

5

Project Scope Management

Objectives

After reading this chapter, you will be able to:

1. Understand the elements that make good project scope management important
2. Explain the scope planning process and describe the contents of a scope management plan
3. Describe the process for developing a project scope statement using the project charter and preliminary scope statement
4. Discuss the scope definition process and work involved in constructing a work breakdown structure using the analogy, top-down, bottom-up, and mind-mapping approaches
5. Explain the importance of scope verification and how it relates to scope definition and control
6. Understand the importance of scope control and approaches for preventing scope-related problems on information technology projects
7. Describe how software can assist in project scope management

OPENING CASE

Kim Nguyen was leading an initial project team meeting to create the work breakdown structure (WBS) for the IT Upgrade Project. This project was necessary for implementing several high-priority, Internet-based applications the company was developing. The IT Upgrade Project involved creating and implementing a plan to get all employees' information technology assets to meet new corporate standards within nine months. These standards specified the minimum equipment required for each desktop or laptop computer, namely the type of processor, amount of memory, hard disk size,

type of network connection, and software. Kim knew that to perform the upgrades, they would first have to create a detailed inventory of all of the current hardware, networks, and software in the entire company of 2000 employees.

Kim had worked with other stakeholders to develop a project charter and preliminary scope statement. The project charter included rough cost and schedule estimates for the project and signatures of key stakeholders; the preliminary scope statement provided a start in defining the hardware, software, and network requirements as well as other information related to the project scope. Kim called a meeting with her project team and other stakeholders to define the scope of the project further. She wanted to get everyone's ideas on what was involved in doing the project, who would do what, and how they could avoid potential scope creep. The company's new CEO, Walter Schmidt, was known for keeping a close eye on major projects like this one. They had started using a new project management information system that let everyone know the status of projects at a detailed and high level. Kim knew that a good WBS was the foundation for scope, time, and cost performance, but she had never led a team in creating one or allocating costs based on a WBS. Where should she begin?

WHAT IS PROJECT SCOPE MANAGEMENT?

Recall from Chapter 1 that several factors are associated with project success. Many of these factors, such as user involvement, clear business objectives, minimized scope, and firm basic requirements, are elements of project scope management. William V. Leban, program manager at Keller Graduate School of Management, cites the lack of proper project definition and scope as the main reason why projects fail.¹

One of the most important and most difficult aspects of project management, therefore, is defining the scope of a project. **Scope** refers to *all* the work involved in creating the products of the project and the processes used to create them.

¹ Challin, Natalie, "Four Reasons Why Projects Fail," *PM Network* (June 1998): p. 7.

Recall from Chapter 2 that the term **deliverable** describes a product produced as part of a project. Deliverables can be product-related, such as a piece of hardware or software, or process-related, such as a planning document or meeting minutes. Project stakeholders must agree on what the products of the project are and, to some extent, how they should produce them to define all of the deliverables.

Project scope management includes the processes involved in defining and controlling what is or is not included in a project. It ensures that the project team and stakeholders have the same understanding of what products the project will produce and what processes the project team will use to produce them. There are five main processes involved in project scope management:

1. **Scope planning** involves deciding how the scope will be defined, verified, and controlled and how the WBS will be created. The project team creates a scope management plan as the main output of the project scope planning process.
2. **Scope definition** involves reviewing the project charter and preliminary scope statement created during the initiation process and adding more information during the planning process as requirements are developed and change requests are approved. The main outputs of scope definition are the project scope statement, requested changes to the project, and updates to the project scope management plan.
3. **Creating the WBS** involves subdividing the major project deliverables into smaller, more manageable components. The main outputs include a work breakdown structure (WBS), a WBS dictionary, a scope baseline, requested changes to the project, and updates to the project scope statement and project scope management plan.
4. **Scope verification** involves formalizing acceptance of the project scope. Key project stakeholders, such as the customer and sponsor for the project, inspect and then formally accept the deliverables of the project during this process. If the deliverables are not acceptable, the customer or sponsor usually requests changes, which result in recommendations for taking corrective actions. The main outputs of this process, therefore, are accepted deliverables, requested changes, and recommended corrective actions.
5. **Scope control** involves controlling changes to project scope, which is a challenge on many information technology projects. Scope control includes identifying, evaluating, and implementing changes to project scope as the project progresses. Scope changes often influence the team's ability to meet project time and cost goals, so project managers must carefully weigh the costs and benefits of scope changes. The main outputs of this process are requested changes, recommended corrective actions, and updates to the project scope statement, WBS and WBS dictionary, scope baseline, project management plan, and organizational process assets.

SCOPE PLANNING AND THE SCOPE MANAGEMENT PLAN

The first step in project scope management is scope planning. The project's size, complexity, importance, and other factors will affect how much effort is spent on scope planning. For example, a team working on a project to upgrade the entire corporate accounting system for a multibillion dollar company with more than 50 geographic locations should spend a fair amount of time on scope planning. A project to upgrade the hardware and software for a small accounting firm with only five employees, on the other hand, would need a much smaller scope planning effort. In any case, it is important for a project team to decide how they will define the scope, develop the detailed scope statement, create the work breakdown structure, verify the scope, and control the scope for every project they undertake.

What Went Right?

Many financial service companies use customer relationship management (CRM) systems to improve their understanding of and responsiveness to customers. A senior management team at the Canadian money management company Dynamic Mutual Funds (DMF) launched an enterprise-wide, national program to build and manage its customer relationships. It soon became clear that the way the company developed its project scope planning and definition in the past would not work for this important program. They needed a more organized, highly participative approach that could be accomplished quickly.

The team proposed a new concept, project scope design, which consisted of seven non-sequential steps:

1. Analyze the project atmosphere, stakeholders, and centers of influence.
2. Align the project scope with the organization's strategic objectives and business challenges.
3. Determine where to add value to the business.
4. Study the process flow between the business units.
5. Develop an efficient communication strategy.
6. Develop the project approach.
7. Coordinate the new project with the other initiatives already under way.

DMF's program to manage customer relationships successfully completed its first phase in June 2001, and that October DMF won an eCustomer World Golden Award for world-class innovation in the Canadian marketplace.²

² Kayed, Omar. "Seven Steps to Dynamic Scope Design." *PM Network* (December 2003).

The main output of scope planning is a scope management plan. The **scope management plan** is a document that includes descriptions of how the team will prepare the project scope statement, create the WBS, verify completion of the project deliverables, and control requests for changes to the project scope. Kim, the project manager in the opening case, should work with her project team to write the scope management plan. After they have a good draft, she should review it with the project sponsor to make sure their approach meets expectations.

Key inputs of the scope management plan include the project charter, preliminary scope statement, and project management plan, as described in Chapter 4. Table 5-1 shows the project charter for the project described in the opening case. Notice how information from the project charter provides a basis for making scope management decisions. It describes the high-level scope goals for the project, a general approach to accomplishing the project's goals, and the main roles and responsibilities of important project stakeholders.

Table 5-1: Sample Project Charter

Project Title: Information Technology (IT) Upgrade Project

Project Start Date: March 4, 2007 **Projected Finish Date:** December 4, 2007

Project Manager: Kim Nguyen, 691-2784, *knguyen@course.com*

Project Objectives: Upgrade hardware and software for all employees (approximately 2,000) within nine months based on new corporate standards. See attached sheet describing the new standards. Upgrades may affect servers, as well as associated network hardware and software. Budgeted \$1,000,000 for hardware and software costs and \$500,000 for labor costs.

