

MANAGING WEB PROJECTS



EDWARD B. FARKAS



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Checklists, forms, and templates listed in Chapter 6 may be downloaded from:

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Preface

How to Use This Book

The book is divided into four parts: a step-by-step guide to managing Web projects; instructions for creating a quality system that will continually improve your project management methodology; reproducible tools and templates, and wraps up with technical and project management glossaries with associated formulas. Throughout, you will find many useful hints and insights.

The flow of the step-by-step guide is synchronized with a typical Internet project life cycle. At the end of each project phase you will find a “What do I do now?” box containing practical tips.

The book includes a tools suite with a proven track record of success, containing—

- Project initiation tools
- Project planning tools
- Project execution tools
- Project control tools
- Project close-out tools

The book, additionally, includes Work Instructions that can be used to develop a formal quality management system specific to a project management organization. If you seek ISO 9001 certification, the Work Instructions will be invaluable. The Work Instructions can also be leveraged in either a TQM (Total Quality Management) or a Six Sigma environment. While they are not specific to the CMMi (Capability Maturity Model) or ITIL (Information Technology Infrastructure Library) frameworks, they are compatible with the planning and deployment elements or processes. The glossary portion of the book contains the following useful sections:

- A project management acronym table
- An Internet project management glossary
- A technical Internetworking glossary

The methodology defined in this book is applicable for the implementation of most Internetworking projects and Internet Service Provider (ISP) offers, including:

- Managed Web hosting
- Collocation Web hosting
- Application loading and testing
- Web site security products
- Web site load (stress) tests
- Web site load balancing
- Virtual Private Network (VPN)
- Voice-over-IP (VoIP)
- Disaster Recovery

Introduction

This book has been designed for project managers in the Internetworking industry, which includes everything from Web developers to Internet Service Providers (ISPs). It will walk you through a typical project life cycle, and provide you with a comprehensive set of practical tools.

Project Management is a profession based on a body of knowledge and internationally accepted standards codified in the Guide to the Project Management Body of Knowledge (PMBOK®) and a group of Practice Standards focused on specific elements of importance to the practice of project and program management. University-level certificate and master's degree programs, as well as most professional project management training and certification programs, are based on the PMBOK® and the related Practice Standards. The Project Management Institute (PMI) helped develop the PMBOK®. Additionally, the Project Management Institute manages an internationally recognized certification program. Project managers can become Certified Associate Project Managers (CAPM®) or Project Management Professionals (PMP®). A number of the Project Management Institute's standards have been adopted by other professional organizations such as the Institute of Electrical and Electronics Engineers, Inc. (IEEE), the International Standards Organization (ISO), and the American National Standards Institute (ANSI).

The PMBOK® includes the following nine knowledge areas:

1. Project Integration Management
2. Project Scope Management
3. Project Time Management
4. Project Human Resource Management
5. Project Cost Management
6. Project Risk Management

7. Project Quality Management
8. Project Procurement Management
9. Project Communications Management

In addition to the nine knowledge areas the PMBOK® includes five major processes:

1. Initiation
2. Planning
3. Executing
4. Controlling
5. Closing

This book will focus on those areas of the PMBOK® that correspond to Internetworking project management. In other words, the book will show you *how* to get the projects done! You will learn how to go from an architecture diagram to the deployment of sites on the World Wide Web.

The tools, methods, and techniques in the book can also be used for managing programs, Program Offices, or ongoing support functions. The book will help you lead project teams and manage your customers' expectations.

Checklists, forms, and templates from Chapter 6 may be downloaded from:

www.crcpress.com/product/isbn/9781439804957

They are in Word or Excel formats and may be customized.

About the Author



Edward B. Farkas, CFC, CHS, MIEEE, PMP, has worked as a project and program manager in the public and private sectors. During his career he has managed over \$6 billion of aviation, construction, engineering, ecommerce, information technology, public safety, and telecommunication projects in Argentina, Colombia, China, England, Hong Kong, Saudi Arabia, and the United States, and has firmly established his reputation as an expert in program project management services all over the world. He is a published author and frequent guest speaker at distinguished educational institutions and professional organizations such as the Project Management Institute and the New York Software Industry Association. Mr. Farkas' undergraduate degrees are in engineering and management; he is a certi-

fied Project Management Professional, certified Lead ISO (Quality Management Systems) Auditor, Certified Forensic Consultant, and Certified in Homeland Security—Level III. He is currently a program director for a major government agency and, time permitting, teaches project management for the City University of New York.

