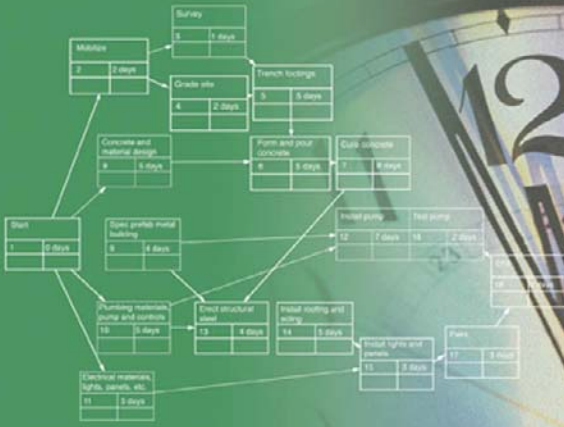
The PROJECT MANAGEMENT Tool Kit

100 TIPS AND TECHNIQUES FOR GETTING THE JOB DONE RIGHT



TOM KENDRICK

THE PROJECT MANAGEMENT TOOL KIT

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THE PROJECT MANAGEMENT TOOL KIT

Second Edition

100 Tips and Techniques for Getting the Job Done Right

TOM KENDRICK

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To my family:

My father, Tom Kendrick,
His father, also Tom Kendrick,
and my uncle, George Kendrick.
They taught me the value of tools and logic.

My wife, Barbara Kendrick, for her support, patience,
and efforts to ensure this edition remained coherent.

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How to Use This Book (Read This First!)

If you are a typical project leader, you are very busy. Time pressures, complexity of project work, and lack of sufficient resources make your work challenging and difficult. Successful project management requires you to execute efficiently and well, even in situations where you may have little experience.

The Project Management Tool Kit assembles short, easy-to-apply summaries of proven project management practices. These concise summaries will help you to achieve consistently better project results. Novice project leaders will be able to use the process steps as **roadmaps** to understand what is necessary in unfamiliar situations. Experienced managers can use the process summaries as **checklists** to ensure that they do not leave out anything essential, especially when a project requires something out of the ordinary.

The Project Management Tool Kit is based on established, practical ideas used by successful project managers in many fields, and it includes processes from all of the areas outlined in the Project Management Institute (PMI) *PMBOK® Guide, Fourth Edition (2008)*. As with most reference books *The Project Management Tool Kit* is organized alphabetically for quick, *random* access to process guidance. The purpose of this book is to arrange the fundamental processes of project management in an easy-to-use, compact format.

All projects are different, and their unique challenges will undoubtedly require additional processes beyond those included here. Although not every project will need all of the practices in this book, most will prove useful, particularly after you make the minor adjustments necessary to customize them to your specific environment.

The processes in this book fit into several categories. The nine PMI® PMBOK® knowledge areas are numbered four through 12. The first four groupings here include processes from PMBOK® knowledge area four (Project Integration Management), as well as additional project management processes of a more general nature. Groups five through 12 directly map to the remaining numbered knowledge areas of the PMBOK®. These lists gather together related practices and concepts in the sequence in which people typically use them.

The process summaries are arranged alphabetically and numbered in *The Project Management Tool Kit*. To facilitate skimming, within each process keywords and phrases are in *italics*, and references to related processes are **boldface**.

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1

Activity Definition (PMBOK® 6.1, Define Activities)

What: Documenting the activities resulting from the lowest level of the project work breakdown structure (WBS) and assigning an owner to each.
When: Project planning.
Results: Clear descriptions of all identified project work and delegation of responsibility.

Verify Activities

Activity definition is a key step in **project plan development**. After developing the **work breakdown structure** (WBS), verify that all work listed is *necessary*. If the work at the lowest level will probably require more than a month to complete or more than 80 hours of effort, strive to break it down further.

People often overlook work related to organizational, business, or legal requirements. Examples include preparation for **project life cycle** checkpoints, methodology requirements, project and other reviews, scheduled presentations, and specific documents the project must create. Add any *missing work* you discover to the WBS and scope baseline.

Describe Activities

Convert the lowest-level WBS entries into project activities that can be estimated, scheduled, and tracked. Check that each represents a *discrete*, separate piece of work that has a starting and a stopping point. For each piece of work, capture and document any assumptions.

Describe each lowest-level work package concisely in terms of the work to be done and the task deliverable (examples: install power, edit user documentation). These *verb-noun descriptions* ensure clarity and make planning and tracking easier.

Identify one or more specific *deliverables* for each lowest-level activity. For

each deliverable, specify the acceptance or test criteria. Be able to describe any requirements relating to standards, performance, or specific quality level. If no one can clearly define the deliverable for an activity, the work may be unnecessary; consider deleting it.

Assign Owners

Seek capable, motivated owners for each lowest-level activity. Staff all work possible using *willing volunteers*, and remember that the project leader remains responsible for all tasks without an owner.

For each activity, assign one and only *one owner*, **delegating responsibility** for the work. Owners will be responsible for planning, estimating, monitoring, and reporting on the activity, but they will not necessarily do all the work alone. In some cases, owners will lead a team doing the work, or even serve as a liaison for outsourced tasks. For each activity, identify all needed skills, staff, and any other resources.

Identify Milestones

In addition to project activities, which consume time and effort, project schedules also have milestones—events used to synchronize project work and mark significant project transitions that have no duration. Uses for milestones include:

- Project start
- Project end
- Completion of related parallel activities
- Phase gates or life cycle stage transitions
- Significant decisions, approvals, or events
- Interfaces among **multiple dependent projects**
- Other external activity dependencies and deliverables

List all project milestones.

Document Activities

Document all activities and milestones in a database, **software tool for project management**, or some other appropriate format. Include activity names, owners, assumptions, deliverable descriptions, and other important information. The activity list (often part of a *WBS Dictionary*) serves as the

foundation for project planning, risk analysis, execution, and control. Provide all activity owners a summary of their work.

Use activity definitions as a foundation for many other planning processes, including **activity duration estimating**, **activity resource estimating**, **activity sequencing**, **schedule development**, **cost estimating**, **risk identification**, **required skills analysis**, and **responsibility analysis**.

As the project planning and execution proceeds, keep activity information current. Periodically *update* the activity list to add work identified during the project.

2

Activity Duration Estimating (PMBOK® 6.4, Estimate Activity Durations)

What: Forecasting durations for all identified project activities.
When: Project planning, execution, and control.
Results: Duration estimates in workdays for all project tasks.

Determine Duration

Duration estimates are a central component of **project plan development**. For each listed task in your project **activity definition**, use **responsibility analysis** and other planning data to develop *timing estimates*, in workdays. Useful estimating ideas include:

- *History* (**lessons learned**, databases of diagnostic **project metrics**)
- *Activity-owner analysis* and personal experience
- *Analogs* (previous work of a similar type)
- *Experts* (consultants, peers, managers, vendor proposals)
- *Published data* (Internet, papers, articles, professional magazines)
- *Parametric or size-based formulas* ("rules of thumb"; complexity analysis; component or module counts; function points and other code assessments; measurements of volume, area, length, or other parameters)
- *Team analysis* (**Delphi technique**, further work decomposition)

If duration estimates exceed your standards for length (20 workdays is a typical maximum), consider further decomposition. Update the project **work breakdown structure** to reflect any changes you make.

Refine Duration Estimates and Reconcile with Resource and Cost Estimates

Refine the initial duration estimates using *project-specific factors* such as:

- Alternative approaches requiring less time
- Project constraints and assumptions
- Specific staffing data from **human resource planning**
- Any unclear project specifications from **scope definition**
- Any known delays or requirements for synchronization of work from **activity sequencing**
- Probable scope changes
- Technical complexity
- Requirements for unusually high reliability or performance
- Overall project length
- Requirements for innovation**,** investigation, or invention
- Training

Duration estimating is closely related to **cost estimating** and **activity resource estimating**. Which of these you do first does not matter much, but you must reconcile them before finalizing a baseline plan. Adjust estimates as necessary to *ensure consistency* with your cost and effort analyses.

Consider Risks and Alternatives

Once you have made a "most likely" duration estimate, probe for failure modes and potential problems. Determine the timing consequences of *worst case scenarios*.

You may adjust estimates for uncertainty using the Program Evaluation and Review Technique (*PERT*) formula: $t_e = (t_o + 4t_m + t_p)/6$, where t_e is a weighted-average "expected" duration based on t_o (an optimistic duration), t_m (the most likely duration), and t_p (a pessimistic duration). Document significant pessimistic estimates in your **risk identification**, and consider them when establishing a schedule reserve for the overall project.

For estimates in which you have low confidence, seek alternative ways of performing the work that rely on older, more *established methods* that you can estimate more accurately.

Capture the Duration Data

Document duration estimates in workdays to use in **schedule development**. Duration estimates are the principal estimates that **software tools for project management** use, and a schedule database is a standard place to store them. **Project variance analysis** relies on realistic timing information.

Update Duration Estimates

Revise duration estimates as needed to resolve timing problems during the project through **schedule control**.

Revalidate estimates periodically during **project reviews**, particularly for lengthy projects.

3

Activity Resource Estimating (PMBOK® 6.3, Estimate Activity Resources)

What: Forecasting staffing, equipment, and other resources needed for project activities.
When: Project planning.
Results: Resource details for all project activities and a basis for cost estimating.

Determine Required Resources

Resource analysis begins with determining what people will need to complete each task listed in your project **activity definition**.

For most project activities, the main—sometimes only—resource required is *dedicated labor* within the organization. Estimating internal labor requires both specific identification of required skills and an overall assessment of how much effort from each resource type you will need.

Determine the types of contributors needed for each activity through **required skills analysis**. For each lowest-level activity in your **work breakdown structure**, develop effort estimates in units combining staffing and time, such as person-days or engineer-hours, for each identified category of expertise. Useful sources of data for activity-effort estimating include:

- *History* (**lessons learned**, databases of diagnostic **project metrics**, information from **earned-value management**)
- *Activity-owner analysis* and personal experience
- *Analogs* (previous work of a similar type)
- *Experts* (consultants, peers, managers, vendor proposals)
- *Published data* (Internet, papers, articles, professional magazines)
- *Parametric or size-based formulas* ("rules of thumb"; complexity analysis; component or module counts; function points and other

code assessments; measurements of volume, area, length, or other parameters)
- *Team analysis* (**Delphi technique**, further work decomposition)

Refine Effort Estimates and Reconcile with Duration Estimates

Adjust effort estimates for each specific project activity. Consider resource and *staffing factors* such as:

- Alternative approaches requiring less effort
- Project constraints and assumptions
- Specific staffing information
- Staff capabilities
- Staff availability, based on discussions and resource calendar data
- Staff productivity
- Activities that are not fully staffed by named, committed contributors
- Delays in **team acquisition**
- Potential turnover
- The project work environment and frequency of interruptions
- Team size
- Communications and **meetings**
- Geographical separation of team members
- Conflicting **project priorities** with other work
- Training and learning-curve issues

Activity-effort estimating is closely related to **activity duration estimating**. Which you choose to do first does not matter much, but you must reconcile them before finalizing a baseline plan. Determine the normal number of *work hours available* in a workday for project activities after removing meetings, e-mail, telephone calls, breaks, meals, and other interruptions. Five to six hours may be available, but for some contributors the total is lower. Adjust activity durations as necessary to ensure consistency with realistic staffing availability.