Approach:

- Update the information technology inventory database to determine upgrade needs
- Develop detailed cost estimate for project and report to CIO
- Issue a request for quote to obtain hardware and software
- Use internal staff as much as possible for planning, analysis, and installation

ROLES AND RESPONSIBILITIES:

<i>NAME</i>	<i>ROLE</i>	<i>RESPONSIBILITY</i>
Walter Schmidt	CEO	Project sponsor, monitor project
Mike Zwack	CIO	Monitor project, provide staff
Kim Nguyen	Project Manager	Plan and execute project
Jeff Johnson	Director of Information, Technology Operations	Mentor Kim
Nancy Reynolds	VP, Human Resources	Provide staff, issue memo to all employees about project
Steve McCann	Director of Purchasing	Assist in purchasing hardware and software

Table 5-1: Sample Project Charter (continued)

Sign-off: (Signatures of all the above stakeholders)

<i>Walter Schmitt</i>	<i>Steve McCann</i>
<i>Mike Zwick</i>	<i>Nancy Reynolds</i>
<i>Kim Nguyen</i>	<i>Jeff Johnson</i>

Comments: (Handwritten or typed comments from above stakeholders, if applicable)

"This project must be done within ten months at the absolute latest." Mike Zwick, (CJ)

"We are assuming that adequate staff will be available and committed to supporting this project. Some work must be done after hours to avoid work disruptions, and overtime will be provided."
Jeff Johnson and Kim Nguyen, Information Technology department

This short document includes important information that will help Kim guide her project team in developing the scope management plan. Additional input that assist in scope planning include information related to organizational process assets, such as policies and procedures related to scope planning and management, and historical information about previous projects. Environmental factors, such as the organization's infrastructure or marketplace conditions, also affect how scope should be managed on a project.

The main tools and techniques available for scope planning include templates, forms, and standards, as well as expert judgment. For example, if a project involves developing a database, project team members can decide to use common systems analysis and design standards, such as creating entity relationship diagrams, use cases, data flow diagrams, and so on to help document the scope. Many software tools include online templates and forms for creating these and similar items. Expert judgment should also be used to help decide the best way to manage scope for particular projects. For example, organizations often hire experts from outside companies to evaluate and recommend off-the-shelf software and then assist in managing the purchase and installation of the new software.

SCOPE DEFINITION AND THE PROJECT SCOPE STATEMENT

The next step in project scope management is to define further the work required for the project. Good scope definition is very important to project success because it helps improve the accuracy of time, cost, and resource estimates, it defines a baseline for performance measurement and project control, and it aides in communicating clear work responsibilities. The main tools and techniques used in scope definition include analyzing products, identifying alternative approaches to doing the work, understanding and analyzing stakeholder needs, and using expert judgment. The main output of scope definition is the project scope statement.

As described in Chapter 4, the project team develops a preliminary scope statement in initiating a project as part of the project integration management knowledge area. This document, as well as the project charter, organizational process assets, and approved change requests provide a basis for creating the **project scope statement**. Table 3-7 in Chapter 3 includes a sample project scope statement. The preliminary project scope statement should provide basic scope information, and the project scope statement should continue to clarify and provide information that is more specific.

Although contents vary, project scope statements should include, at a minimum, a description of the project, including its overall objectives and justification, detailed descriptions of all project deliverables, and the characteristics and requirements of products and services produced as part of the project. It is also helpful to document project success criteria in the project scope statement, as well as provide other scope-related information, such as the project boundaries, product acceptance criteria, project constraints and assumptions, project organization, defined risks, schedule milestones, order of magnitude cost estimate, configuration management requirements, and approval requirements. It should also reference supporting documents, such as product specifications that will affect what products are produced or purchased, or corporate policies, which might affect how products or services are produced. Many information technology projects also require detailed functional and design specifications for developing software, which also should be referenced in the detailed scope statement.

As time progresses, the scope of a project should become more clear and specific. For example, the project charter for the IT Upgrade Project shown in Table 5-1 includes a short statement about the servers and other computers and software that the IT Upgrade Project may affect. Table 5-2 provides an example of how the scope becomes progressively more detailed in the preliminary scope statement, and then the project scope statement.

Table 5-2: Further Defining Project Scope

Project Charter:

Upgrades may affect servers...

Preliminary Scope Statement:

Servers: If additional servers are required to support this project, they must be compatible with existing servers. If it is more economical to enhance existing servers, a detailed description of enhancements must be submitted to the CIO for approval. See current server specifications provided in Atch 6. The CEO must approve a detailed plan describing the servers and their location at least two weeks before installation.

Project Scope Statement, Version 1:

Servers: This project will require purchasing ten new servers to support Web, network, database, application, and printing functions. Two of each type of server will be purchased and dedicated to this project. Detailed descriptions of the servers are provided in a product brochure in Appendix 8 along with a plan describing where they will be located.

Notice in Table 5-2 that the preliminary and project scope statements often refer to related documents, such as product specifications, product brochures, or other plans. As more information becomes available and decisions are made related to project scope, such as specific products that will be purchased or changes that have been approved, the project team should update the project scope statement. They might name different iterations of the scope statement Version 1, Version 2, and so on. These updates may also require changes to be made to the project scope management plan. For example, if the company must purchase servers for the project from a supplier they have never worked with before, the scope management plan should include information on working with that new supplier.

An up-to-date project scope statement is an important document for developing and confirming a common understanding of the project scope. It describes in detail the work to be accomplished on the project and is an important tool for ensuring customer satisfaction and preventing scope creep, as described later in this chapter.

Recall from Chapter 1 the importance of addressing the triple constraint of project management—meeting scope, time, and cost goals for a project. Time and cost goals are normally straightforward. For example, the time goal for the IT Upgrade Project is nine months, and the cost goal is \$1.5 million. It is much more difficult to describe, agree upon, and meet the scope goal of many projects.



Media Snapshot

Many people enjoy watching television shows like *Changing Rooms* or *Trading Spaces*, where participants have two days and \$1,000 to update a room in their neighbor's house. Since the time and cost are set, it's the scope that has the most flexibility. Examples of some of the work completed include new flooring, light fixtures, paint, new shelves, artwork, etc. to brighten up a dull room.

Designers on these shows often have to change initial scope goals due to budget or time constraints. For example, designers often go back to local stores to exchange items, such as lights, artwork, or fabric, for less expensive items to meet budget constraints. Or they might describe a new piece of furniture they'd like the carpenter to build, but the carpenter changes the design or materials to meet time constraints. Occasionally designers can buy more expensive items or have more elaborate furniture built because they underestimated costs and schedules.

Another important issue related to project scope management is meeting customer expectations. Who wouldn't be happy with a professionally designed room at no cost to them? Although most homeowners are very happy with work done on the show, some are obviously disappointed. Unlike most projects where the project team works closely with the customer, homeowners have little say in what gets done and cannot inspect the work

along the way. They walk into their newly decorated room with their eyes closed. Modernizing a room can mean something totally different to a homeowner and the interior designer. For example, one woman was obviously shocked when she saw her bright orange kitchen with black appliances. Another couple couldn't believe there was moss on their bedroom walls. What happens when the homeowners don't like the work that's been done? The FAQ section of tlc.com says, "Everyone on our show is told upfront that there's a chance they won't like the final design of the room. Each applicant signs a release acknowledging that the show is not responsible for redecorating a room that isn't to the owner's taste." Too bad you can't get sponsors for most projects to sign a similar release form. It would make project scope management much easier!