Chapter 1

The Project Life Cycle

Project Integration

Understanding project integration requires viewing where and how the project manager fits into the project life cycle. To do this, we first need to examine a typical Internet project life-cycle methodology.

This is a high-level view of the key processes and the project manager's role in them. Subsequent parts of the book will further define the terms and related mechanisms.

In many companies, a typical project life cycle contains phases such as Concept, Development, Execution, and Termination. Another example is Concept, Requirements Definition, Development, Testing, and Close-Out. In an Information Technology Infrastructure Library (ITIL) framework organization, you might have Service Strategy, Service Design, Service Transition, Service Operations, and Continual Service Improvement.

In an Internet methodology, there typically are seven phases in the project life cycle:

- Phase 1: Presales
- Phase 2: Project Planning
- Phase 3: Provisioning
- Phase 4: Acceptance Testing
- Phase 5: Site Launch Support or going live
- Phase 6: Quality Assurance
- Phase 7: Ongoing Support

Presales

The Presales phase includes solution design and proposal development. The sales team provides the scope definition of the work by identifying the technical, business, and customer requirements for a solution. Key deliverables in this phase are the development of a quotation, offer, or statement of work (SOW), and in many cases a design document or drawing.

The project manager reviews the design documents, which typically include an architecture. The project manager should make sure that the bill of materials (BOM) is complete. The BOM should list all the hardware components and all the software elements shown or implied in the architectural drawing. A complete BOM will result in better cost estimates. Another benefit of a complete BOM is avoiding delays due to incomplete purchasing or shipping.

Beyond ensuring the integrity of the BOM, with the assistance of the project team's architect, the project manager performs a scope analysis by reviewing the scope documents to identify the following.

1. Project stakeholders
2. Project constraints
3. Project dependencies
 - a. Customer
 - b. Third parties
 - c. Internet service providers (ISPs)
4. Assumptions that may become risk issues or are dependencies.
5. Initial project risks. A more detailed risk analysis is completed during the project planning phase, employing tools that will be described later.
6. Deliverables

The scope analysis will yield critical inputs to the project planning effort. For example, knowing the stakeholders helps determine the project's organization breakdown structure (OBS) as well as the Project Communications Plan. The identified constraints, for example, may influence the schedule's end date or be managed as a potential project risk. The Tools and Templates section in Chapter 6 includes a scope review guide that will facilitate a detailed scope analysis.

Table 1.1 shows how the scope analysis yields critical information needed to develop a project plan.

Tip: *When you read the scope documents highlight, in different colors, text that describes stakeholders, constraints, dependencies, assumptions, and risks. When you go back to the scope documents to develop the project plan the highlighting will save you a lot of time.*

An alternative tool, Table 1.2, is displayed in the following text; this can be in either MS Word or Excel.

Table 1.1 Results of Scope Analysis

<i>Element</i>	<i>Leads to</i>	<i>Drives</i>
Project Stakeholders	Responsibility Assignment Matrix, Communications Plan	Resource Management, Expectations Management
Project Constraints	Potential risks, possible milestones, potential end dates	Project Schedule
Project dependencies	Potential risks	Risk Management Plan, Project Schedule
Assumptions	Potential risks or dependencies	Schedule or Risk Management Plan
Project Risks	Risk Management Plan	Resources, Project Schedule
Deliverables	Work breakdown structure	Work packages—levels of effort, Project Quality Plan

Table 1.2 Scope Analysis Table

<i>Scope Analysis</i>					
<i>Stakeholder</i>	<i>Deliverable</i>	<i>Dependency</i>	<i>Assumption</i>	<i>Risk</i>	<i>Constraint</i>

Additionally, for complex projects, the project manager decomposes the scope of work by developing a work breakdown structure (WBS). Later, we give a step-by-step guide to help you create a WBS. One of the many WBS outputs is an understanding of the project manager’s level of effort (LOE), which helps determine the labor hours you will need to manage the project. The LOE output will

also determine the labor hours the project team will need to complete the project. The project manager is responsible for evaluating the scope of work.