Determine Other Resources

Project activities may have requirements for *other resources* in addition to internal labor. Quantify these additional resources for each project activity. Include all activity-related resources required for:

- Outsourcing (from **procurement planning** and **negotiating contracts**)
- Hardware and other equipment purchases
- Charges for use of shared or rented equipment
- Supplies and required components
- Software acquisition and licenses
- Communications, such as audio, video, computer networking
- Services, including shipping costs, duplicating, and printing
- Travel expenses
- Other needs with direct costs

Capture Resource Estimates

Document resources for project activities to support **cost estimating** and for **project plan development**. **Project variance analysis** relies on realistic resource information.

If the resource estimates are not consistent with committed project staffing, use the data to support **human resource planning** and when necessary in **negotiating project changes**.

Update Resource Estimates

Revise effort estimates as your project progresses, and use **cost control** in resolving resource problems during project execution.

Revalidate resource estimates periodically during **project reviews**, particularly for lengthy projects.

4

Activity Sequencing (PMBOK® 6.2, Sequence Activities)

What: Determining dependencies among project activities.
When: Project planning.
Results: A graphical or tabular summary of project workflow.

Review Project Data

Activity sequencing is generally done in parallel with **activity duration estimating** and **activity resource estimating** during **project plan development**. Sequencing is a *bottom-up planning* process, not based on fixed-date or arbitrarily imposed top-down deadlines. Significant plan variances against project timing objectives are best resolved through **constraint management and plan optimization** and **negotiating project changes**.

To begin, assemble project milestone and **activity definition** data, along with other *project information*, such as organizational standards, life cycle and methodology requirements, constraints, and assumptions.

Identify Dependencies

There are many ways to *model project workflow*, but the easiest and most effective is to build an activity network using activity and milestone descriptions written on yellow sticky notes arrayed on a large piece of paper (or wall) where they can be moved around readily. This manual project workflow analysis (also called precedence diagramming) has several advantages over alternative approaches:

- It is easier to do as a team than directly entering dependency data into a computer scheduling tool.
- Dependency analysis on a small computer screen can be confusing, making it easy to miss critical linkages.

- The resulting network of activities is consistent with standard **software tools for project management**, where the information developed will likely be stored.

Starting from the initial milestone, begin linking the activities and milestones, based on logical workflow and use of the activities' deliverables. There are several *linkage types* that represent virtually all project dependencies:

- *Finish-to-Start*. Here, the work is sequential. The first activity must end before one or more following activities can begin. This linkage is most common; it is the default in project scheduling tools.
- *Start-to-Start*. The work is synchronized. This type of linkage occurs when work must start and progress in parallel.
- *Finish-to-Finish*. The activity deliverables are synchronized. Finish-to-finish links are most common whenever the task deliverables may change or deteriorate if not used promptly.
- *Start-to-Finish*. Here, initiating work on an activity forces the termination of an earlier activity. Real requirements for this are very rare.

Project managers can also model *lags and leads* by defining an offset in time between activities. They may be Finish-to-Start, Finish-to-Finish, or Start-to-Start.

Because a project network is a model of workflow through time, linkages (the arrows that connect the activities and milestones) *must not loop* back on themselves. If rework is required, define additional new activities. Scheduling software checks for and will not permit loops.

It is also useful to characterize activity dependencies. Some are mandatory—essential to the project workflow. Other dependencies may be discretionary in that they are subject to rearrangement without project impact and useful for "what if" analysis. Project activities may also link to external events or to fixed time constraints.

Document Project Work Sequences

Check that each activity and milestone links backward to at least one predecessor (except for the initial milestone) and forward to at least one successor (except for the final milestone). Figure 4.1 gives an example. Ensure *continuity of workflow* on each path in the network. If you find logical gaps where you are missing work necessary to connect defined activities, add the new activity to your project **work breakdown structure**.

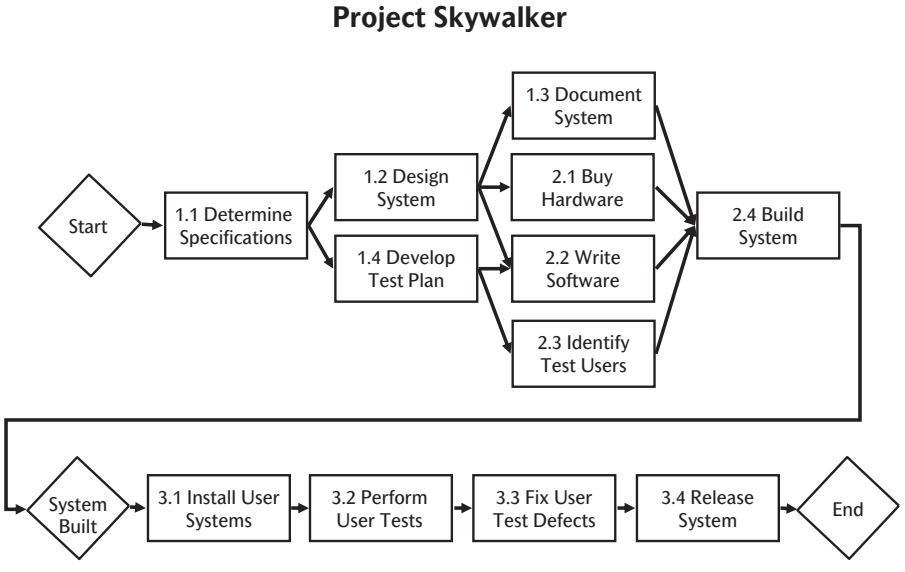

Figure 4.1. The work breakdown structure for Project Skywalker.

Use the *graphical representation* of the project to support **schedule development** and critical-path analysis. Some other names for this network diagram are:

- Logical project networks
- PERT charts (although true "Program Evaluation and Review Technique" charts are actually different, this usage has become common)
- Dependency diagrams

If you intend to use scheduling software to assist in managing your project, *enter the dependency data* from your network chart into the tool's database.

Revalidate dependencies connecting activities periodically during **project reviews**, especially on lengthy projects.

5

Brainstorming

What: Using a team to generate many ideas.
When: Throughout a project.
Results: A large number of options for consideration.

Prepare

Brainstorming is useful for *generating alternatives* in many situations, such as:

- Project plan development
- Issue management
- Risk response planning
- Scope definition
- Cause-and-effect analysis
- Decision-making
- Creative problem-solving

Brainstorming is a *group technique*, dependent on teamwork and interaction for good results. Gather people with insight into the current situation or problem when developing ideas.

Clearly present the *problem statement*, and encourage discussion if it is unclear. Post the statement where it will be visible to everyone.

Generate Ideas

Begin the process by providing paper or yellow sticky notes to the team members and encouraging them to write down as many ideas as they are able *on their own*, in silence. Capture each idea on a separate piece of paper. Minimize distractions, and request that people who finish first remain quiet while others continue to work.

When everyone is done, ask each person to read one of his or her ideas aloud and post each idea where it is visible to the group. When you have heard from everyone, continue until you have accumulated all the ideas in a

single list. Include any new ideas that people generate while listening to others' submissions.

When gathering the ideas, allow *no discussions*, criticism, or questions. Focus on collecting the inputs as quickly as possible.

When the team can see all the ideas, ask if anyone has any *questions* about the items on the list. Allow the person who contributed the idea to answer questions initially, but encourage other participants to help refine the wording. Before making significant changes, get agreement from the person who generated the idea.

Organize the List

When there are no more questions, *condense the list*. If some ideas are similar, work to consolidate them. If ideas seem similar but the people who contributed them think they are different, leave them listed separately.

Truncate the list, if necessary. If the list is longer than 20 items, give everyone three or four votes to indicate favored ideas, and reduce the list by selecting the ideas with the most support.

Prioritize the remaining ideas using a systematic process. You could discuss ideas further to generate information on costs and benefits, or apply systematic **decision-making** using weighted criteria and relative evaluations. Another method is to have each person rank the ideas on the list and use the rankings to define an overall team prioritization.

As a team, *consider the best option* and discuss any issues or potential problems associated with it. If no one has any objections, bring the brainstorming session to a close. If members disagree, consider the next two or three items on the list or revise your evaluation method. Strive for a consensus that all can support.

Document the result and *put it to use*.

6

Canceling Projects

What: Terminating a troubled project before its scheduled completion.
When: Project execution and control.
Results: Minimized time, effort, and money expended on doomed projects, and improved long-term team motivation.

Not every project, no matter how worthy or promising, will end well. When it becomes apparent that a project *will not ultimately succeed*, canceling it early, in a positive way, has many benefits.

Recognize the Situation

One reason for early termination is *insufficient progress* toward the **project objective**. **Performance reporting** may reveal:

- Schedule delays or execution problems
- Funding or resource consumption that is too high
- Insufficient staff or other resources
- Unachievable scope given available technologies and capabilities

Other reasons for ending projects relate to higher-level *business considerations*, such as:

- Changes in overall business strategy
- Shifts of priority to more urgent project or nonproject work
- Recognition that too many simultaneous projects are under way
- Loss of funding or sponsorship

Assess the Situation

Perform a **project review** and validate your **plan-variance analysis**. Use **cause-and-effect analysis** to understand the sources of project problems. *Explore options* for continuing, such as **issue management**, **performance**

problem resolution, **negotiating project changes**, renewing **sponsorship** for the project, **problem escalation**, or other alternatives.

Terminate

If the project cannot be rescued, document the situation and *communicate* it to all stakeholders. Include a summary of the status, along with any alternatives you considered and your recommendations for the timing and staffing of project closure. If appropriate, document the requirements for possible later resumption of the project.

Get approval for cancellation, and bring the work to a *logical conclusion*. **Closing projects**, even when canceled, requires:

- Documenting the results achieved
- Capturing **lessons learned** and clearly describing the situation that resulted in early termination
- Archiving the project data in your project management information system
- Acknowledging contributions
- Completing **procurement close-out** to project any other financial requirements

Bring the project to as positive a conclusion as possible. Work to let everyone involved *move on* from the project to other work with enthusiasm. Discourage "bridge burning" and "blame-storming."

7

Cause-and-Effect Analysis

What: Determining the sources of a problem situation.
When: Throughout a project.
Results: Identified root causes for current or potential project trouble.

Identify Sources of Trouble

Cause-and-effect analysis is applied in a wide range of situations, such as:

- Issue management
- Schedule control
- Cost control
- Scope change control
- Risk response planning
- Process improvement
- Creative problem-solving
- Failure diagnosis

There are many names for essentially *similar processes*, including root cause analysis; failure mode and effect analysis; "fishbone diagrams"; and Ishikawa diagrams, named for Dr. Kaoru Ishikawa, the Japanese quality-movement expert who popularized the concepts.

Describe the Effect

Whatever the process is called, it begins with a clear, *unambiguous statement* of the problem issue, risk, variance, or other adverse situation. Quantify the effect, defining the consequences in terms that are as specific and measurable as possible.

Involve project *team members* and stakeholders with insight into the effect. Ensure that each person understands the situation and can describe it in his or her own words.