CREATING THE WORK BREAKDOWN STRUCTURE

After completing scope planning and definition processes, the next step in project scope management is to create a work breakdown structure. A **work breakdown structure (WBS)** is a deliverable-oriented grouping of the work involved in a project that defines the total scope of the project. Because most projects involve many people and many different deliverables, it is important to organize and divide the work into logical parts based on how the work will be performed. The WBS is a foundation document in project management because it provides the basis for planning and managing project schedules, costs, resources, and changes. Since the WBS defines the total scope of the project, some project management experts believe that work should not be done on a project if it is not included in the WBS. Therefore, it is crucial to develop a good WBS.

The project scope statement and project management plan are the primary input for creating a WBS. The main tools and techniques include using WBS templates, as described below, and using **decomposition** or subdividing project deliverables into smaller pieces. The output of the process to create the WBS are the WBS itself, the WBS dictionary, a scope baseline, and updates to the project scope statement and scope management plan.

What does a WBS look like? A WBS is often depicted as a task-oriented family tree of activities, similar to an organizational chart. A project team often organizes the WBS around project products, project phases, or using the project management process groups. Many people like to create a WBS in chart form first to help them visualize the whole project and all of its main parts. For example, Figure 5-1 shows a WBS for an intranet project. Notice that product areas provide the basis for its organization. In this case, there are main boxes or groupings on the WBS for developing the Web site design, the home page for the intranet, the marketing department's pages, and the sales department's pages.

Intranet			
Web Site Design	Home Page Design	Marketing Pages	Sales Pages
Site Map	Text	Text	Text
Graphic Design	Images	Images	Images
Programs	Hyperlinks	Hyperlinks	Hyperlinks

Figure 5-1. Sample Intranet WBS Organized by Product

In contrast, a WBS for the same intranet project can be organized around project phases, as shown in Figure 5-2.³ Notice that project phases of concept, Web site design, Web site development, roll out, and support provide the basis for its organization.

Level 0 - Entire Project		Intranet Project				
Level 1	Concept	Web Site Design	Web Site Development	Roll Out	Support	
Level 2	Evaluate Current Systems	Define Requirements	Define Specific Functionality	Define Risks & Risk Management Approach	Develop Project Plan	Brief Web Development Team
Level 3	Define User Requirements	Define Content Requirements	Define System Requirements	Define Server Requirements	Define Server Owner Requirements	

Figure 5-2. Sample Intranet WBS Organized by Phase

A WBS can also be shown in tabular form as an indented list of tasks that shows the same groupings of the work. For example, Table 5-3 shows the WBS from Figure 5-2 in tabular form. The items on the WBS are the same, but the numbering scheme and indentation of tasks show the structure. Many documents, such as contracts, use this tabular form. Project management software also uses this form. The WBS is actually the contents of the Task Name column in Project 2003. See Appendix A for detailed information on creating a WBS using Project 2003.

³ This particular structure is based on a sample Project 98 file.

Table 5-3: Intranet WBS in Tabular Form

- 1.0 Concept
 - 1.1 Evaluate current systems
 - 1.2 Define requirements
 - 1.2.1 Define user requirements
 - 1.2.2 Define content requirements
 - 1.2.3 Define system requirements
 - 1.2.4 Define server owner requirements
 - 1.3 Define specific functionality
 - 1.4 Define risks and risk management approach
 - 1.5 Develop project plan
 - 1.6 Brief Web development team
- 2.0 Web Site Design
- 3.0 Web Site Development
- 4.0 Roll Out
- 5.0 Support

Figure 5-3 shows the phase-oriented intranet WBS, using the same numbering scheme from Table 5-3, in the form of a Gantt chart created in Project 2003. You can see from this figure that the WBS is the basis for project schedules. Notice that the WBS is in the left part of the figure under the Task Name column. The resulting schedule is in the right part of the figure. You will learn more about Gantt charts in Chapter 6, Project Time Management.

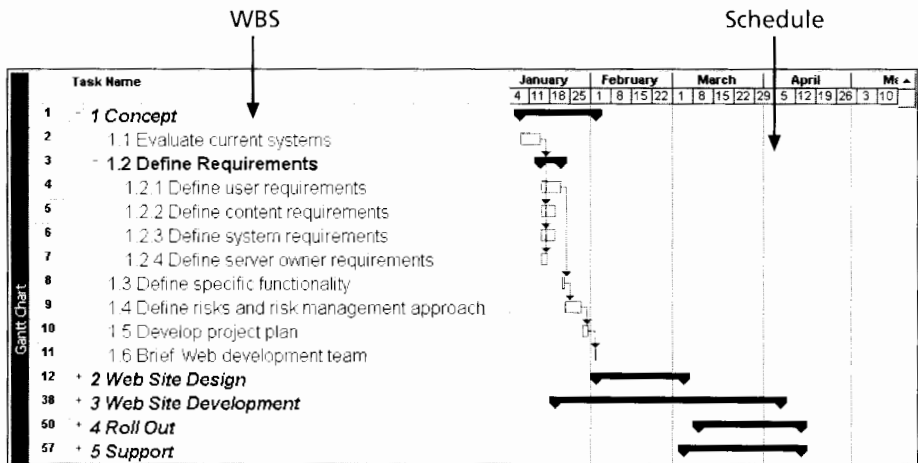


Figure 5-3. Intranet Gantt Chart in Microsoft Project

The work breakdown structures in Figures 5-1, 5-2, and 5-3 and in Table 5-3 present information in hierarchical form. The 0 level of a WBS represents the entire project and is the top level. (Note the labels on the left side of Figure 5-2. Also, note that some sources call the entire project level 1 instead of level 0.) The next level down is level 1, which represents the major products or phases of the project. Level 2 includes the major subsets of level 1. For example, in Figure 5-2 the level 2 items under the level 1 item called “Concept” include: evaluate current systems, define requirements, define specific functionality, define risks and risk management approach, develop project plan, and brief Web development team. Under the level 2 item called “Define Requirements” are four level 3 items on the WBS: define user requirements, define content requirements, define server requirements, and define server owner requirements.

In Figure 5-2, the lowest level is level 3. A **work package** is a task at the lowest level of the WBS. It also represents the lowest level of work that the project manager is using to monitor and control the project. Generally, each work package in a WBS should represent roughly 80 hours of effort. You can also think of work packages in terms of accountability and reporting. If a project has a relatively short time frame and requires weekly progress reports, a work package might represent 40 hours of work or less. On the other hand, if a project has a very long time frame and requires quarterly progress reports, a work package might represent more than 100 hours of work. A work package might also be a specific piece of hardware or equipment, such as a specific server.

Another way to think of work packages relates to entering data into project management software. *You can only enter duration estimates for work packages.* The rest of the WBS items are just groupings or summary tasks for the work packages. The software automatically calculates duration estimates for various WBS levels based on data entered for each work package and the WBS hierarchy.

The sample WBSs shown here seem somewhat easy to construct and understand. *Nevertheless, it is very difficult to create a good WBS.* To create a good WBS, you must understand both the project and its scope and incorporate the needs and knowledge of the stakeholders. The project manager and the project team must decide as a group how to organize the work and how many levels to include in the WBS. Many project managers have found that it is better to focus on getting the top levels done well before getting too bogged down in more detail.

Many people confuse tasks on a WBS with specifications. Tasks on a WBS represent work that needs to be done to complete the project. For example, if you are creating a WBS to redesign a kitchen, you might have level 1 categories called design, purchasing, flooring, walls, cabinets, and appliances. Under flooring, you might have tasks to remove the old flooring, install the new flooring, and install the trim. You would not have tasks like “12’ by 14’ of light oak” or “flooring must be durable.”