Ideally, the project manager should be sufficiently empowered to withhold approval from project scope documents when the scope analysis indicates constraints, dependencies, and risks will jeopardize the project's success. When the project manager is not sufficiently empowered, the concerns from the scope analysis should be well documented and shared with the project team.

This phase ends after the opportunity has been approved.

Project Planning

Upon the project manager's approval of the scope of work, and in many cases the cost, defined in the quotation, SOW, or contract, the project manager proceeds with the development of a project plan. The project plan, at minimum includes a Project Scope Analysis, Risk Breakdown Structure, Risk Management Plan, and a Project Schedule. The project plan may be expanded to include a baseline WBS, Escalation Matrix, Communications Plan, Responsibilities Assignment Matrix, Resource Management Plan, Roles and Responsibilities Chart, Organization Breakdown Structure, and other plan elements described in greater detail in the following text.

The number of project plan elements is a function of the project's complexity. A listing of the plan elements is displayed in Table 1.3.

The project manager chairs the internal kick-off meeting with all the internal stakeholders. The internal kick-off meeting is designed to ensure that the deliverables and project plan are finalized and agreed upon. The internal kick-off meeting facilitates the project team's buy-in and resource commitments. This meeting may include subcontractors and in some cases suppliers as well.

Prior to the external (customer facing) kick-off meeting, the project manager should develop a communications plan for the meeting. This will determine who presents the plan, responds to questions, and manages expectations.

After the internal meeting, the project manager runs the external (customer-facing) kick-off meeting to obtain customer sign-off on the deliverables and the project plan. The next phase begins upon the completion of the external kick-off meeting.

The external kick-off meeting is an invaluable opportunity to manage the customer's expectations! If, for example, an external risk has been identified along with a plan to manage it, the external kick-off meeting may be the best time to secure the customer's buy-in of the proposed risk response. Candid communication at this point will go a long way to avoiding "surprises" that internal and external managers do not wish to have.

Refer to the Tools section to access the Project Kick-Off template that can be used to manage the kick-off meeting.

Table 1.3 Project Plan Elements

<i>Project Plan Element</i>	<i>Why and What the Element Represents</i>
Activity Sequence Diagram	Helps determine the critical path; can be used to calculate project level start and end dates (backward and forward pass techniques); provides a foundation for the project
(Network)	Schedule.
Communications Plan	Determines content and frequency of reports; defines who can discuss issues with the customer.
Escalation Matrix	(This may be part of the Communications Plan) Defines how and within what time frame issues are escalated—and to whom.
Organization Breakdown Structure	Similar to an Org Chart; clarifies the working relationships associated with the project. (In many cases, this will translate to a project team matrix.)
Project Schedule	Defines the tasks and subtasks of project activities; typically determines which resources will be applied to the task and subtasks; provides specific time frames for completion of activities and milestones.
Responsibilities Assignment Matrix	Determines what each member of the project team is responsible for. (For example, who approves scope changes.)
Risk Breakdown Structure	This can help define the risks associated with the project.
Risk Management Plan	Identifies risk issues by root cause and indicates how each risk issue will be managed.
Roles and Responsibilities Chart	This can indicate who does what and when.
Work Breakdown Structure	Helps break down the project deliverable which, in turn, facilitates definition of work packages that simplify level of effort calculations.

Additional planning tools that are available in the Tools section include the following:

1. Scope review guide (also used during the Presales Phase)
2. Risk management checklists
3. Project schedule templates, offering various levels of complexity

Tip: *If you define successful project completion as part of the external kick-off meeting, you can avoid problems later on. Gain buy-in from internal and external stakeholders, and document your common understanding of the goals of the project. For example, Success might be a dedicated server, with a certain amount of memory, and an architecture that will back up files every night. If this is documented as the measure of successful project completion, then there should be no misunderstandings later on regarding the frequency of data backups or the fact that automatic virus protection and root access are not part of the scope. Service level agreements (SLAs) are often used to define ISP responsibilities such as maximum percentage of server down time, site access time, time frames for problem resolution, and more.*

Provisioning

Most ISPs use the term *provisioning* to describe the physical installation of hardware and software. For Web hosting projects, this term also covers the associated order management activities. For nonhosting projects, *circuit provisioning* and *provisioning* are common terms.