Identify Root Causes

As a group, **brainstorm** possible sources for the undesirable outcome. Collect as *many inputs* from the team as quickly as you can. Tap sources of data such as documented problems, **lessons learned**, and other documentation from prior projects, checklists, and templates. Use the idea from **quality planning** of "asking *why* five times" to probe for causes, not symptoms. Focus on the quantity of ideas, not the quality; you can filter later.

Organize the results into major *cause categories* such as:

- Scope
- Schedule
- Staff and resources
- Cost
- Organization

Diagram and Document

Display root causes visually, using a *fishbone diagram* (as shown in Figure 7.1) to provide deeper understanding of the situation. Use subcategories as needed to organize the information logically, and review the results to see whether they stimulate additional causes.

Document the root causes and apply them to resolve the problem situation.

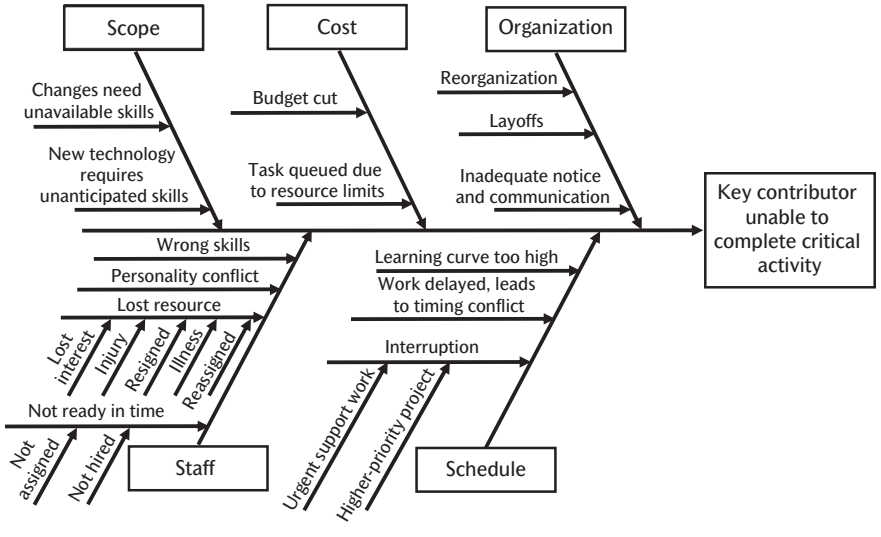

Figure 7.1. A sample fishbone diagram.

8

Closing Projects (PMBOK® 4.6, Close Project or Phase)

What: Completion of project management tasks at the end of a project or phase.
When: Project (or phase) closure.
Results: Final project documents, approvals, and lessons learned.

This process is used to close a project. It is also applicable to life cycle phase or stage gate transitions, especially for longer projects.

Obtain Formal Acceptance

Review **requirements collection** and **scope definition** and your records of **scope change control** to determine the project *deliverable requirements*. Check that all final testing is aligned with the agreed-upon specifications.

Work with the people who must evaluate your project results to complete **scope verification**, formally acknowledging that the project deliverable has met the project goals. If there are no issues, *get formal sign-off* from your project sponsor and as appropriate from customers or other stakeholders. For projects undertaken for a fee, ensure the customer is properly and promptly billed.

If the project fails to deliver on some objectives, obtain written acknowledgment of the *partial results* that were delivered. Even when **canceling projects**, formally document all accomplishments.

Complete Project Documentation

Whatever the ultimate result of the project may be, *write a report* to summarize results and to acknowledge contributors. This report is generally similar in format to project **information distribution** and **performance reporting**. Use the report to communicate to all that the project is over.

Begin the final report with a *high-level summary*, including the most significant results. In the remainder of the report, stress the accomplishments of the project team and formally recognize significant contributions individuals

and groups made to the project. Include retrospective **project metrics** and other performance information.

Add the final project report to the *project information archive*, along with any other project documents and reports that are updated or created as part of your project close-out.

Close Out Contracts and Accounting

Complete all paperwork required for contracted services used on the project and approve appropriate final payments. If there are issues or problems relating to a contract, escalate and resolve them as soon as possible. Complete **procurement close-out** following payment of all invoices, taking action to *terminate the contract*.

Summarize required financial information for the project and ensure that any *project accounting* is done accurately and promptly.

Thank Team Members

At the end of a project, *thank people*, both in person and in writing. For contributors who report to others, acknowledge their work formally to their managers. Use **rewards and recognition** as positive reinforcement for the good work of deserving project contributors.

Celebrate

Celebrate success at the end of a project with an event. Even if the project had problems, identify accomplishments and do something to end the project on a positive note. Celebrations need not be lavish to be effective. On **global teams**, arrange similar events for each location.

Analyze the Project

At the end of a project, conduct a *post-project analysis* to capture **lessons learned**. Meet with the project team soon after the completion of project work to list practices that went well and should be used on future projects. Also identify project processes that need change, and generate recommendations for remedy. Document the results and add the report to the project information archive.

9

Coaching and Mentoring

What: Sharing expertise with team members and building needed skills.
When: Throughout a project.
Results: Improved teamwork and better project performance.

Seek Opportunities to Help

Identify *capability gaps* in the project using **required skills analysis**. Identify proficiencies the project needs or would benefit from that are missing or insufficient. Use coaching for **performance problem resolution**.

Assess weaknesses on the project team and consider *threats and risks* that could require responses using specialized talents.

Align *personal goals* with project and organizational needs. Ask team members what they desire to learn and do, and use the information to guide **team management** and increase **motivation**. Keep the "big picture" and **project vision** in sight, and identify opportunities to develop new skills on the project team when **delegating responsibility**.

Foster an Open Environment

Build *trust* and teamwork, so people will feel free to discuss any matter or topic without fear of criticism. Encourage "pull"; respond positively to requests for help and encourage project staff members to let you know when they are inexperienced or lack skills needed for their assigned activities. Display **leadership**; model the behaviors you wish to see on the project: Follow through on commitments, make time for **communicating informally**, and be willing to teach and share your expertise.

Protect Confidentiality

Effective mentoring requires *discretion*. People need to feel free to reveal their shortcomings and ask "dumb questions." Because this may not be the

case when the mentor is also the individual's manager, mentoring is generally most successful across organizational boundaries, where adverse consequences and repercussions may be avoided.

Establish Enduring Relationships

Build on coaching and mentoring relationships over time. Establish long-term two-way relationships, where in some cases the roles reverse and the mentor requests guidance. Encourage people who benefit from mentoring to share what they have learned with others by becoming mentors.

10

Communicating Informally

What: Periodic person-to-person communication without a specific purpose.
When: Throughout a project.
Results: Good team relationships, fewer misunderstandings, and early warning of potential problems.

Informal communication is often as (or more) important on projects as formal communication. Many risks and problems surface first through conversations and other team interactions, and **team management** and relationship building depend upon it.

Take Advantage of Unstructured Communication

Casual *conversations* at coffee machines, in corridors, and in parking lots represent some of the most important project communication. Successful project leaders make an effort to encourage frequent, unstructured conversations, both with and among team members. "Soft data" and valuable project information often surface during unplanned exchanges.

Even with **global teams**, where you are seldom able to talk with people in person, there may be opportunities to do it once in a while; always take full advantage of face-to-face opportunities to enhance relationships. Use the *telephone* when you are distant. Call team members regularly, even when there may be no pressing project business, to ask how they are doing.

Practice Structured Informal Communication

Many project leaders set aside time at least once a week for "*managing by wandering around.*" MBWA is a particularly effective way to reinforce trust and build relationships within a project team. Although it is best done in person and with no particular objective, it can also be a part of regularly scheduled one-on-one meetings or telephone calls for **status collection** or discussion when **delegating responsibility**. Asking questions about interests, family matters, or other nonproject matters adds a personal touch and

helps build **motivation**, particularly if you keep it brief and restrict yourself to topics both of you are interested in discussing.

Informal communications are also an important benefit of *team activities*, longer meetings (such as **start-up workshops** and **project reviews**), and project celebrations. Use milestones and other key project dates to organize events that are at least partly social, to reinforce the connections on the team. Particularly for longer projects, extracurricular activities are effective in maintaining teamwork, but let the team choose the event. Avoid "forced merriment" and diversions that may annoy or distract the team. Eating together, scheduling an outing to a film, or engaging in some other event of mutual interest builds team cohesion essential to a healthy project.

11

Communications Planning (PMBOK® 10.2, Plan Communications)

What: Documenting communications decisions for a project.
When: Project planning.
Results: A communications infrastructure that ensures timely and effective communication with stakeholders and supports smooth project execution.

Determine Communication Requirements

Review the **project infrastructure** decisions and determine how all formal communications will occur. Define the internal reporting required for your project team. Plan for any external communications to those listed in **stakeholder identification**, especially your sponsor. Assign responsibility for all project communications, and schedule routine communications to support **project plan execution**.

If the project involves *confidential* or proprietary information, document how it will be handled.

Determine how project communications will occur. Plan to take advantage of all **information distribution** and *communications methods* available. Throughout the project use all types of communications: *formal* and *informal*, *written* and *verbal*.

Develop a plan for *archiving project data* and communications in a project management information system (often referred to as a PMIS), including project definition documents, project plans, status reports and presentations, logs of project issues and approved changes, and project closure reports. For all project data that will be stored online, consider security and determine what you may need to do to permit or restrict access.

Document the Plan and Get Approval

Record your decisions and identify anything in the communications plan that requires hardware you do not possess or will generate expenses beyond what is expected for the project. Present your plan to your sponsor for review and get approval for it.

Use Your Plan

Install any teleconferencing equipment or other hardware necessary to communicate with distant **virtual team** members, and test systems before their first scheduled use. If there are problems, schedule any upgrades or maintenance promptly and coordinate any planned changes to ensure ongoing compatibility.

Update your communications plan as needed to improve visibility and information flow throughout the project. For longer projects, reevaluate communications requirements during **project reviews**.

12

Conflict Resolution

What: Gaining team agreement following a difference of opinion.
When: Throughout a project.
Results: Ongoing cooperation and team cohesion.

Understand Sources of Conflict

Whenever people work together, there is potential for conflict. Avoiding disagreements begins with *minimizing causes*. Table 12.1 illustrates typical problems and remedies.

Table 12.1. Causes of conflict and their remedies.

Causes of Conflict	*Remedies*
Overlapping responsibility	• Clear **activity definition** • Unambiguously **delegating responsibility**
Differing cultures, viewpoints, perspectives, and backgrounds	• Effective **team management** and **team development** • Conducting a project **start-up workshop** • Avoiding unnecessary interactions that depend on **global teams** and **virtual teams**
Misunderstandings	• Thorough **communications planning** • Effective **information distribution**
Lack of trust and relationships	• Periodic face-to-face **meetings**

Deal with Conflicts

Detect conflicts early and deal with problems while they are still small. *Probe for information* using open-ended questions, seeking to understand the source of the disagreement.

Conflict-management modes include *forcing* (imposing unity through authority), *withdrawing* (moving on to other work without resolution), or *smoothing* (minimizing conflict by improving interpersonal relationships). Even *avoiding* any discussion may be possible on very short projects, but for

teams that must work together closely, only *confrontation* and *compromise* are effective for typical projects. Sometimes it is not possible to resolve conflicts while keeping everyone equally satisfied, so successful resolution often involves seeking a "third way" that is different from the team members' initial ideas but is one they ultimately accept.