Another concern when creating a WBS is how to organize it so that it provides the basis for the project schedule. You should focus on what work needs to be done and how it will be done, not when it will be done. In other words, the tasks do not have to be developed as a sequential list of steps. If you do want some time-based flow for the work, you can create a WBS using the project management process groups of initiating, planning, executing, controlling, and closing as level 1 in the WBS. By doing this, not only does the project team follow good project management practice, but the WBS tasks can also be mapped more easily against time. For example, Figure 5-4 shows a WBS and Gantt chart for the intranet project, organized by the five project management process groups. Tasks under initiating include selecting a project manager, forming the project team, and developing the project charter. Tasks under planning include developing a scope statement, creating a WBS, and developing and refining other plans, which would be broken down in more detail for a real project. The tasks of concept, Web site design, Web site development, and roll out, which were WBS level 1 items in Figure 5-2, now become WBS level 2 items under executing. The executing tasks vary the most from project to project, but many of the tasks under the other project management process groups would be similar for all projects. If you do not use the project management process groups in the WBS, you can have a level I category called project management to make sure that tasks related to managing the project are accounted for. Remember that all work should be included in the WBS, including project management.

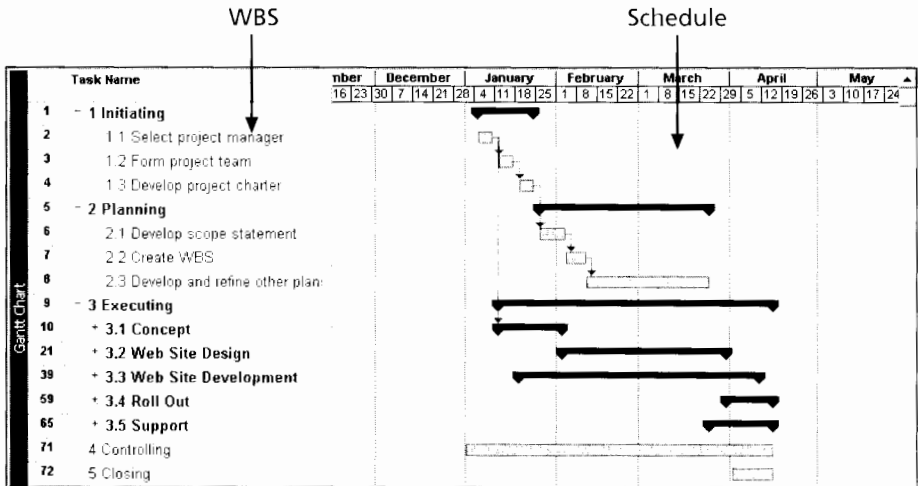


Figure 5-4. Intranet Gantt Chart Organized by Project Management Process Groups

JWD Consulting used the project management process groups for the level 1 items in its WBS for the Project Management Intranet Site Project in Chapter 3. The project team focused on the product deliverables they had to produce for the project in breaking down the executing task. Table 5-4 shows the categories they used for that part of the WBS. Some project teams like to list every deliverable they need to produce and then use those as the basis for creating all or part of their WBS. Recall that the scope statement should list and describe all of the deliverables required for the project. It is very important to ensure consistency between the project charter, scope statement, WBS, and Gantt chart to define the scope of the project accurately.

Table 5-4: Executing Tasks for JWD Consulting's WBS

3.0 Executing

- 3.1 Survey
- 3.2 User inputs
- 3.3 Intranet site content
 - 3.3.1 Templates and tools
 - 3.3.2 Articles
 - 3.3.3 Links
 - 3.3.4 Ask the expert
 - 3.3.5 User requests
- 3.4 Intranet site design
- 3.5 Intranet site construction
- 3.6 Site testing
- 3.7 Site promotion
- 3.8 Site roll-out
- 3.9 Project benefits measurement

It is also very important to involve the entire project team and the customer in creating and reviewing the WBS. *People who will do the work should help to plan the work* by creating the WBS. Having group meetings to develop a WBS helps everyone understand *what* work must be done for the entire project and *how* it should be done, given the people involved. It also helps to identify where coordination between different work packages will be required.

Approaches to Developing Work Breakdown Structures

There are several approaches you can use to develop a work breakdown structure. These approaches include:

- Using guidelines
- The analogy approach
- The top-down approach
- The bottom-up approach
- The mind-mapping approach

Using Guidelines

If guidelines for developing a WBS exist, it is very important to follow them. Some organizations—for example, the U.S. Department of Defense (DOD)—prescribe the form and content for WBSs for particular projects. Many DOD projects require contractors to prepare their proposals based on the DOD-provided WBS. These proposals must include cost estimates for each task in the WBS at a detailed and summary level. The cost for the entire project must be calculated by summing the costs of all of the lower-level WBS tasks. When DOD personnel evaluate cost proposals, they must compare the contractors' costs with the DOD's estimates. A large variation in costs for a certain WBS task often indicates confusion as to what work must be done.

Consider a large automation project for the U.S. Air Force. In the mid-1980s, the Air Force developed a request for proposals for the Local On-Line Network System (LONS) to automate 15 Air Force Systems Command bases. This \$250 million project involved providing the hardware and developing software for sharing documents such as contracts, specifications, requests for proposals, and so on. The Air Force proposal guidelines included a WBS that contractors were required to follow in preparing their cost proposals. Level 1 WBS items included hardware, software development, training, project management, and the like. The hardware item was composed of several level 2 items, such as servers, workstations, printers, network hardware, and so on. Air Force personnel reviewed the contractors' cost proposals against their internal cost estimate, which was also based on this WBS. Having a prescribed WBS helped contractors to prepare their cost proposals and the Air Force to evaluate them.

Many organizations provide guidelines and templates for developing WBSs, as well as examples of WBSs from past projects. At the request of many of its members, the Project Management Institute recently developed a WBS

Practice Standard to provide guidance for developing and applying the WBS to project management (see the third Suggested Reading at the end of this chapter). This document includes sample WBSs for a wide variety of projects in various industries, including projects for Web design, telecom, service industry outsourcing, and software implementation.

Project managers and their teams should review appropriate information to develop their unique project WBSs more efficiently. For example, Kim Nguyen and key team members from the opening case should review their company's WBS guidelines, templates, and other related information before and during the team meetings to create their WBS.

The Analogy Approach

Another approach for constructing a WBS is the analogy approach. In the **analogy approach**, you use a similar project's WBS as a starting point. For example, Kim Nguyen from the opening case might learn that one of her organization's suppliers did a similar information technology upgrade project last year. She could ask them to share their WBS for that project to provide a starting point for her own project.

McDonnell Aircraft Company, now part of Boeing, provides an example of using an analogy approach when creating WBSs. McDonnell Aircraft Company designed and manufactured several different fighter aircraft. When creating a WBS for a new aircraft design, it started by using 74 predefined subsystems for building a fighter aircraft based on past experience. There was a level 1 WBS item for the airframe that was composed of level 2 items, such as a forward fuselage, center fuselage, aft fuselage, and wings. This generic product-oriented WBS provided a starting point for defining the scope of new aircraft projects and developing cost estimates for new aircraft designs.

Some organizations keep a repository of WBSs and other project documentation on file to assist people working on projects. Project 2003 and many other software tools include sample files to assist users in creating a WBS and Gantt chart. Viewing examples of other similar projects' WBSs allows you to understand different ways to create a WBS. See the companion Web site for this text and the author's Web site for sample WBSs.