Other corporations may use equivalent terms such as *construction*, *deployment*, and *installation* to describe an implementation. During this phase, the project manager tracks the tasks; monitors the milestones, dependencies, risks; and communicates status information to internal and external stakeholders, as needed. The Tools section has tools, such as the Progress Meeting template, to facilitate the management of this phase.

Project managers can control the labor hours charged to the project employing earned value management (EVM) formulas that will be detailed later.

Tip: *Checking the status of intermediate milestones can provide early warnings of potential schedule delays.*

Acceptance Testing

Upon completion of the provisioning of at least one unit or server, a unit acceptance test (UAT) is conducted and the Acceptance Testing phase begins. Project managers ensure that UAT has been completed and that all the units have passed the test.

The *unit* in UAT refers to a server. Depending on the ISP procedures, UAT has different meanings. For some ISPs, UAT is no more than proving a communication

link from the operations group or operations center to the server in the data center. For other ISPs, UAT includes verification that the server's operating system (OS) has been loaded. In application development, UAT is used to refer to customer testing from a usability perspective.

For further details on acceptance testing, see the “Work Instruction—Acceptance Testing” in Chapter 5. Note that this phase does not include the validation of acceptance testing by the customer, only UAT testing.

If the ISP has the technical capacity, it is advisable to request a test of the entire architecture. The architecture test, sometimes known as a *systems test*, should include key functions such as data backup and recovery. The systems test includes all hardware components, such as routers, not just the servers.

The object of this phase is to ensure that the ISP has provided the customer all contractual deliverables in working order. This assurance will aid in managing, and meeting, the customer's expectations.

Tip: *Well-thought-out testing protocols can mitigate risk issues. For example, if the customer is providing applications, UAT and system testing prior to loading the software will eliminate finger pointing if the loaded application is not working correctly. By eliminating the server or architecture as a possible cause, the customer and the project team know that the problem resides in the customer-provided software.*

Site Launch Support

Let's begin by defining the term *launch support*. This phase begins after the servers or system is handed off to the customer. It concludes when the applications (software) the server will run have been installed. The contract determines which party is responsible for loading and testing the applications.

The timing for the beginning of this phase will vary, especially for those projects that include a phased implementation whereby completed components and servers are incrementally handed off to the customer. This phase is best described as proactively planning the “hands-on” post-provisioning customer support needs. Customer support is most critical if, based on the contract, customers begin installing their own content and applications in preparation for launching their Web site on the new servers.

Chapter 5 contains suggested procedures that can be used to manage the Launch Support phase.

Quality Assurance

When the implementation is complete, the project manager requests the customer to complete your organization's customer satisfaction survey (sample survey is shown in the Tools section) to capture the customer's feedback on the implementation. This feedback is an invaluable input to your company's quality management system.

It is highly recommended that post-project reviews be completed to evaluate the project processes and project team, and to provide feedback to the project manager's organization. An essential component of continuous improvement, post-project reviews enable team members to identify lessons learned from a project (so that we do not repeat the same mistakes) and best practices (so that we continue to use processes that work). This phase is referred to as the Quality Assurance phase.

Chapter 6 contains customer survey question samples.

A well-designed quality assurance program is continuously evolving; thus, the related work instruction the book contains will change over time.

Ongoing Support

Certain customers may meet the engagement criteria for ongoing support services of the ISP and include these services as part of their contract. The Ongoing Support phase begins once the project is complete: The customer has accepted the deliverables, and a closure letter has been sent. At this point, designated staff supporting the account take over as primary point of contact (PPOC) responsible for coordinating all communications between the customer and the ISP. If ongoing support is included in the contract, the ongoing support PPOC is included at the external kick-off meeting to introduce him or her to the customer. At the conclusion of the project, the project manager works with the ongoing support PPOC to ensure a smooth transfer of the customer. The ongoing support PPOC should be responsible for creating an account or account transition plan.