Face the Issues

Resolving internal team conflicts begins with *meeting in person* (or via suitable conferencing techniques) so people can discuss matters openly.

Clearly state the problem situation, and verify that everyone *wants to resolve* the conflict.

Consider All Perspectives

Allow each person to *present his or her perspective* on the issue, without allowing any comments or criticism from others.

Clarifying questions are permitted, but narrowly *focus on facts and data*, not on personality and emotion. Use active listening, paraphrasing, constructive feedback, and open questions to gain understanding.

Quantify the alternatives and options discussed in terms of time, money, or other specific units that will support objective comparisons.

Seek "Win-Win" Resolutions

Brainstorm other alternatives and *combinations of ideas* presented. Use the information you have and **creative problem-solving** to develop new, better ideas with potentially broader acceptance.

Use systematic **decision-making** to reach *common agreement* or at least a resolution that everyone will accept.

Confirm closure and document what was decided.

Get Assistance When You Cannot Resolve the Conflict

In the case of especially significant external barriers and internal conflicts, you may fail to resolve the situation within your team. **Problem escalation** should always be a last resort, but a *forcing solution* imposed by the project sponsor or others with more authority may be occasionally necessary. Use this tactic sparingly; frequent escalations can lead to team resentment, malicious compliance, and future project conflict.

13

Consensus-Building for Your Ideas

What: Creating team support for your ideas.
When: Throughout a project.
Results: Group buy-in and agreement for your plan of action.

Note: This process is suitable for project situations where you need to gain approval from a group to implement an idea. For general group problem-solving, use the **decision-making** process.

Plan

Outline the situation requiring your response. After documenting it, write down any alternatives that you have for dealing with it. Do not limit yourself to considering only the option you prefer.

Identify all the team members, *stakeholders*, and others from whom you must obtain buy-in.

From the perspectives of these decision-makers, *analyze* each possible response, noting the benefits, costs, and any possible objections. If your preferred response remains the best overall alternative, develop credible answers for any objections you can anticipate.

Document your analysis, outlining the situation, your proposed response, and clearly specified and quantified benefits and costs. If you expect to have to do a formal **presentation**, organize it carefully, and rehearse what you plan to say.

Meet

Schedule a time and place to meet with the people who need to agree on your proposal. Get their commitment to attend.

Be thorough in your **meeting planning**. Set an *agenda* that covers presentation and discussion of the problem situation, analysis by the group, and closure with a decision.

Discuss the details of the situation and the consequences of taking no action.

Present a summary of your proposed response, emphasizing its *main benefits*. Continue discussing the details and show how your idea directly addresses the needs.

Invite questions, criticism, concerns, and objections. Acknowledge them and *respond* to them using the information you prepared. Encourage people to suggest modifications to your proposal that might improve it, and adopt any beneficial suggestions.

Ask if anyone has an *alternative* course of action that he or she would like to present. If there are alternatives, discuss them along with yours. Use the information on alternatives you developed before the meeting to raise any issues concerning costs or other deficiencies.

Summarize the *merits* of your proposal and of any alternative ideas discussed. Focus the summary on areas of agreement within the group.

Seek *consensus* from the group for a single idea. If your preparation was thorough and your proposal has merit, the group will choose your idea.

Acknowledge the agreement, *document* the decision, and close the meeting.

Take Action

Communicate the decision to all project contributors, and *implement* your idea.

14

Constraint Management and Plan Optimization

What: Resolving differences among project constraints and your bottom-up plans.
When: Project planning, execution, and control.
Results: A project schedule that is consistent with top-down objectives, or the best option and several alternatives.

Document Constraints and Limitations

Toward the conclusion of project plan development, *review and document* the **project objective**, assumptions, and constraints identified in your **project charter** at **project initiation**. Also note:

- Intermediate milestones and key *target dates*
- Profiles of *available staffing* effort from **human resource planning**
- Technical and other **required skills analysis**, with any *skill gaps* uncovered in **responsibility analysis**
- *Interfaces* and dependencies linking to any **multiple dependent projects**
- Any *other limitations* or issues identified in the planning process

Identify Discrepancies Between the Bottom-Up Plans and Goals

Compare stated project goals with your plans. Determine if there are issues between your **schedule development** and the project deadline. Identify differences between the project budget derived from **cost estimation** and the budget limits for the project. Outline any scope issues between defined project deliverables and what your project team is realistically capable of producing.

Document any significant *additional differences* between timing and specification of interim deliverables, the profiles from **resource leveling**,

unavailable skills, or any other variances between your plan and project requirements.

Use Priorities to Explore Trade-Offs

Review **project priorities**, and use **brainstorming** to develop *plan modifications* consistent with them. If schedule is the top priority, modify resources and scope as necessary to align project completion with the defined project deadline. **Software tools for project management** can make "what-if" exploration of project options easier.

Possible *resource* plan changes include:

- Locating and rescheduling work to use *resource undercommitments*
- *Delaying noncritical work*
- *Moving staff to more critical work* from noncritical activities
- *Outsourcing or adding staff* from other parts of the organization
- *Upgrading or replacing equipment* to improve efficiency
- *Increasing performance* through **process improvement**
- *Automating manual work*
- Using **rewards and recognition** to *improve productivity* and **motivation**
- *Building new skills* through training or **coaching and mentoring**
- *Decreasing interruptions*, distractions, and other commitments

There may be project specifications that are not essential or are not time critical. Consider modifications to project *scope*, such as:

- Prioritizing specifications and *deleting less important features*
- *Delaying some requirements* to a follow-on project
- *Phasing the delivery of results* over a longer time frame
- *Reducing complexity* of the required work
- *Finding opportunities for reuse and leverage*
- *Buying needed components* instead of making them

Even if timing is your highest priority, consider changes to the *schedule*, such as:

- *Revising activity dependencies*
- *Using float to accelerate critical tasks*, delaying less critical work
- *Fast-tracking*—breaking activities into pieces executed in parallel

- *Starting work earlier* than currently scheduled
- "*Crashing*" work by adding resources
- *Scheduling work on nonworkdays* (but this can backfire)

Document the Plan(s)

Consider changes you are empowered to make, and strive to develop a plan to *meet your project objective* and constraints. If you are successful, gain support from the team, document the resulting plan, and use it for **project baseline setting**.

If your best efforts still *fall short of the project objective*, document at least two plan alternatives that come as close as possible and at least meet the primary project priority. These alternative plans provide the data you need for **negotiating project changes** with your sponsor and stakeholders before **project baseline setting** and **project plan execution.**

15

Cost Budgeting (PMBOK® 7.2, Budget Costs)

What: Determining the overall expected project cost, based on bottom-up planning.
When: Project planning, execution, and control.
Results: A realistic budget for the project derived from detailed planning data.

Identify Direct Project Costs

Project **activity resource estimating** and **cost estimating**, which are central to **project plan development**, form the basis for cost budgeting. Accumulate all activity-related expenses for labor (based on effort estimates and appropriate labor rates), outsourcing, equipment, materials, software, travel, support, training, communication, services, and other nonlabor.

Determine the Project Budget and Project Cost Profile

Cost budgeting begins by accumulating these costs for the entire project. The *overall project budget* is the sum of all of the bottom-up costs associated with project activities plus any project-level expenses for **team acquisition**, overhead, or other indirect costs allocated to the project. For longer projects, you may also need to consider factors such as salary changes, contract renegotiations, and the effects of inflation.

The project budget also includes any *budget reserve* that you were able to establish during **risk response planning**. The total of all these project costs forecasts the project budget at completion (BAC).

You can also combine project budget data with **schedule development** to create a *cost profile* for the project. You can generate resource histograms for overall project costs using resource calendars from **human resource planning**, spreadsheets, project databases, and other methods, for the project as a whole or for specific cost categories. This same analysis process ap-

plies to **resource leveling**. The overall project cost profile also provides much of the information for **return on investment analysis**.

Profiles and histograms of costs (or effort) associated with staffing may be generated using **software tools for project management**. This is the foundation of *planned value* (or budgeted cost of work scheduled, BCWS), used for **earned-value management**. This period-by-period cost information displays when the project is expected to require various levels of effort. Earned-value analysis may be done using either effort statistics or overall costs.

Review Project Costs

Contrast the overall project budget with the project objective to determine whether the bottom-up analysis is consistent with the initial expectations of the project sponsor and stakeholders. If there are significant variances, either with the overall costs or with the timing of the costs, *minimize the differences* through **constraint management and plan optimization**.

If there are still problems after your best replanning efforts, *resolve budget issues* by **negotiating project changes**, and work to establish a realistic budget as part of **project baseline setting**.

Manage the Project Budget

Document the project cost baseline and use it to track project performance during **project plan execution**.

Develop a project *budget-management plan* and periodically revise it as necessary during **project reviews**.

16

Cost Control (PMBOK® 7.3, Control Costs)

What: Monitoring project costs and managing use of project resources.
When: Project execution and control.
Results: A record of project costs, with plan adjustments as required to meet budget expectations.

Determine Status and Analyze Variances

Cost control is central to **project plan execution**. It follows **status collection** and **plan-variance analysis** in the project-tracking cycle. It is necessary in any cycle where you discover a significant cost or effort variance, or your **earned-value management** measurements are over the limit. For each variance use **cause-and-effect analysis** to review its *root cause and impact* on the project timeline. If the root cause relates to individual or team ineffectiveness, work toward **performance problem resolution**. Determine whether the impact is a onetime or short-term issue, or whether the root cause is long term—a chronic problem or part of an adverse trend.

Plan Responses

Review your **project infrastructure** decisions and **integrated change-control process** to *ensure consistency* with agreed-upon principles.

Involve the project *team members* in your planning and **issue management**; engage as many perspectives and points of view as practical.

Determine the overall project cost impact by **forecasting project completion**. Depending on the severity of the problem and the nature of its root cause, the *type of response* may be:

- A minor change that preserves the **project objective**
- Implementation of a contingency plan developed during **risk response planning**
- A major change to the project

For *short-term* effort problems, consider "brute force" solutions, such as working overtime in the evenings or on nonworkdays.

For more significant problems, **brainstorm** approaches that could resolve the resource variance. Explore options using the processes of **project plan development**, especially **constraint management and plan optimization**. Develop plans that deal with the root cause of the problem, not just the symptoms. Avoid adopting the first alternative you develop; work to generate *several credible responses*. Typical responses include:

- **Resource leveling**
- Lengthening the schedule
- Finding lower-cost alternatives for project work
- Borrowing resources from other projects
- Reducing the scope of the project deliverable
- Implementing responses that were effective in similar past situations

For problems that cannot be solved using conventional analysis, use **creative problem-solving**. Allocate a reasonable amount of time to plan a response, but avoid "analysis paralysis." Set a time limit for planning, and use systematic **decision-making** to choose the *best idea* available within that limit.

Take Action and Document Results

Validate the response you select before you implement it. Verify that your proposal is consistent with your **project priorities**. If the response involves changes to the deliverable, get approval for it through **scope change control**. Discuss any major changes with the project sponsor and appropriate stakeholders. If necessary, use **problem escalation** to obtain approval. Very major changes may result in new **project baseline setting**.