The Top-down and Bottom-up Approaches

Two other approaches for creating WBSs are the top-down and bottom-up approaches. Most project managers consider the top-down approach of WBS construction to be conventional. To use the **top-down approach**, start with the largest items of the project and break them into their subordinate items. This process involves refining the work into greater and greater levels of detail. For example, Figure 5-2 shows how work was broken down to level 3 for part of the intranet project. After finishing the process, all resources should be assigned

at the work package level. The top-down approach is best suited to project managers who have vast technical insight and a big-picture perspective.

In the **bottom-up approach**, team members first identify as many specific tasks related to the project as possible. They then aggregate the specific tasks and organize them into summary activities, or higher levels in the WBS. For example, a group of people might be responsible for creating a WBS to create an e-commerce application. Instead of looking for guidelines on how to create a WBS or viewing similar projects' WBSs, they could begin by listing detailed tasks they think they would need to do in order to create the application. After listing detailed tasks, they would group the tasks into categories. Then, they would group these categories into higher-level categories. Some people have found that writing all possible tasks down on notes and then placing them on a wall helps them see all the work required for the project and develop logical groupings for performing the work. For example, a business analyst on the project team might know that they had to define user requirements and content requirements for the e-commerce application. These tasks might be part of the requirements documents they would have to create as one of the project deliverables. A hardware specialist might know they had to define system requirements and server requirements, which would also be part of a requirements document. As a group, they might decide to put all four of these tasks under a higher-level item called "define requirements" that would result in the delivery of a requirements document. Later, they might realize that defining requirements should fall under a broader category of concept design for the e-commerce application, along with other groups of tasks related to the concept design. The bottom-up approach can be very time-consuming, but it can also be a very effective way to create a WBS. Project managers often use the bottom-up approach for projects that represent entirely new systems or approaches to doing a job, or to help create buy-in and synergy with a project team.

Mind Mapping

Some project managers like to use mind mapping to help develop WBSs.

Mind mapping is a technique that uses branches radiating out from a core idea to structure thoughts and ideas. Instead of writing tasks down in a list or immediately trying to create a structure for tasks, mind mapping allows people to write and even draw pictures of ideas in a nonlinear format. This more visual, less structured approach to defining and then grouping tasks can unlock creativity among individuals and increase participation and morale among teams.⁴

⁴ Mindjet Visual Thinking. "About Mind Maps." (www.mindjet.com) (2002).

Figure 5-5 shows a diagram that uses mind mapping to create a WBS for the IT Upgrade Project. The circle in the center represents the entire project. Each of the four main branches radiating out from the center represents the main tasks or level 1 items for the WBS. Different people at the meeting creating this mind map might have different roles in the project, which could help in deciding the tasks and WBS structure. For example, Kim would want to focus on all of the project management tasks, and she might also know that they will be tracked in a separate budget category. People who are familiar with acquiring or installing hardware and software might focus on that work, and so on. Branching off from the main task called “Update inventory” are two subtasks, “Perform physical inventory” and “Update database.” Branching off from the “Perform physical inventory” subtask are three further subdivisions, labeled Building A, Building B, and Building C, and so on. The team would continue to add branches and items until they have exhausted ideas on what work needs to be performed.

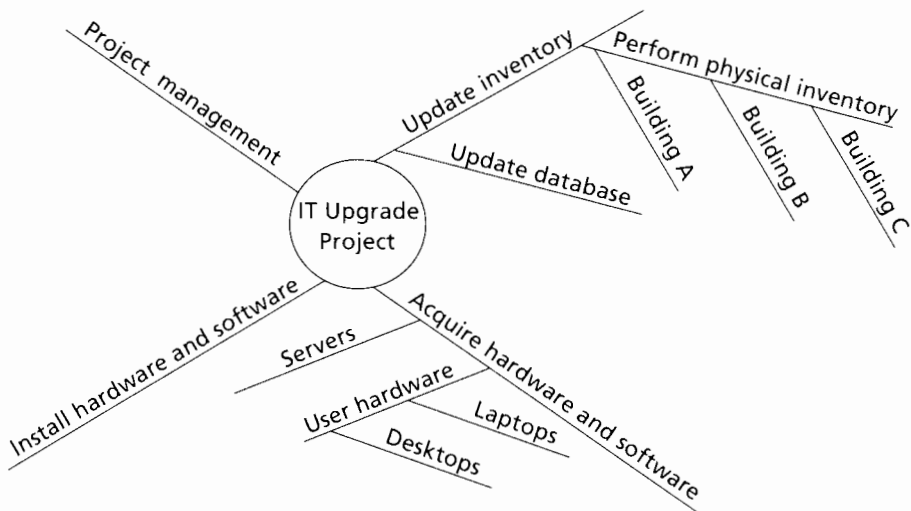


Figure 5-5. Sample Mind-Mapping Technique for Creating a WBS

After discovering WBS items and structure using the mind-mapping technique, you could then translate the information into chart or tabular form, as described earlier. Figure 5-6 shows a chart of the WBS items from the mind map in Figure 5-5.

Information Technology Upgrade Project			
Project Management	Update Inventory	Acquire Hardware and Software	Install Hardware and Software
Perform Physical Inventory	Update Database	Servers	User hardware
Building A	Building B	Building C	
		Laptops	Desktops

Figure 5-6. Resulting WBS in Chart Form

Mind mapping can be used for developing WBSs using the top-down or bottom-up approach. For example, you could conduct mind mapping for an entire project by listing the whole project in the center of a document, adding the main categories on branches radiating out from the center, and then adding branches for appropriate subcategories. You could also develop a separate mind-mapping document for each deliverable of a project by putting the deliverable in the center of a document and then surrounding it with other mind-mapping documents to create one for the entire project. You can also add items anywhere on a mind-mapping document without following a strict top-down or bottom-up approach. After the mind-mapping documents are complete, you can convert them into a chart or tabular WBS form.

The WBS Dictionary and Scope Baseline

As you can see from these sample WBSs, many of the items listed on them are rather vague. What exactly does “Update database” mean, for example? The person responsible for this task might think that it does not need to be broken down any further, which could be fine. However, the task should be described in more detail so everyone has the same understanding of what it involves. What if someone else has to perform the task? What would you tell him/her

to do? What will it cost to complete the task? Information that is more detailed is needed to answer these and other questions.

A **WBS dictionary** is a document that describes detailed information about each WBS item. The format of the WBS dictionary can vary based on project needs. It might be appropriate to have just a short paragraph describing each work package. For a more complex project, an entire page or more might be needed for the work package descriptions. Some projects might require that each WBS item describe the responsible organization, resource requirements, estimated costs, and other information. The project manager should work with his/her team and sponsor to determine the level of detail needed in the WBS dictionary.

The approved project scope statement and its associated WBS and WBS dictionary form the **scope baseline**. Performance in meeting project scope goals is based on this scope baseline.

Advice for Creating a WBS and WBS Dictionary

As stated previously, creating a good WBS is no easy task and usually requires several iterations. Often, it is best to use a combination of approaches to create a project WBS. There are some basic principles, however, that apply to creating any good WBS and its WBS dictionary.

- A unit of work should appear at only one place in the WBS.
- The work content of a WBS item is the sum of the WBS items below it.
- A WBS item is the responsibility of only one individual, even though many people may be working on it.
- The WBS must be consistent with the way in which work is actually going to be performed; it should serve the project team first, and other purposes only if practical.
- Project team members should be involved in developing the WBS to ensure consistency and buy-in.
- Each WBS item must be documented in a WBS dictionary to ensure accurate understanding of the scope of work included and not included in that item.
- The WBS must be a flexible tool to accommodate inevitable changes while properly maintaining control of the work content in the project according to the scope statement.⁵

⁵ Cleland, David I. *Project Management: Strategic Design and Implementation*, 2nd ed. (New York: McGraw-Hill, 1994.)