The PPOC is defined as the individual authorized to discuss and approve project scope cost or schedule changes. The PPOC is usually the project manager throughout the project life cycle. The post-project, ongoing support, or account manager becomes the PPOC. Why is the PPOC designation important? It is not unusual for members of the project team, with the best of intentions, to inadvertently change the scope in meetings with the customer. An example of this would be the customer discussing new functionality, and the technical team member indicating that the new functionality is doable. That conversation may be misinterpreted to mean that the technical team member will, in fact, add the new functionality. The identification and communication of who the PPOC is will help prevent scope creep.

The account plan should include a copy of the installed architecture along with a complete BOM that includes all the applications loaded on the servers. The plan should list all the daily, weekly, and monthly maintenance items such as virus checks. The plan should include mechanisms to measure the ISP's SLA performance.

The Tools section of the book contains templates such as a deliverables acceptance form, closure letter, and account transition plan.

Each phase of the project life cycle, as depicted in Figure 1.1, may be viewed as a subproject within the overall project. The project manager must have a clear idea of all tasks, when each must be completed, and who is responsible for each.

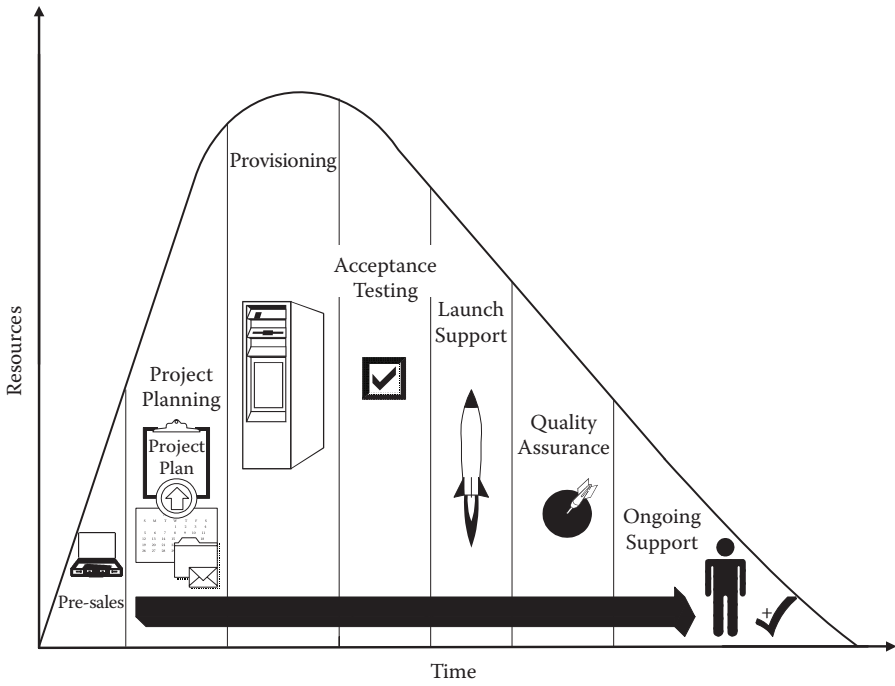


Figure 1.1 The project life cycle.

In PMBOK® parlance, this would be a Responsibility Assignment Matrix. We will discuss schedule development later.

Tip: The project life cycle is part of a larger customer life cycle. The customer life cycle begins with initial contact and may end at either accounts receivable or a post-project/post-service quality survey.

Chapter 2

From Scope to Schedule

In this chapter, we will move from scope definition to the process of developing a schedule. This can be done by an individual project manager alone, within the context of a quality management system as described in Chapter 5 or as part of a Project Management Office (PMO). Before drilling down into the steps that take us from scope to schedule, we will take a moment to define the PMO.