Inform the project team and appropriate stakeholders of your plans and *implement the response*.

Following your implementation, monitor the situation to ensure that your response obtained the *expected results* and did not lead to adverse unforeseen consequences. If problems persist, seek a better solution through additional planning.

Update any project and *planning documents* that are affected by the actions, and reflect any new estimates in your **project budgeting**. Communicate the results of your efforts in project **performance reporting**.

17

Cost Estimating (PMBOK® 7.1, Estimate Costs)

What: Forecasting the costs of project activities.
When: Project planning, execution, and control.
Results: Cost estimates for all resources needed for project activities.

Estimate the Cost of Project Labor

Cost estimates are central to **project plan development** and require an effort estimate for each listed task in your project **activity definition**. Verify your effort analysis from **activity resource estimating**.

Calculate a cost for the effort using either expected actual labor expenses for staffing, or with whatever standard *labor rates* your organization has established for the relevant types of contributors working on your project.

Determine Other Costs

Some project activities will have expenses in addition to labor. Some possible additional costs are associated with **procurement administration**, equipment, materials, software, travel, support, training, communication, services, and other direct expenses. Estimate these *other expenses* for your activities, and ensure that they are consistent with your resource analysis.

Calculate Costs and Adjust for Uncertainty

Sum the labor costs and other expenses to determine a "most likely" cost estimate for each project activity. Establish and use consistent standards for the precision of all cost estimates. Estimates with more than about three significant digits are rarely realistic.

Once you have this base cost estimate, probe for failure modes and potential problems. Determine the cost and resource consequences of *worst cases*.

The Program Evaluation and Review Technique (PERT) offers a formula

you may use to adjust cost estimates for uncertainty: $c_e = (c_o + 4c_m + c_p)/6$, where c_e is a weighted-average "expected" cost, c_o is an optimistic cost, c_m is the most likely cost, and c_p is a pessimistic cost. Note significant pessimistic cost estimates in project risk identification, and consider them when establishing a budget reserve for the overall project.

Capture Cost Data

Document costs for project activities to support **cost budgeting**, **resource leveling** analysis, and **earned-value management**. Assign estimated costs to appropriate accounts or categories if this is standard practice for your projects. Project variance analysis and earned-value management rely on realistic activity cost information.

Update Cost Estimates

Revise cost and effort estimates as needed to resolve resource problems during the project through **cost control**.

Revalidate estimates for effort and cost periodically during **project reviews**, particularly for lengthy projects.

18

Creative Problem-Solving

What: Using novel or unconventional approaches to resolve project problems.
When: Throughout a project.
Results: Solutions to problems and situations that do not yield to "normal" techniques.

Frame the Problem

Novel approaches to problem-solving may be necessary in many project situations, including:

- **Decision-making**
- **Project plan development**
- **Scope planning**
- **Issue management**
- **Conflict resolution**
- **Process improvement**
- **Risk response planning**

Clearly *describe the problem* you face in writing. Outline conventional approaches that you applied to the problem and summarize why these methods failed to resolve the problem.

Engage the Right People

Work with a *diverse group* to stimulate ideas. Seek the help of people who have a track record of original thinking. Find help outside your normal work group—experts; people from other functions and disciplines; and contributors with different backgrounds, cultures, and perspectives. Involve generalists with a wide range of knowledge, and mix beginners and experienced team members together. Strive for synergy in the team, where the sum of talent exceeds the capabilities of the individuals.

Establish a Conducive Environment

Creativity is less likely in familiar surroundings. Find an *unusual place* to work—off-site, outside, or in someone else's workplace. Getting away from your normal work space also minimizes interruptions.

Provide an atmosphere where people can *take risks* without criticism. Foster a willingness to test new ideas and alternatives, and encourage the free cascading of thoughts. Encourage humor, fun, and positive interaction.

The best solutions may not emerge quickly; get commitment for the *time and effort* the problem deserves, but do set a reasonable time limit.

Approach the Problem

Begin by **brainstorming** possibilities for resolution. Encourage everyone to think like a novice, without preconceived notions of what will not work. Be organized and *have a plan* for proceeding—avoid "getting stuck." The following approaches may help:

- Consider new technologies and alternatives.
- Use analogies. Look for similarities in other fields.
- Combine ideas into new concepts.
- "Misuse" techniques, ideas, and tools.
- Focus on what you *can* make work and attempt to expand on it.
- Be persistent. Develop partial answers and work them into full solutions.
- Tolerate errors and failure; seek ways to address the defects or succeed with related methods.

Keep track of unsuccessful approaches; if something does not work, move on. Within the allotted time, select the best available option for dealing with the problem.

Implement and Communicate

Use the developed solution to *deal with the problem* situation.

Document your solution and *communicate* it to others responsible for similar project work. Also, capture information on any approaches you found deficient to avoid future blind alleys.

19

Customer Interviews

What: Discussions with customers and users of project deliverables to determine requirements and needs.
When: Project initiation and planning, with periodic review during execution.
Results: Clear knowledge of the customer environment, needs, and trends.

Plan the Interview

Interviews are a technique for one-on-one user **requirements collection**. Some interviews are part of the interaction with specific individuals who are project stakeholders. Other interviews are more generic, as part of qualitative **market research**. Whatever the purpose, *plan* the interview(s), estimating the required time, skills, costs for travel, and other expenses. Determine how many interviews you will need to do; 20 to 30 interviews are typical for market research. Set up appointments with the individuals you need to meet with well in advance. Obtain and test a tape recorder to use during the interviews.

Define what you need to learn, and develop a *discussion guide* to use during interviews to ensure that you consistently probe for the information you need. Do a practice interview with one of your team members before your first customer session.

If you will be able to interview a customer only once, ensure that the *people you meet with* will be able to discuss all the topics of interest adequately. Never conduct an interview alone; have at least one other person to take notes. If you are not fluent in the language of your customer, arrange for an interpreter.

Conduct the Interview

Arrive slightly early to ensure that you keep your appointment. Following introductions, briefly *discuss your objectives* and reconfirm the customer's agreement. Request permission to record the interview and set up the tape

recorder. If recording is not permitted, have a colleague take very thorough notes.

Ask your questions, but spend most of your time listening. You are there to collect *the voice of the customer*. Learn by watching what happens. Work to understand what the customer does.

When you are finished, *thank the customer*, and follow up afterward with written thanks and responses to any questions you were unable to answer during the interview.

Capture Results

Discuss what you learned immediately after the interview, and summarize your interview findings promptly in a consistent format. Soon after your last interview, *document your overall analysis*.

Use the *customer interview* information to complete a **scope definition** and conduct follow-up interviews to support **project reviews**.

20

Decision-Making

What: Using a systematic process to select one option among competing alternatives.
When: Throughout a project.
Results: Team buy-in for a decision that can be expected to deliver good results.

Define the Issue or Question

Good decision-making begins with a clear, *unambiguous statement* of the question that needs to be answered. Avoid beginning to solve problems prematurely, before you understand the issues. Use **cause-and-effect analysis** to probe for the source of the problem, not just the symptoms. Decompose complex issues into a number of smaller, simpler ones.

Frame the question by defining what results a decision must produce. Define measures that signify successful resolution, and limit your considerations to things that you can influence or control.

Determine Logistics and Procedure

Decision-making requires teamwork; determine *who needs to participate* and get their commitment to participate. If one or more distant team members participate, select times for conference calls that are acceptable to them.

Get agreement from participants on the *decision process* you will use. Objective decisions require defined criteria, such as cost, time, usefulness, completeness, or feasibility. Seek criteria that relate to your defined goal, and make them measurable. Prioritize the criteria by relative importance. Also identify any constraints such as time, resources, or required approvals.

Develop Options

Work with the team to **brainstorm** *options*. Generate as many as you can in the time available. **Creative problem-solving** techniques and **cause-and-**

effect analysis can help in developing a wide range of possibilities. Research the possibilities; investigate what others have done through networking, browsing the Internet, and benchmarking.

Analyze Options and Decide

Filter the options generated through a quick assessment using your decision criteria, especially if you have generated a large number of alternatives. Restrict detailed analysis to no more than about six options.

Analyze the best options, determining estimates for each that relates to your decision criteria. When it is difficult to quantify the assessment, compare options in pairs to determine which alternatives the team prefers, and how strongly it prefers them. **Software tools for project management** may be useful in complex situations.

Use the assessments to *sequence the options*, and then discuss how people feel about the prioritized list. Test the top option with scenarios, models, or simulations, and think about possible unintended consequences and risks. If there are valid problems with the first option, consider the next alternative or revise your decision criteria.

Use systematic analysis to *reach closure*, and document the team's decision.

Communicate and Implement the Decision

Document and *clearly communicate* the decision to all people it affects.

Implement the decision and measure the results.

Be prepared to *revisit and adjust* decisions if they fail to deliver expected results. It is usually better to make decisions quickly, following up with necessary modifications, than to wait indefinitely for complete information.

21

Delegating Responsibility

What: Setting individual goals and tracking them to completion.
When: Project planning and execution.
Results: Commitment by team members to goals that align with business and project objectives.

Set Goals

When setting goals, both the project leader and the individual team member involved should *create lists* of work to accomplish. The lists should include, but not be limited to, items from the **activity definition** in which the individual participates or is an owner. Strive to capture all significant current responsibilities. Schedule a meeting time to discuss goals.

Make one list by combining the items from the leader's and the individual's lists. For any goal that appears only on one list, discuss it and agree that it is valid before adding it. If similar goals are on the two lists, develop a single, consensus description.

Test that each goal described on the list is:

- *SMART*: specific, measurable, assignable, realistic, time-bounded
- *Stable* (if it may change, list one or more shorter-term goals)
- *Aligned* with business and **project objectives**
- *Coherent* (all the goals listed make logical sense together)
- *Clear* (the intended result is unambiguous)

To enhance **motivation**, include at least one goal that relates to a *personal preference* or desire for development.

Outline the *benefits* of achieving the goals to the individual, the project, and the overall organization. Uncover potential problems with goals through **risk identification**. If needed, modify goals to reduce risk.

Review the *target date* for each goal. Validate the activity duration estimates and cost estimates for all project activities where the individual is the owner. Modify unrealistic dates, and reflect any changes made in project planning

documents. Ensure that the highest-priority goals are scheduled for completion as early as practical and discuss the consequences of late completion in specific, measurable terms.

Document all current goals on the list, including any details on costs, timing, staffing, and external dependencies.

Get *commitment* for the goals on the list and express your confidence in the individual's ability to complete them successfully. Schedule periodic follow-up meetings to review goals and discuss progress.

Review and Update Goals

Prior to the follow-up meeting, *prepare to review* progress on the list of goals. Assemble data from **status collection** and if necessary, prepare a list of potential new goals to replace those that have been completed.

Begin the meeting by discussing finished work and goals showing satisfactory progress. *Recognize good performance* and thank the contributor for any goals completed. Consider **rewards and recognition** for completion of significant accomplishments.

Use **plan-variance analysis** to identify any *unmet goals* or any project work that is falling behind schedule. Use the follow-up meeting for each **performance problem resolution**, and determine if it would be best to adjust the goal, replace it, or drop it.