SCOPE VERIFICATION

It is difficult to create a good project scope statement and WBS for a project. It is even more difficult, especially on information technology projects, to verify the project scope and minimize scope changes. Some project teams know from the start that the scope is very unclear and that they must work closely with the project customer to design and produce various deliverables. In this case, the project team must develop a process for scope verification that meets unique project needs. Careful procedures must be developed to ensure the customer is getting what they want and the project team has enough time and money to produce the desired products and services.

Even when the project scope is fairly well defined, many information technology projects suffer from **scope creep**—the tendency for project scope to keep getting bigger and bigger. There are many horror stories about information technology projects failing due to scope problems such as scope creep. For this reason, it is very important to verify the project scope and develop a process for controlling scope changes.

⊗ *What Went Wrong?*

A project scope that is too broad and grandiose can cause severe problems. Scope creep and an overemphasis on technology for technology's sake resulted in the bankruptcy of a large pharmaceutical firm, Texas-based FoxMeyer Drug. In 1994, the CIO was pushing for a \$65 million system to manage the company's critical operations. He did not believe in keeping things simple, however. The company spent nearly \$10 million on state-of-the-art hardware and software and contracted the management of the project to a prestigious (and expensive) consulting firm. The project included building an \$18 million robotic warehouse, which looked like something out of a science fiction movie, according to insiders. The scope of the project kept getting bigger and more impractical. The elaborate warehouse was not ready on time, and the new system generated erroneous orders that cost FoxMeyer Drug more than \$15 million in unrecovered excess shipments. In July of 1996, the company took a \$34 million charge for its fourth fiscal quarter, and by August of that year, FoxMeyer Drug filed for bankruptcy.⁶

Another major source of information technology project scope problems is a lack of user involvement. For example, in the late 1980s at Northrop Grumman, which specializes in defense electronics, information technology, and advanced aircraft, shipbuilding, and space technology, an information technology project team became convinced that it could, and should, automate the review and approval process of government proposals. The team implemented a powerful workflow system to manage the whole process. Unfortunately, the end users for the system were aerospace engineers who preferred to work in a more

⁶ James, Geoffrey. "Information Technology Liascoes . . . and how to avoid them." *Datamation* (November 1997).

casual, ad hoc fashion. They dubbed the system “Naziware” and refused to use it. This example illustrates an information technology project that wasted millions of dollars developing a system that was not in touch with the way end users did their work.⁷

Failing to follow good project management processes and use off-the-shelf software often results in scope problems. 21st Century Insurance Group in Woodland Hills, California, paid Computer Sciences Corporation \$100 million on a project to develop a system for managing business applications, including managing insurance policies, billing, claims, and customer service. After five years, the system was still in development and used to support less than 2 percent of the company’s business in 2002. Joshua Greenbaum, an analyst at Enterprise Applications Consulting, called the project a “huge disaster” and questioned the insurance company’s ability “to manage a process that is pretty well known these days...I’m surprised that there wasn’t some way to build what they needed using off-the-shelf components and lower their risk.”⁸

Scope verification involves formal acceptance of the completed project by the stakeholders. This acceptance is often achieved by a customer inspection and then sign-off on key deliverables. To receive formal acceptance of the project scope, the project team must develop clear documentation of the project’s products and procedures to evaluate if they were completed correctly and satisfactorily. To minimize scope changes, it is crucial to do a good job of verifying project scope.

The project scope statement, WBS dictionary, project scope management plan, and deliverables are the main input for scope verification. The main tool for performing scope verification is inspection. The customer, sponsor, or user inspects the work after it is delivered. The main outputs of scope verification are accepted deliverables, requested changes, and recommended corrective actions. For example, suppose Kim’s team members deliver upgraded computers to users as part of the IT Upgrade Project. Several users might complain because the computers did not include special keyboards they need for medical reasons. Appropriate people would review this change request and take appropriate corrective action, such as getting sponsor approval for purchasing the special keyboards.

SCOPE CONTROL

As discussed in the section of Chapter 4 on integrated change control, change is inevitable on projects, especially changes to the scope of information technology projects. **Scope control** involves controlling changes to the project scope. Users often are not exactly sure how they want screens to look or what functionality

⁷ Ibid.

⁸ Songini, Marc L., “21st Century Insurance apps in limbo despite \$100M investment,” *ComputerWorld* (December 6, 2002).

they will really need to improve business performance. Developers are not exactly sure how to interpret user requirements, and they also have to deal with constantly changing technologies.

The goal of scope control is to influence the factors that cause scope changes, assure changes are processed according to procedures developed as part of integrated change control, and manage changes when they occur. You cannot do a good job of scope control if you do not first do a good job of scope definition and verification. How can you prevent scope creep when you have not agreed on the work to be performed and your sponsor hasn't verified that the proposed work was acceptable? You also need to develop a process for soliciting and monitoring changes to project scope. Stakeholders should be encouraged to suggest changes that will benefit the overall project and discouraged from suggesting unnecessary changes.

The project scope statement, project scope management plan, WBS and WBS dictionary, performance reports, work performance information, and approved change requests are the main input to scope control. Two important tools for performing scope control include a change control system and configuration management, as described in Chapter 4. Other tools include replanning project scope and performing variance analysis. **Variance** is the difference between planned and actual performance. For example, you can measure cost and schedule variance, as described in more detail in Chapter 7, Project Cost Management. The outputs of scope control include requested changes, recommended corrective action, and updates to the project scope statement, WBS and WBS dictionary, scope baseline, organizational process assets, and project management plan.

Table 1-2 in Chapter 1 lists the top ten factors that help information technology projects succeed. Four of these ten factors are related to scope verification and control: user involvement, clear business objectives, minimized scope, and firm basic requirements. To avoid project failures, therefore, it is crucial for information technology project managers and their teams to work on improving user input and reducing incomplete and changing requirements and specifications.

Suggestions for Improving User Input

Lack of user input leads to problems with managing scope creep and controlling change. How can you manage this important issue? Following are suggestions for improving user input:

- Develop a good project selection process for information technology projects. Insist that all projects have a sponsor from the user organization. The sponsor should not be someone in the information technology department, nor should the sponsor be the project manager. Make project information, including the project charter, project management plan, project

scope statement, WBS, and WBS dictionary, easily available in the organization. Making basic project information available will help avoid duplication of effort and ensure that the most important projects are the ones on which people are working.

- Have users on the project team. Some organizations require project managers to come from the business area of the project instead of the information technology group. Some organizations assign co-project managers to information technology projects, one from information technology and one from the main business group. Users should be assigned full-time to large information technology projects and part-time to smaller projects. A key success factor in Northwest Airline's ResNet project (see the companion Web site for this text for an entire case study on this project) was training reservation agents—the users—in how to write programming code for their new reservation system. Because the sales agents had intimate knowledge of the business, they provided excellent input and actually created most of the software.
- Have regular meetings with defined agendas. Meeting regularly sounds obvious, but many information technology projects fail because the project team members do not have regular interaction with users. They assume they understand what users need without getting direct feedback. To encourage this interaction, users should sign off on key deliverables presented at meetings.
- Deliver something to project users and sponsors on a regular basis. If it is some sort of hardware or software, make sure it works first.
- Do not promise to deliver what cannot be delivered in a particular time-frame. Make sure the project schedule allows enough time to produce the deliverables.
- Co-locate users with the developers. People often get to know each other better by being in close proximity. If the users cannot be physically moved to be near developers during the entire project, they could set aside certain days for co-location.