The Project or Program Management Office

Now that we have a conceptual understanding of the project life cycle and the elements that the project manager manages, we need to take the next step. It is recommended that Internet companies, such as Internet service providers (ISPs), and Web design and application development companies, have a Program or Project Management Office (PMO). A typical PMO provides functional contributions as outlined here:

- Develops and deploys project management methodologies. The project life cycle for each product may be customized.
- Coordinates process improvements and initiatives that include project management activities.
- Creates project and program management standards and tools. For example, one standard might be that all projects must have a risk management plan.
- An associated tool might be a risk checklist, customized by product line.

- Standardization facilitates consistency and repeatability. The challenge is to develop standards that empower the project manager. Samples of empowering standards are contained in the Work Instructions section of the book (Chapter 5).
- Facilitates focus groups, composed of project managers, to evaluate methodology, standards, or tools changes prior to release.
- Analyzes needs for communication mechanisms, such as an internal Web site, and implements solutions that meet requirements.
- Provides specialized human resource training, coaching, and development.
- Captures and disseminates best practices and lessons learned.
- Provides strategic, financial planning, and budgeting services to executive management.
- Enables a project management organization to be its own cost center. This, in turn, can lead to a billable project management group.
- Collects and analyzes key performance indicators and recommends corrective or preventative methodology or tool improvements.
- Provides portfolio management advisory guidance to executive management.
- Ensures quality through internal quality assurance reviews. Such reviews can be based on the standards, processes, tools, and work instructions developed by the PMO.

A well-thought-out PMO serves as the Project Center of Excellence.

To be successful, the project manager must be able to identify project stakeholders and must know how to manage them as resources. It is the norm rather than the exception that project managers direct “virtual” staffs that change as projects move into different phases.

Managing and coordinating the activities of staff who are not direct reports can be done employing the techniques in this book that speak to human resource management.

Tip: *Leadership is an act of self-empowerment.*

Stakeholders may be defined as those individuals who have a vested interest in either the project activities or the project outcome. By project activities, we mean the tasks and subtasks identified in the project’s schedule. Project outcome refers to the direct and indirect results of the project as a whole.

It is noteworthy that good project managers begin by identifying the important internal and external stakeholders. Important stakeholders are individuals having the ability to affect the project’s success, that is, individuals who can affect the scope, schedule, or budget.

External stakeholders may include vendors, subcontractors, and third parties. Earned value management formulas that provide objective data points for resource management are given in the appendix titled “Project Management and Internetworking Glossaries and Formulas.”

At this point, we will drill down and describe the elements to be considered when moving from scope to schedule.

The stakeholder identification component of the project scope analysis facilitates the development of a project communications plan. A later section will cover the details of project communications management.

The world of project integration also includes the relationship between the project manager, project sponsors, and the PMO. This book views the customer as the sponsor.

Triangle of Truth

To help place scope, time, and cost in perspective, we will take a moment to review how these elements relate to each other.

The Triangle of Truth: The Big Three Known as the Triple Constraints

Figures 2.1 and 2.2 illustrate the Triangle of Truth, also known as the *triple constraints*. Figure 2.1 depicts how the triangle is incomplete if we think of one item without the other two. In Figure 2.2, we see a triangle in which each side represents one side of the triple constraint, and if we change the lengths of one side, the lengths of the other two sides are impacted.

Tip: *The key lesson is that a project manager must always view events affecting the project within the context of the Triangle of Truth. In other words, assume that any change in one element will somehow affect the other two, unless proved otherwise. The three key elements are scope, schedule/time, and cost.*

If you are responsible for the management of a project, you will discover that you have to manage the project's scope, schedule/time, and cost. A common mistake that new project managers make is that they do not realize the critical

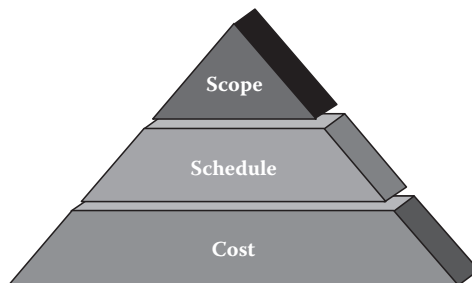


Figure 2.1 Triangle of truth.