Discuss any proposed *new goals* and add them to the current list of goals. Reprioritize the resulting list, and adjust the dates on the goals as necessary.

To end the meeting, *document the updated goals*, and confirm the place and time for your next progress review meeting.

Communicate new schedule information about any goals that slipped or changed to any people or **multiple dependent projects** that may be affected.

Keep a *history* of goals and accomplishments for **project reviews**, evaluations, and analysis of **lessons learned**.

22

Delphi Technique

What: Using group input to refine forecasts and estimates.
When: Project planning, execution, and control.
Results: Credible responses to questions requiring quantitative answers, even when supporting data is sparse.

Define the Question

The Delphi technique draws on "group intelligence" and relies on the fact that although no one person may be able to provide reliable estimates confidently, the middle range of estimates drawn from a population of stakeholders is frequently a realistic predictor of numeric results. Delphi taps into *undocumented history*, often yielding very realistic estimates and forecasts. The collaborative process also builds **motivation**, ownership, buy-in, and **teamwork**.

To begin the process, clearly *state the question* requiring a numeric answer. For projects, the Delphi process can assist with:

- **Activity duration estimating**
- **Activity resource estimating**
- **Cost estimating**
- **Quantitative risk analysis** of impact or probability
- **Decision-making**
- Forecasts for **return on investment analysis**

Gather *five or more people* who possess relevant experience and knowledge, even though they may not have confidence that they can answer with precision. Meetings in person are best, but **virtual team** meetings can be effective.

Provide facts, issues, constraints, and assumptions related to the question. Share information on any aspect except for *your opinion* on the answer.

Familiarize the team members with the *Delphi process* if it is new to them.

Collect Responses

Collect an initial response to the question from each participant. The participants should generate responses quickly and *individually*. Responses can be either anonymous or attributed.

Sort inputs based on the numerical responses into three roughly equal groups: the highest, middle, and lowest thirds.

Discuss the Outcome

After collecting the individual responses, encourage *group discussion*. Consider these questions:

- Are the most pessimistic responses based on specific experiences?
- Are there credible shortcuts or innovative methods that support the optimistic responses?
- Is the average of the middle responses realistic and reasonable?

Repeat the Process

Collect *another set* of individual responses. After collection, group and discuss them.

Convergence in two to three cycles is common for most project-related questions. Strive for *consensus*, or at least an answer that all on the team will accept.

Document and use the outcome of the Delphi process.

23

Earned-Value Management (EVM)

What: Using predictive and diagnostic project metrics to determine project performance.
When: Project planning, execution, and control.
Results: Early detection of resource-overconsumption issues, as well as reliable forecasts of adverse budget and schedule trends.

Understand the Basis

Earned-value management (EVM) seems complex, but it has a simple foundation. **Project plan development** generates a schedule and a budget documented during **project baseline setting**. **Project plan execution** generates real data, resulting in an actual schedule and an actual budget. EVM is one way to assess the *differences* between these schedules and budgets. EVM evaluates project progress in terms of diagnostic **project metrics** (using resource units, either *money* or *effort*) related to these schedules and budgets in various combinations. Table 23.1 illustrates the three principal metrics for EVM.

Table 23.1. Principal EVM metrics.

	Budgets	
Schedules	*Planned Expenses*	*Actual Expenses*
Planned Schedule	Planned Value (PV)	
Actual Schedule	Earned Value (EV)	Actual Cost (AC)

EVM tracks planned and actual cumulative resource consumption at the level of project activities. When all three of these metrics are the same, a project is considered on time and on budget.

The first requirement for EVM is **cost estimating** for each activity defined at the lowest level of the **work breakdown structure**. The overall budget is allocated among the planned project activities, accounting for exactly 100 per-

cent of the project budget. *Planned value* (PV), also called the budgeted cost of work scheduled (BCWS), is a running accumulation of these costs for the entire project based on the project schedule. Because PV may be calculated from the baseline plan, it is actually a predictive project metric, but for EVM it is generally treated as a diagnostic metric, calculated periodically along with the other measures.

Whereas PV is based on the planned schedule and planned budget, actual cost (AC) is calculated using the actual schedule and actual budget. AC, sometimes referred to as the actual cost of work performed (ACWP), is a running accumulation of the actual costs for every project activity that is currently under way or complete. EVM does not directly compare PV and AC, because their differences may result from budget issues, schedule variances, or both.

To untangle the comparison problem, *earned value* (EV) is derived from a combination of the planned budget and the actual schedule. EV, defined as the budgeted cost of work performed (BCWP), is the running accumulation of the costs that were planned for every project activity that is currently complete.

Perform the Analysis

Actual costs are *assessed* throughout the project through **status collection**. For a given date, EV and PV are most commonly calculated using the 50/50 rule—accumulating half the planned cost on the start date and the other half at the finish. EVM metrics may also use interpolated estimates for **performance reporting**.

Assess budget performance by combining earned value and actual cost. These metrics are both based on the *actual schedule*, so any difference must result from resource consumption. The *cost performance* (CP) is EV minus AC and is a quantitative measure of how much the project is currently over (or under) budget. The ratio of EV to AC is the *cost performance index* (CPI), revealing the consumption of the project budget as a percentage. Positive CP, or a CPI above one, indicates that the project is under budget.

Assess schedule performance by combining earned value and planned value. Both EV and PV are based on the planned budget, so any difference in the two must result from schedule variance. *Schedule performance* (SP) is EV minus PV, and the *schedule performance index* (SPI) is the ratio of EV to AC. For assessing project performance schedule, however, there are other techniques for **project variance analysis** that may be more accurate and easier to evaluate.

The project in Figure 23.1 is about half completed, and its EVM shows that it is significantly over budget and somewhat behind schedule.

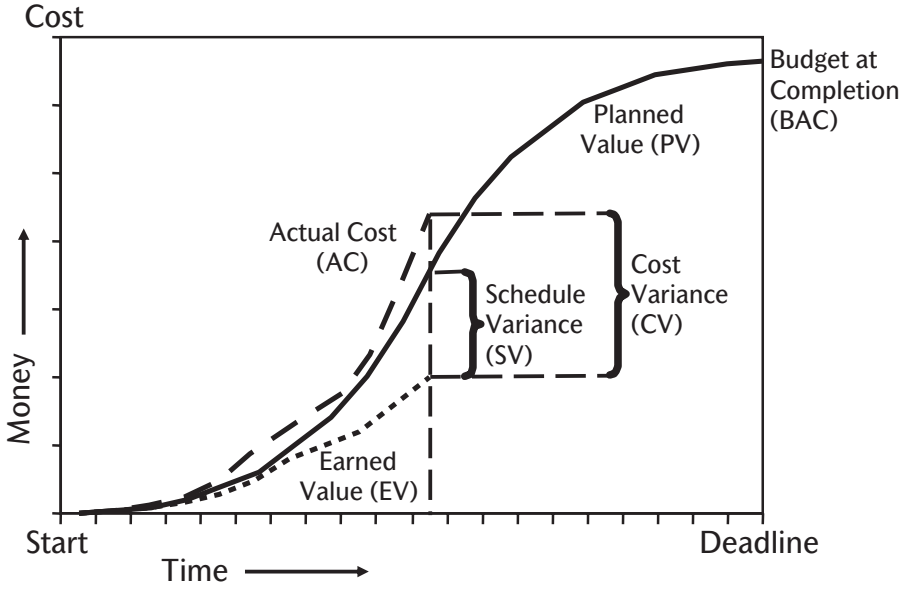

Figure 23.1. Graph of EVM metrics.

The *value* of EVM is debated extensively. It can represent quite a bit of overhead, and for some projects, tracking the data may seem like overkill. On the other hand, EVM accurately predicts project budget overrun as early as 15 percent of the way through a problem project, and it also provides an effective basis for **forecasting project completion**.

24

Forecasting Project Completion

What: Using predictive and diagnostic project metrics to estimate project completion.
When: Project execution and control.
Results: Realistic project expectations based on reliable forecasts of budget, schedule, and other project trends.

Although some projects reassess project completion with each cycle of **project variance analysis** and communicate it as part of routine **performance reporting**, other projects do it less frequently as part of **project reviews** or with other periodic high-level project analysis.

Verify Project Status

The first step in assessing project completion is to establish a credible picture for the project. Assemble the current accurate schedule, effort consumption, cost, and other **project metric** data, and use them to determine how your project is doing compared to the commitments made during **project baseline setting**. There are a number of specific measures related to project completion defined as part of **earned-value management** (EVM), but even if you are not using EVM to track project progress, you can use other straightforward techniques using other project metrics for determining whether the current expectations for schedule, budget, and other overall project objectives remain realistic. If forecasting reveals significant shifts, begin **negotiating project changes** and working on **stakeholder-expectation management**.

Forecast Project Financials

Project financial analysis involves comparing expected expenses with actual expenses and then extrapolating the results to determine if the committed budget is realistic. One simple high-level assessment technique begins by calculating two ratios, one for activities and another for financials. The activity ratio is the number of project activities completed to date divided by the

total number of activities defined at the lowest level of the project **work breakdown structure**. You can compare this ratio with the aggregated actual expenses to date divided by the total committed project budget. If the ratios are comparable, the project may be doing well. However, if the completed activity ratio is 0.3 and the expense ratio is higher (for example, 0.5), the project is likely to overrun its budget significantly. Extrapolation using this technique would predict a final cost of about 167 percent of budget, but this high-level technique is imprecise. A better estimate of the overall final budget could be actual expenses to date plus remaining costs based on revised **costing estimates** for all remaining activities.

For projects employing EVM, there are several well-defined methods for determining project estimate at completion (EAC). The most optimistic method assumes that the initial analysis for all remaining work was accurate and adjusts the original Budget at Completion for the current cost variance (CV), or earned value minus actual cost. (In other words, this "best case" EAC = BAC – CV.)

A more widely used formula assumes that the performance to date is a better predictor than the original estimates for future work, so it calculates the adjustment to the initial BAC by dividing BAC by the cost performance index (CPI). (This "realistic case" EAC = BAC/CPI.) An even more conservative method further adjusts this by dividing BAC by both the CPI and the schedule performance index (SPI), on the assumption that a slipping project will be even more over budget. (A "worst case" EAC = BAC/(CPI × SPI).)

Two other metrics are used for resource and cost forecasting: estimate to completion (ETC, the cost of remaining work), and the to complete performance index (TCPI, a diagnostic metric indicating the performance required to achieve the goal BAC). ETC is calculated by subtracting the current actual cost from the project EAC, which is derived using any of the three methods. TCPI (or sometimes to complete index—TCI) is the ratio of work remaining to funds remaining and is generally calculated as (BAC – EV)/(BAC–AC). A TCPI greater than one indicates that without improved performance the project will overspend its BAC. For this metric, the numerator is based on plans and the denominator is based on actuals. A TCPI variant that indicates the performance needed to meet the current EAC uses (EAC – AC) in the denominator.