Suggestions for Reducing Incomplete and Changing Requirements

Some requirement changes are expected on information technology projects, but many projects have too many changes to their requirements, especially during later stages of the project life cycle when it is more difficult to implement them. The following are suggestions for improving the requirements process:

- Develop and follow a requirements management process that includes procedures for initial requirements determination. (See the Suggested Reading by Robertson for detailed information on managing requirements.)

- Employ techniques such as prototyping, use case modeling, and Joint Application Design to understand user requirements thoroughly. **Prototyping** involves developing a working replica of the system or some aspect of the system. These working replicas may be throwaways or an incremental component of the deliverable system. Prototyping is an effective tool for gaining an understanding of requirements, determining the feasibility of requirements, and resolving user interface uncertainties. **Use case modeling** is a process for identifying and modeling business events, who initiated them, and how the system should respond to them. It is an effective tool for understanding requirements for information systems. **Joint Application Design (JAD)** uses highly organized and intensive workshops to bring together project stakeholders—the sponsor, users, business analysts, programmers, and so on—to jointly define and design information systems. These techniques also help users become more active in defining system requirements.
- Put all requirements in writing and keep them current and readily available. Several tools are available to automate this function. For example, a type of software called a requirements management tool aids in capturing and maintaining requirements information, provides immediate access to the information, and assists in establishing necessary relationships between requirements and information created by other tools.
- Create a requirements management database for documenting and controlling requirements. Computer Aided Software Engineering (CASE) tools or other technologies can assist in maintaining a repository for project data.
- Provide adequate testing to verify that the project's products perform as expected. Conduct testing throughout the project life cycle. Chapter 8, Project Quality Management, includes more information on testing.
- Use a process for reviewing requested requirements changes from a systems perspective. For example, ensure that project scope changes include associated cost and schedule changes. Require approval by appropriate stakeholders. For example, at PanEnergy Corporation in Houston, Bruce Woodland completed a \$10 million electronic commerce project on time and under budget. He says, "Whenever someone wanted to add or change something, we'd tell them how long it would take and then ask them how they wanted to deal with it. . . . The first few times, the users almost took us out behind the dumpster and hanged us. But when we could match specific functionalities they wanted with the time and dollars they required, we didn't have a problem."⁹
- Emphasize completion dates. For example, a project manager at Farmland Industries, Inc. in Kansas City, Missouri, kept her 15-month, \$7 million integrated supply-chain project on track by setting the project deadline.

⁹ King, Julia, "IS reins in runaway projects," *ComputerWorld* (September 24, 1997).

She says, “May 1 was the drop-dead date, and everything else was backed into it. Users would come to us and say they wanted something, and we’d ask them what they wanted to give up to get it. Sticking to the date is how we managed scope creep.”¹⁰

- Allocate resources specifically for handling change requests. For example, Peeter Kivestu and his ResNet team at Northwest Airlines knew that users would request enhancements to the reservations system they were developing. They provided a special function key on the ResNet screen for users to submit their requests, and the project included three full-time programmers to handle these requests. Users made over 11,000 enhancement requests. The managers who sponsored the four main software applications had to prioritize the software enhancement requests and decide as a group what changes to approve. The three programmers then implemented as many items as they could, in priority order, given the time they had. Although they only implemented 38 percent of the requested enhancements, they were the most important ones, and the users were very satisfied with the system and process.

USING SOFTWARE TO ASSIST IN PROJECT SCOPE MANAGEMENT

Project managers and their teams can use several types of software to assist in project scope management. As shown in several of the figures and tables in this chapter, you can use word processing software to create scope-related documents, and most people use spreadsheet or presentation software to develop various charts and graphs related to scope management. Project stakeholders also transmit project scope management information using various types of communication software such as e-mail and assorted Web-based applications.

Project management software helps you develop a WBS, which serves as a basis for creating Gantt charts, assigning resources, allocating costs, and so on. You can also use the templates that come with various project management software products to help you create a WBS for your project. See the section on project scope management in Appendix A for detailed information on using Project 2003 and Appendix D for information on templates related to project scope management.

You can also use many types of specialized software to assist in project scope management. Many information technology projects use special software for requirements management, prototyping, modeling, and other scope-related work. Because scope is such a crucial part of project management, there are many software products available to assist in managing project scope.

¹⁰ Ibid.

Project scope management is very important, especially on information technology projects. After selecting projects, organizations must plan what is involved in performing the work of the project, break down the work into manageable pieces, verify the scope with project stakeholders, and manage changes to project scope. Using the basic project management concepts, tools, and techniques discussed in this chapter can help you successfully perform project scope management.

CASE WRAP-UP

Kim Nguyen reviewed guidelines for creating WBSs provided by her company and other sources. She had a meeting with the three team leaders for her project to get their input on how to proceed. They reviewed several sample documents and decided to have major groupings for their project based on updating the inventory database, acquiring the necessary hardware and software, installing the hardware and software, and performing project management. After they decided on a basic approach, Kim led a meeting with the entire project team of twelve people. She reviewed the project charter and preliminary scope statement, described the basic approach they would use to manage the project scope, and reviewed sample WBSs. Kim opened the floor for questions, which she answered confidently. She then let each team leader work with his or her people to start writing the detailed scope statement and their sections of the WBS and WBS dictionary. Everyone participated in the meeting, sharing their individual expertise and openly asking questions. Kim could see that the project was off to a good start.

CHAPTER SUMMARY

Project scope management includes the processes required to ensure that the project addresses all the work required, and only the work required, to complete the project successfully. The main processes include scope planning, scope definition, WBS creation, scope verification, and scope control.

The first step in project scope management is scope planning, where a scope management plan is created. This plan should include descriptions of how the

team will prepare the detailed scope statement, create the WBS, verify completion of the project deliverables, and control requests for changes to the project scope.

A project scope statement is created in the scope definition process. This document often includes a project justification, a brief description of the project's products, a summary of all project deliverables, and a statement of what determines project success. There are often several versions of the project scope statement to keep scope information up-to-date.

A work breakdown structure (WBS) is a deliverable-oriented grouping of the work involved in a project that defines the total scope of the project. The WBS forms the basis for planning and managing project schedules, costs, resources, and changes. You cannot use project management software without first creating a good WBS. A WBS dictionary is a document that describes detailed information about each WBS item. A good WBS is often difficult to create because of the complexity of the project. There are several approaches for developing a WBS, including using guidelines, the analogy approach, the top-down approach, the bottom-up approach, and mind mapping.

Scope verification involves formal acceptance of the project scope by the stakeholders. Scope control involves controlling changes to the project scope.

Poor project scope management is one of the key reasons projects fail. For information technology projects, it is important for good project scope management to have strong user involvement, a clear statement of requirements, and a process for managing scope changes.

There are many software products available to assist in project scope management. The WBS is a key concept in properly using project management software since it provides the basis for entering tasks.

DISCUSSION QUESTIONS

1. What is involved in project scope management, and why is good project scope management so important on information technology projects?
2. Discuss the process of further defining project scope, going from information in a project charter to a preliminary scope statement, project scope statement, WBS, and WBS dictionary.
3. Describe different ways to develop a WBS and explain why it is often so difficult to do.
4. Describe a project that suffered from scope creep. Could it have been avoided? How? Can scope creep be a good thing? When?
5. Why do you need a good WBS to use project management software? What other types of software can you use to assist in project scope management?