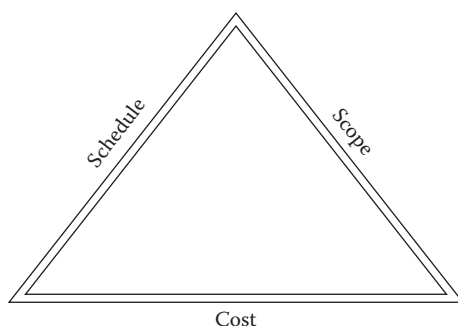


Figure 2.2 Triple constraints.

relationship among these three elements. This book will present simple ways to manage each element. As we move forward, it is important to remember the Triangle of Truth.

The price of forgetting the Triangle of Truth can be high: budget overruns, late schedules, and a scope that has gone out of control. This truth cannot be over-emphasized. Any change in scope that includes changes to deliverables must affect cost. It is impossible to modify the architecture to include more servers without increasing the cost. Deliverables are either procured or produced and, as a rule of thumb, if items are added it will take more time, thus changing the schedule.

Project Scope Management

The Project Management Institute (PMI) and the Project Management Body of Knowledge (PMBOK®) define scope management as the ongoing process of ensuring that the project includes the deliverables, *and only those deliverables* agreed upon in the contractual documents.

Scope creep occurs when we do not understand the scope of work, forget the phrase “and only those deliverables,” or do not remember the Triangle of Truth. Another cause of scope creep is the lack of a well-designed change management process. We will address change management processes later.

Project scope is usually articulated in a group of documents. At an ISP or a development firm, these documents may include a Master Agreement, a Service Quotation, a Deliverables Document, and an Architectural Diagram that includes a Bill of Materials (BOM).

If the documents defining the project scope conflict with one another, the project manager defaults to the *controlling* document. In most companies, the Master Agreement is a controlling document for terms and conditions, and the Service

Quotation controls the architectural drawing. It is useful to remember that regardless of the written scope of work, the customer's expectations may not be stated in those documents. A good project manager *continually manages expectations*. Those who don't may complete the project scope on time and within budget and still have an unhappy customer. (Typically, the controlling document is specified in the contract.)

Another document that is related to scope is the "Charter," and selected lines of business within ISPs may use a "Statement of Work" or SOW. Some basic information regarding both documents is given in the following sections.

Charter

A direct way of viewing the charter is to see it as a sort of passport-to-proceed. The key elements of a charter include the following:

- **It should formally recognize that the project exists.**

Why? This will legitimize the project. It will force other departments in the organization to acknowledge the project and allow the project team to process project actions such as purchasing, obtaining materials, and setting up accounting codes, etc.

- **It should state the individual who is charged with managing the project.**

Why? This provides the project manager the authority needed to implement the project. This, in some companies, indicates "signature authority" to approve project team activities. It will help the project manager in obtaining accurate information from other departments to track and manage the project's progress, and allows the project manager to directly interact with entities internal and external to the company.

- **It should give the project manager the explicit authority to either obtain or negotiate the human and material resources needed to implement the project.**

Why? Project teams rarely have permanent team employees. Usually, a team is developed based on the nature and needs of the project. This element empowers the project manager to obtain team members.

- **It should indicate how the project links to the organization's business plan, mission statement, or strategic vision.**

Why? Higher-level executives are the ones who develop these items. More importantly, they themselves are judged by how effectively they actually implement these items. Bluntly put, it may become difficult for an executive to not support a corporate activity that ties to one of these key documents.

- **It should briefly describe the project in nontechnical terms.**

Why? This closes the loop by stating what the project manager will implement. In a way, this provides a framework on which to move forward.

Statement of Work (SOW)

An SOW is a description of what the project is in plain English. It may be supplemented by other, more technical, documents such as drawings, specifications, catalog cuts, etc. This book contains an SOW template in the Tools and Templates section in Chapter 6. The SOW actually describes what the project manager has to implement. It should be clear and concise, and must include the items detailed in the following subsections.

General Scope of Work—Include Goals and Related Background

Why? This allows the reader to understand, without jargon, what actual work the project team will perform. It places work in a larger context. In other words, it explains why the project exists.

