. Which logical relationship does the PDM use most often?
   A. Start-to-finish
   B. Start-to-start
   C. Finish-to-finish
   D. Finish-to-start

16. You have been hired as a contract project manager for Grapevine Vineyards. Grapevine wants you to design an Internet wine club for its customers. Customers must register before being allowed to order wine over the Internet so that legal age can be established. You know that the module to verify registration must be written and tested using data from Grapevine’s existing database. This new module cannot be tested until the data from the existing system is loaded. You are going to hire a vendor to perform the programming and testing tasks for this module to help speed up the project schedule. Since they’ll have access to your customer list and potentially other trade secrets, you’ll asked them to sign a nondisclosure agreement. This is an example of which of the following?
   A. Standard form
   B. Organizational process asset
   C. Fixed cost contract
   D. Procurement documents

17. You are the project manager for BB Tops, a nationwide toy store chain. Your new project involves a creating a prototype display at several stores across the country. You are using a RACI chart to display individuals and activities. What does RACI stand for?
   A. Responsible, accountable, consult, inform
   B. Responsible, assignment, control, inform
   C. Resource, activity, control, identify
   D. Resource, accountable, consult, identify
18. This process can directly influence the project schedule.
   A. Human Resource Planning
   B. Plan Purchases and Acquisitions
   C. Activity Sequencing
   D. Plan Contracting

19. You are the project manager for BB Tops, a nationwide toy store chain. Your new project involves creating a prototype display at several stores across the country. You are hiring a contractor for portions of the project. The contract stipulates that you'll pay all allowable costs and an 8 percent fee over and above the allowable costs at the end of the contract. All of the following describe this type of contract except for which one?
   A. CPPC
   B. CPIF
   C. CPF
   D. Cost-reimbursable contract

20. This process uses tools like decomposition and rolling-wave planning to produce the activity list and other outputs. Because of the purpose of this process, which of the following is considered its primary input?
   A. WBS
   B. Project management plan
   C. PMIS (as part of enterprise environmental factors)
   D. Constraints and assumptions