EXERCISES

1. Use PowerPoint, Visio, or similar software to create a WBS in chart form (similar to an organizational chart—see the sample in Figure 5-2). Assume the level 1 categories are initiating, planning, executing, controlling, and closing. Under the executing section, include level 2 categories of analysis, design, prototyping, testing, implementation, and support. Assume the support category includes level 3 items called training, documentation, user support, and enhancements.
2. Create the same WBS described in Exercise 1 using Project 2003, indenting categories appropriately. Use the outline numbering feature to display the outline numbers (click Tools on the menu bar, click Options, and then click Show outline number). For example, your WBS should start with 1.0 Initiating. Do not enter any durations or dependencies. See Appendix A or Project 2003's Help for assistance. Print the resulting Gantt chart on one page, being sure to display the entire Task Name column.
3. Create a WBS for one of the following projects:
 - Introducing self-checkout registers at your school's bookstore
 - Updating fifty laptops from Project 2002 to Project 2003
 - Creating a new information system for your school or company

Decide on all of the level 1 categories for the WBS. Then break down the work to at least the third level for one of the level 1 items. Enter the WBS into Project 2003 and print out the Gantt chart. Do not enter any durations or dependencies. Make notes of questions you had while completing this exercise.

4. Review a template file in the Microsoft Project 2003 templates folder, from Microsoft's "templates on Office online" (<http://office.microsoft.com/templates>), or from another source. What do you think about the WBS? Write a one-page paper summarizing your analysis, providing at least three suggestions for improving the WBS.
5. Read one of the suggested readings or find an article related to project scope management. Write a one-page summary of the article, its key conclusions, and your opinion.

RUNNING CASE

Managers at Manage Your Health, Inc. (MYH) selected Tony Prince as the project manager for the Recreation and Wellness Intranet Project. The schedule goal is six months, and the budget is \$200,000. Tony had previous project

management and systems analysis experience within the company, and he was an avid sports enthusiast. Tony was starting to put the project team together. Tony knew he would have to develop a survey to solicit input from all employees about this new system and make sure it was very user-friendly.

Recall from Chapter 4 that this application would include the following capabilities:

- Allow employees to register for company-sponsored recreational programs, such as soccer, softball, bowling, jogging, walking, and other sports.
- Allow employees to register for company-sponsored classes and programs to help them manage their weight, reduce stress, stop smoking, and manage other health-related issues.
- Track data on employee involvement in these recreational and health-management programs.
- Offer incentives for people to join the programs and do well in them (e.g., incentives for achieving weight goals, winning sports team competitions, etc.).

Assume that MYH would not need to purchase any additional hardware or software for the project.

TASKS

1. Develop a first version of a project scope statement for the project. Use the template provided on the companion Web site for this text under Appendix D and the example in Chapter 3 as guides. Be as specific as possible in describing product characteristics and requirements, as well as all of the project's deliverables. Be sure to include testing and training as part of the project scope.
2. Develop a work breakdown structure (WBS) for the project. Break down the work to level 2 or level 3, as appropriate. Use the template on the companion Web site for this text under Appendix D and samples in Chapters 3 and 5 as guides. Print the WBS in list form as a Word file. Be sure the WBS is based on the project charter (created in the Chapter 4 Running Case), the project scope statement created in Task 1 above, and other relevant information.
3. Use the WBS you developed in Task 2 above to begin creating a Gantt chart in Project 2003 for the project. Use the outline numbering feature to display the outline numbers (click Tools on the menu bar, click Options, and then click Show outline number). Do not enter any durations or

dependencies. Print the resulting Gantt chart on one page, being sure to display the entire Task Name column.

4. Develop a strategy for scope verification and change control for this project. Write a two-page paper summarizing key points of the strategy.

ADDITIONAL RUNNING CASES AND OTHER APPENDICES

Appendix C provides additional case studies and questions you can use to practice applying the concepts, tools, and techniques you are learning throughout this and subsequent chapters. Review the running cases provided in Appendix C and on the companion Web site (www.course.com/mis/schwalbe4e). Appendix D includes templates for various project management documents. For additional sample documents based on real projects, visit the author's Web site at www.kathyschwalbe.com. Appendix E and the CD-ROM included with this text include a computer simulation where you can also practice applying the project management process groups and knowledge areas.

SUGGESTED READINGS

1. Abramovici, Adrian. "Controlling Scope Creep," *PM Network* (January 2000).

This article states that scope creep is one of the most common problems that project managers face. The author illustrates the problems with scope creep in a short case study and provides practical advice on how to control it.

2. Levinson, Meridith. "Home Improvement," *CIO Magazine* (www.cio.com) (August 1, 2004).

Home Depot, the second largest retailer in the world (trailing only Wal-Mart), is investing nearly \$1 billion in information technology infrastructure and modernization efforts. This article describes several components involved in the massive scope of this effort, business issues driving the changes, and results to date.

3. Project Management Institute. "Project Management Institute Practice Standard for Work Breakdown Structures" (2001).

The WBS Practice Standard is intended to provide guidance for developing and applying the WBS to project management. PMI members can download a free copy of this document from PMI's Web site (www.pmi.org). Nonmembers can purchase the document from PMI. As well as providing guidelines, this document includes several sample WBSs for a variety of projects, from various industries.

4. Robertson, Susan and James. *Mastering the Requirements Process*. Addison-Wesley (1999).

This book does an outstanding job of explaining the requirements management process. The heart of this book is the Volere Requirements Process Model, an industry-tested and adaptable template for gathering and verifying requirements for software products.

5. Turbit, Neville. "Defining the Scope in IT," The Project Perfect White Paper Collection (www.projectperfect.com.au) (October 29, 2003).

This is one of a series of white papers available from the Project Perfect Web site. The author provides a detailed, step-by-step process for defining many information technology deliverables by defining the functionality, the data, and the technical structure.

KEY TERMS

- **analogy approach** — creating a WBS by using a similar project's WBS as a starting point
- **bottom-up approach** — creating a WBS by having team members identify as many specific tasks related to the project as possible and then grouping them into higher level categories
- **decomposition** — subdividing project deliverables into smaller pieces
- **deliverable** — a product, such as a report or segment of software code, produced as part of a project
- **Joint Application Design (JAD)** — using highly organized and intensive workshops to bring together project stakeholders—the sponsor, users, business analysts, programmers, and so on—to jointly define and design information systems
- **mind mapping** — a technique that can be used to develop WBSs by using branches radiating out from a central core idea to structure thoughts and ideas
- **project scope management** — the processes involved in defining and controlling what is or is not included in a project
- **project scope statement** — a document that includes, at a minimum, a description of the project, including its overall objectives and justification, detailed descriptions of all project deliverables, and the characteristics and requirements of products and services produced as part of the project
- **prototyping** — developing a working replica of the system or some aspect of the system to help define user requirements
- **scope** — all the work involved in creating the products of the project and the processes used to create them
- **scope baseline** — the approved project scope statement and its associated WBS and WBS dictionary
- **scope control** — controlling changes to the project scope

- **scope creep** — the tendency for project scope to keep getting bigger
- **scope management plan** — document that includes descriptions of how the project team will prepare the project scope statement, create the WBS, verify completion of the project deliverables, and control requests for changes to the project scope
- **scope verification** — formalizing acceptance of the project scope, sometimes by customer sign-off
- **top-down approach** — creating a WBS by starting with the largest items of the project and breaking them into their subordinate items
- **use case modeling** — a process for identifying and modeling business events, who initiated them, and how the system should respond to them
- **variance** — the difference between planned and actual performance
- **WBS dictionary** — a document that describes detailed information about each WBS item
- **work breakdown structure (WBS)** — a deliverable-oriented grouping of the work involved in a project that defines the total scope of the project
- **work package** — a task at the lowest level of the WBS