Forecast Project Timing

Project timeline analysis is similar. It involves comparing duration estimates with actual durations and then extrapolating the results to determine if the

committed deadline is realistic. The same simple high-level assessment technique uses two ratios, this time with one for activities and another for timing. The activity ratio is exactly the same—the number of project activities completed to date divided by the total number of activities defined at the lowest level of the project **work breakdown structure**. Compare this ratio with the time elapsed on the project so far divided by the total project timeline. If the ratios are comparable, the project is probably on track. However, if the project has used half its time and completed fewer than half the activities, it may be cause for concern. Again, extrapolating an adjusted timeline using these calculations would not be precise, but a significant difference should trigger more detailed analysis of project performance. For a more accurate schedule assessment, use updated **activity duration estimates** for future work along with actual schedule performance to date to reforecast the project completion date. Such analysis is easiest with tracking Gantt charts in a **software tool for project management**.

As a project nears completion, it is also useful to track the results of testing. Projects of a given type tend to exhibit predictable timing in the testing phase. You can use retrospective project metrics to accurately predict the amount of time remaining after the number of uncovered defects and problems per testing period levels off and begins to drop.

You can also estimate schedule forecasts using EVM. Schedule variance (SV) is not measured in time, but you can adjust the expected completion date using the timing difference between the dates when the project PV was equal to current EV. (If EV is lagging, determine the elapsed lag compared to the expectations in the baseline plan.) You can also use the SPI to adjust the overall timing, which you can convert to a new calendar date. Although EVM is theoretically capable of forecasting project timing, other methods tend to be both easier and more accurate.

25

Global Teams

What: Communicating and working well with team members from other cultures.
When: Throughout a project.
Results: Project performance that meets expectations for international teams.

Justify Global Projects

Work in modern companies is worldwide. Projects are global for a variety of *reasons*, including:

- Products and services are used in many countries.
- Companies have employees all over the world.
- Global staffing can lower project expenses.

There are many potential *benefits* of global teams, including access to new skills, 24-hour coverage using normal shift workers, lower project costs, and local knowledge of distant users. However, these prospective advantages come with *challenges*:

- Global team communication is hard, involves multiple languages, and can be expensive.
- Time differences are inconvenient.
- Work styles and cultural variations can lead to difficulties and misunderstandings.
- Confusion and conflict may be frequent.
- Effort for global teams is nearly always higher, compared to a co-located team with similar capabilities.
- When global teams do get together, it is time-consuming and expensive.

The *results* of global projects can be excellent or a disaster (few global projects are "average"), depending on whether the benefits or the challenges

dominate. Success requires project **leadership** that sets a foundation for effective communication and minimizes the challenges.

Understand the Effects of Distance and Language

Different primary languages for global team members may make project communication very difficult. Even when team members share proficiency with a written language, spoken communications can cause misunderstandings and lead to problems. Even sharing a language may not be enough; English in different parts of the world uses the same words to describe different things. Project **communication planning** requires minimizing of jargon, acronyms, and idioms and demands unambiguous content in project documents.

National and regional culture affects communication, but even *company culture* and differences among job functions also matter. How people ask for things, come to agreement, and interact can vary a great deal on any team.

The key to leading projects of all types is communication, and the project leader must ensure *appropriate translations*, so when you are not able to provide clear information personally to the project team and stakeholders, you need to use professional translators. Effective language translation requires both time and money, so consider it in **schedule development**, and include funding for it in your **cost budgeting**. Technical translation is difficult, so work to ensure that the translators are competent both with the languages needed *and* with your technologies.

Tailor Communication Styles

Global teams also differ in *communication preferences*. Although some team members may be more social and talkative, other team members will be more terse and business-oriented. Choose effective **leadership** and communication styles.

Use effective methods of inquiry; *avoid "yes/no" questions* with team members who might say "yes" to be polite.

Whenever you are asking questions *in writing*, carefully reread them. Even innocently written questions may seem insulting or rude to the people receiving them.

There are no fixed rules on communication styles; the best way to proceed is through good **team management** and *one-on-one rapport* with distant team members. If possible, begin global projects with a face-to-face **start-up workshop**. That way, minor issues will remain minor.

Choose the Best Communication Methods

Communication in global teams is both *formal and informal*. If formal communication (**performance reporting**, documents, scheduled **meetings**, **presentations**, and **project reviews**) is ineffective, people will have too little information and project performance will suffer. If **communicating informally** (conversations, e-mails, social interactions, and memos) is inadequate, problems will surface too late, when they are difficult to solve. Preferences differ, so balance project communications to support the project and provide communication that serves everyone's needs.

There are *many techniques* for **information distribution**, but on global teams most communication is either "same time, different place" or "different time, any place." Neither is as effective as in-person communication, but if you conscientiously use all the methods available that are suitable for the team, you can be successful. Avoid using only one or two methods.

Because verbal communication is so difficult on global projects, after teleconferences, meetings, and conversations, always *follow up in writing*.

Manage Other Project Challenges

Confirm *continuing strong sponsorship*. Lacking adequate **sponsorship**, a global team is almost certain to fail.

On global teams, the *work styles* of team members from different cultures can vary a great deal. Some people are team-oriented and accustomed to working within a defined, structured hierarchy. Other people may be independent and more comfortable working independently in an environment where everyone has equal authority. Strive for a project **work breakdown structure** that decomposes project work in ways that minimize the need for people with different working styles to interact closely. In **project plan development**, structure the work consistently with project staff preferences.

Culture also affects how *time and deadlines* are perceived. Some people are scrupulous about making and meeting time commitments, and others have a less precise approach to deadlines. Even the way that people discuss time varies a great deal, making **status collection** on global teams difficult. Make time commitments as explicit as possible, and minimize dependence on team members who have a history of timing problems for key milestones.

Work to achieve a *consistent view* of the **project vision** and its expected results, and use this to bridge any differences and bring the team together. A common goal that everyone understands and considers meaningful is essential to a smoothly working global team.

Increase **motivation** and buy-in to the project by obtaining *documented commitment* when **delegating responsibility**. Ensure that all managers involved also support and understand the commitments.

Project plan execution also requires *extra attention* on global projects. To be effective, you may need to build **influence without authority**. You may need to send inquiries several times, and you generally will send out more information than you get back. Effective project leaders tend to lose some sleep; working with distant team members is most successful when you contact them while they are awake and in the office.

26

Human Resource Planning (PMBOK® 9.1, Develop Human Resources Plan)

What: Defining staffing, roles, responsibilities, and organizational structures for the project.
When: Project initiation and planning.
Results: A project roster defining expected contributions and reporting relationships, either by name or with a plan for resolving staffing requirements.

Determine Necessary Staffing

Capture project *resource plans* based on committed resources, as part of overall **project plan development**. Formally document all ownership and responsibility commitments.

Use **activity resource estimating** to summarize the *staffing* needed to complete each task listed in your project **activity definition**. Use this data and **required skills analysis** to assess your project's talent and headcount needs.

Also assess the overall project needs for organizational support and communication, technical inputs, **stakeholder-expectation management**, user and customer interaction, and other necessary interactions. Document these *interfaces*, liaisons, and connections.

Document all project *staffing needs*.

Analyze Existing Resources

Identify all committed initial staffing, and document the initial project team roster during **project initiation**. Determine *available resources*, using information from your **project charter** and other planning documentation. Assess the realistic capacity available using committed project staff. Ask contributors about other commitments, anticipated time off, and any other

factors that will reduce the amount of available effort. For extended team members, be realistic about how much effort "part-time" on the project actually represents, and be skeptical of optimistic-sounding promises from staff members working on **multiple independent projects**.

Develop a project-resource calendar to show available resources using a time-scaled histogram or spreadsheet similar to your required resource profile. Identify any differences between what you need and what is available. If your preliminary project plans reveal significant *overcommitments*, attempt to resolve them through **resource leveling**. Determine which project activities are understaffed, and document your analysis with planning data.

Compare the skills and experience of the project team with the project skills analysis. Also, use **responsibility analysis** to align staff members with each project activity derived from the **work breakdown structure**. Identify *unmet resource requirements* that project work depends upon, such as:

- Unavailable skills or inadequate experience levels
- Key unstaffed project roles
- Insufficient staffing levels

Review Staffing Procedures and Standards

For projects that will *need to add staff* through hiring, employee transfer, contracting, or other means, ensure that you understand the processes required and that you have commitment from your project sponsor and others in your organization who must support and approve the process. Locate and use templates, filled-out forms, and other staffing documents to minimize effort and potential problems in moving forward.

Identify the *support people* in your organization (such as legal, procurement, and human resources) who will be involved, and obtain their commitment to assist your project.

Develop a Project Roster

Outline the roles and responsibilities required by the project work, and determine the number of project contributors needed for each of the roles. For each identified role for which there is a capable team member already committed to the project, *list the contributor by name* in a project roster or organization chart, along with contact information and other needed data. When project contributors are also committed to other projects or to nonproject work, determine and document the amount of effort available, and include

their availability in the overall staffing analysis. Some find it useful to distinguish between "core" project team members, assigned to the project full-time throughout the work, and "extended" team members, who are essential but less involved. Include other relevant data on your roster, such as telephone numbers, locations, and e-mail addresses. For **global teams** and **matrix teams**, also list organization and time-zone information.

For roles that are not filled (or only partially filled), document the issues.

Resolve Staffing Issues

Determine how you will meet all *unresolved resource requirements*. Options include:

- **Negotiating project changes** to timing or scope to align with available resources
- Additional **team acquisition**
- Contracting for outside help through **procurement planning**

Add all resource issues that are not resolved to the *project risk list* during **risk identification**.

27

Influence Without Authority

What: Gaining commitments from project contributors from other organizations.
When: Project planning, execution, and control.
Results: Cooperative relationships within diverse teams and reliable project commitments.

Prepare

On modern projects, there are many reasons project leaders may have no direct authority over team members. **Matrix teams**, with contributors who report to other managers, and geographically distributed project teams are a prime example. Projects that depend on staff and consultants external to the project as a result of **procurement planning** may also face control challenges. Although cross-organizational teams may have many potential benefits, ultimate project success depends upon your effort and **leadership** to *establish influence*, ensure effective **team management**, and obtain credible commitments.

One source of influence is **sponsorship** from upper managers or from powerful, respected individuals. Work to *build high-level support* for the project from key decision-makers and stakeholders who will back up requests, escalate issue resolution, and assist you in gaining and holding the attention of project contributors. Work with them to establish a **project vision** that they will promote, and align your **project objective** with their goals.

As you assemble the *core project team* and complete your **team acquisition**, seek team members who are likely to get excited by the project and be compatible with other team members. Investigate the backgrounds and organizations of potential contributors, and discover what they, and their managers, care about.

Plan the **project infrastructure** to best support a diverse team. If the project team is *not co-located*, get committed funding for periodic travel to bring team members face-to-face. Fully employ **virtual team technical tools** in your **communication planning**. Cultural differences are often

both the greatest asset and the biggest challenge for cross-organizational teams. Set up the project to maximize the benefits of diversity, and pay close attention to **global team** communication requirements.

Establish Relationships

Schedule and hold a project **start-up workshop**, so you can get to know your team members better. *Discover the individual preferences* of everyone on the project team. Ask people about recent accomplishments that they are proud of, and probe for their individual goals and aspirations for the project. By discovering what they care about, you can structure project responsibilities to take advantage of their innate **motivation**.