Contractor Deliverables

Why? This element clarifies the specific end-products that have to be produced or “delivered.” The term *deliverable* refers to the product or service the customer pays for. Deliverables can be anything from a set of drawings to a truck filled with tomatoes. Sometimes, when dealing with electronic files or written reports, the deliverable may be referred to as an *intellectual product* or *property*.

This element of the SOW facilitates the development of agreements and contracts with consultants, contractors, and subcontractors. Finally, it’s important because this element effectively defines who is responsible for what, and it may contain milestone dates.

The term *milestone* can refer to the completion of an activity or task that marks the initiation or completion of a project phase. Milestones can also represent the completion of significant deliverables. Finally, milestones can be decision points or stage gates.

Contract End Items and Performance Requirements

Why? The listing of contract end items helps define project completion. An example of this would be the submission of a system operating manual and final drawings after the installation. For example, in ISPs or software development projects, the final deliverables may be source code documentation and user manuals. The end items in this subsection are deliverables. Beyond deliverables, contract end items may be related to specific performance criteria, such as throughput.

Studies, Documentation, and Related Specifications

Why? By referencing the document, the studies, documentation, and related specifications become part of the scope of work. It's important to make sure that the documents don't conflict. If there is the possibility of a document conflict, indicate which are the controlling documents.

Data Requirements

Why? If the project manager or the client is expecting deliverables, such as a final report or the results of an acceptance test, it should be explicitly stated. If statistics or data, such as Web site hits, need to be obtained or analyzed, they should also be indicated.

Equipment and Materials for Contract End Items

Why? Contract end items may include available spare parts, additional documentation, and related equipment.

Customer-Furnished Property, Facilities, Equipment, and Services

Why? This item will reduce the project's cost. This section is particularly important for PMOs, and refers to the customer providing items such as office space, office equipment, hardware, or associated infrastructure.

Documentation Provided by the Customer

Why? This may be essential for the project team. Customer-furnished documentation can be anything from a telephone directory to a set of Web site documents. It is recommended that receipts of such items be flagged in the project schedule. Customer-provided documentation is an excellent example of a dependency.

General Schedule of Performance

Why? This section identifies the milestones (e.g., the project start date, completion of a study, approval of a quotation, definition of the project team members, and project completion). It's a double-edged sword because on the one hand it creates targets and may even provide needed internal pressure to obtain resources, but on the other hand if the dates are not realistic you have committed yourself to a certain problem. It is critical that all stakeholders agree to any milestone-level dates included in the project schedule.

Tip: For customer-facing meetings, a milestone-level schedule is suggested. This will prevent possible micromanagement of the project schedule.

Exhibits, Attachments, and Appendices

Why? This is required to ensure that the scope is understood in its entirety. Basically, this item refers to additional documentation supplementing the SOW. It's particularly important if the charter or SOW reference an exhibit, attachment, or section.

Clear Definitions

The SOW should, as discussed earlier, be worded in a nontechnical way. It is a document employed to secure buy-in from all the project customers, both internal and external. The higher up the organization the stakeholders are, the simpler the document must be. High-level executives simply do not have the time to read documents requiring interpretation. Additionally, your customer may not have the technical expertise to understand a document full of specialized terminology.

Finally, the SOW serves as a kind of road map for the project team. It provides direction, which allows the team members to quickly match their work product with the intended scope.

Different people can interpret certain words in many ways if they're not explicitly clarified, for example, "the system should always be available." What does "available" mean? Are we saying 24 hours a day, 7 days a week, or just during business hours? What is meant by the "system"? Does this imply the customer's right to go into an ISP data center? A well-drafted SOW can help manage customer expectations and provide a framework for the development of a project plan. Clarity in language also reduces project risk.

Managing Scope Changes

Though scope may, at times, appear to be "dynamic," project managers want to keep the scope well defined and as static as possible though there may be occasions when scope changes are advised. When changes must be made, project managers must manage them and take into account the way in which such changes affect the project.

Tip: Remember the Triangle of Truth. Scope/cost/schedule: Change in one usually means change in the other two.

Scope change is not a brand new project. If the scope revision is so radical as to effectively redefine the initial service quotation (SOW or charter), it is known as a *cardinal change*. A cardinal change may well invalidate the contract. If the change