As the planning for the project proceeds, align ownership of work from **activity definition** with individual preferences. When **delegating responsibility**, use the *principle of reciprocity*. In return for a commitment to the project, offer something meaningful in exchange. Assess what you and the project have to offer, and use these currencies to gain reliable agreements to deliver what the project requires. As a project leader, you have more to offer than you may suspect. Currencies for exchange may be:

- *The work* (ownership and responsibility, learning and **team development**, new technology, challenges)
- *Recognition* (**rewards and recognition**—tangible and intangible, thanks, visibility, reputation building)
- *Interpersonal factors* (trust, networking, loyalty, teamwork, friendship)
- *The project itself* (**project vision**, importance, business results, job security)

Clearly *document all commitments* with team members, and verify each agreement with the team member's direct manager.

Maintain Relationships

Deliver on your promises. Uphold your end of each agreement you have made. Protect your reputation for doing what you said that you would do, fully and on time.

Frequent, effective *communication* is essential to sustaining relationships. Throughout **project plan execution**, tailor formal communications to meet the needs of the team members, and solidify team trust by **communicating informally** with everyone frequently. Meet face-to-face with team members

as often as practical. Stay in close contact with team members who belong to external organizations, going beyond the requirements of **procurement administration**.

Identify problems before they become project threatening. Be disciplined in **status collection** and use **project variance analysis** to detect slipping commitments, so you can quickly recover through **performance problem resolution**. Confront team discord promptly and restore cooperation through **conflict resolution**.

Recognize contributions of team members throughout the project. Thank people individually following completion of project work, and take full advantage of any opportunity to use existing reward and recognition programs. Highlight significant accomplishments, naming names, in **performance reporting** and in project **presentations**.

At least every six months, *assemble the team in person* to reinforce project goals, reacquaint the people, and do a **project review**. Validate all existing and new commitments, and schedule some time for a casual team-building event to have some fun and celebrate project results so far.

28

Information Distribution (PMBOK® 10.3, Distribute Information)

What: Providing timely status information to the project team, stakeholders, managers, and others.
When: Throughout a project.
Results: Periodic, accurate reports and presentations, and a thorough, accessible archive for project data.

Establish Routine Project Communications

Determine how and when project information will flow through **communications planning**, based on the needs and locations of your team members. Use your **project infrastructure** decisions to select *methods* appropriate for various situations, such as those in Table 28.1.

Table 28.1. Communication methods.

	Same Place	*Different Place*
Same Time	• Conversations • Meetings • Networking • Team-building activities • Celebrations	• Telephone calls • Teleconferences • Videoconferences • Web-based meetings
Different Time	• Reports • Newsletters • Audio recordings • Video recordings • Yellow sticky notes • Memos	• Voice mail • E-mail • Fax • Websites • Network collaboration tools • Interoffice mail • Other mail

Use all the communication means you have available, and provide information to team members using the methods they find easiest to use. Team members will need access to detailed information, so ensure that they can easily and accurately read diagrams, tables, planning documents, and other formatted information, and be sure all communication systems are *compatible*.

Use *standard formats* for routine communications throughout the project to make finding information easier for the recipients. Minimize the use of acronyms, technical jargon, idioms, and other potentially *unfamiliar language* that may confuse some of the project team members. If you must include potentially difficult terminology, define it when you first use it in *each* document.

Summarize Management Reporting

When providing high-level project information to influential people listed in **stakeholder identification**, including sponsors, managers, and others who can affect your project, analyze the information before sending it. Begin with a short *summary* including your main points. To clarify complicated or technical information, develop graphs, diagrams, and carefully written descriptions to make the information as clear as possible for the people who are not deeply involved with the project. Be careful to exclude unnecessary detail in high-level communications and **presentations**.

Establish Your Project Management Information System (PMIS)

Decide where and how to *archive project information*. Determine where it will be stored and for how long. If there are security issues, identify the people who must be able to read and update the archives, and implement systems to ensure that those who should not have access are excluded. Provide for storage of the **project charter**, all project definition reports, project planning documents, and reports and logs that are generated during project execution. If the documents are not stored online, develop a system for sending copies to all locations where the project team will access the data, and work to keep all locations synchronized with current versions of each project document.

29

Inheriting a Project

What: Taking over a project already in progress.
When: Generally during project execution.
Results: Project continuity that is as seamless as possible.

Turnover in projects is common, and sometimes it may involve the project leader. In some cases, the project you will be asked to take over will be in great shape, having been managed by a competent leader who is no longer available for reasons having nothing to do with the project, such as an injury, an illness, or a promotion. More commonly, though, leaderless projects are troubled projects, so it is best to be very organized and proceed with caution.

Engage the Team

If you do not know your new team members, introduce yourself and find out what each contributor does. Verify roles and responsibilities and invest time in **team management** to build *relationships and trust* with each person. Use **informal communication** to get to know the team, and interact face-to-face as much as possible.

Discuss the project with each team member, using an approach similar to a **lessons learned** analysis. Ask what is going well and what each person feels is the best way to keep things going well. Probe to uncover the *need for changes* and commit to using **issue management** and **process improvement** to correct any uncovered problems.

Even though you may not really have much of a grasp of what is going on, encourage people to *continue the work* and keep things moving, **delegating responsibility** for **leadership** when necessary while you work to better understand the project.

Verify (or Create) Plans

It is wisest to treat an inherited project the same way you would a new one. Verify **sponsorship** and **stakeholder identification**. Engage the key people surrounding your project to ensure that you understand what they expect.

Begin to develop relationships with those outside your project whom you will interact with and review the **project charter** and **scoping definition** to validate that they remain accurate. (If there are none, work to establish them.)

If there appears to be a good overall *project plan*, use it to track the current efforts, but be skeptical. Review any existing planning documents carefully, and use them as the basis for your own **project plan development**. Work with the team to create your own up-to-date, realistic plan as soon as practical.

Establish a Realistic Project Baseline

If your best bottom-up credible plans are not consistent with the project's stated objectives, approach your sponsor and use your data to begin **negotiating project changes** for realistic **project baseline setting**. You will have some initial leverage; the organization does require somebody to lead the project. Use your brief window of opportunity to propose changes. It may be crucial for success to *shift the project baseline*. The former project leader left for some reason, and it may or may not have been exactly what you were told.

A change of project leader is a useful time to schedule a **project start-up workshop**, or even a **project review**. Most of the planning you need to do can be integrated into these sessions, and as a bonus, the efforts are excellent for team development and building the relationships and trust you will need for project control.

30

Integrated Change Control (PMBOK® 4.5, Perform Integrated Change Control)

What: Managing changes for all project aspects.
When: Project execution and control.
Results: Coherent management of changes, and minimization of unintended change consequences.

Identify Potential Project Changes

After you have completed **project baseline setting**, use a set of processes to manage integrated change control for the project. With the plan set and scope frozen, your *documented processes* for dealing with change are essential for project stability and ultimate success. Even for small projects, written processes will enhance your chances of success.

Potential project changes originate from many sources but they tend to fall into two categories:

1. *Internal* (**project variance analysis**, **performance reporting**, **project reviews**, **risk identification**, team-generated ideas, opportunities, loss of staff)
2. *External* (change requests, regulatory changes, modified standards, **market research**, new technology, meddling sponsors, natural disasters)

For all project changes, the main principle is to *resist all changes* until you can determine that the change represents a net positive business value—that the benefits expected of the change significantly exceed the consequences.

An overall project change process closely resembles the "*Plan-Do-Check-Act*" cycle of quality management. Validate all changes made, and adjust as necessary.

Document and Analyze Changes

Regardless of the source, provide *written documentation* for each proposed change (at a minimum as part of your routine **performance reporting** and **information distribution**). Scope changes generally employ specialized forms and entail detailed processes for documenting, logging, and tracking submitted changes.

Integrated change control includes many different types of change. *Analyze each proposed change*, using the appropriate process for its type, as shown in Table 30.1.

Table 30.1. Changes and their control processes.

Types of Change	*Principal Control Processes*
Scope	**Scope change control**, **Quality control**
Schedule	**Schedule control**
Cost	**Cost control**
Internal Staffing	**Organizational planning**, **Human resource planning**
Internal Staffing	**Procurement administration**
Risk	**Risk response planning**, **Risk monitoring and control**
Process	**Process improvement**, **Organizational change**
Overall	**Project review**
Catastrophic	**Problem escalation**, **Canceling projects**

Determine the *consequences* for every potential project change in specific terms, such as cost, timing, effort, reduced deliverable value, staff morale and **motivation**, customer confidence, or other relevant factors. Also consider the risks and possible unintended consequences of the change. Especially for major changes, apply the techniques of **project plan development** to assess the implications for **forecasting project completion**.

Estimate the worth of the *expected benefits* of the change (the value of problems solved, shortening of the schedule, improvements to deliverables, higher efficiency, or whatever the primary intention of the change happens to be). Be skeptical of optimistic value assessments for proposed discretionary changes.

Decide and Communicate

Use a systematic process for **decision-making**, and make a prompt *business decision* for each change. For each potential change, there are four alternatives: approval, approval with modification, deferral, and rejection. For changes that are mandatory (satisfying legal requirements, solving project-threatening

problems, responding to significant external factors), the decision is usually easy: Accept the change or cancel the project. For discretionary changes, a default decision of "reject," or at least "defer," is safest, but the net value of some changes may seem so significant that it will make sense to accept them. When this is the case, verify precisely what is necessary and strip out anything superfluous before approving any change.

Before final acceptance of any change that affects the **project objective**, **negotiate project changes**, and for major shifts, revalidate **project baseline setting**. *Update all project documents* that are affected by accepted changes.

Document every change decision, supported by analysis, and *communicate the results* to the requestor, your team members, and appropriate stakeholders. For all accepted changes, consider implications for **stakeholder-expectation management**. Log all change decisions, and store the data in your project information archive, for use in **project reviews** and analysis of **lessons learned**.

Implement all approved changes promptly, and monitor for expected results and any unintended consequences.

31

Issue Management

What: Dealing with project problems and variances.
When: Throughout a project, but primarily during execution.
Results: Prompt resolution of project issues.

Establish an Issue-Management Process

If you do not already have an issue- or action-item tracking process, establish one early as part of your **project infrastructure**. Set up the process to deal with project problems relating to resources, timing, priority, and other matters. Get *buy-in* from your team for a disciplined process that identifies, tracks, and resolves issues promptly.

Create an *issues log* in your **communications planning**. Make it part of your project management information system and ensure that it is easily accessible online by members of your project team and by appropriate stakeholders. Include information on each open issue in a table, spreadsheet, or Web-based list, including an identifier or code associated with each issue to facilitate communications. Table 31.1 provides a sample log.

Table 31.1. Sample issues log.

ID	*Description*	*Opened*	*Due Date*	*Priority*	*Owner*	*Status*	*Comments*
41	Part shipped late	03 Jan 20xx	31 Jan 20xx	High	Frodo	Open	Expediting from alternate source

Track and Close Issues

Issues may arise anywhere in a project, in processes such as:

- **Project variance analysis**
- **Performance problem resolution**
- **Scope change control**

- **Quality control**
- **Risk monitoring and control**
- **Procurement administration**
- **Constraint management and plan optimization**
- **Project reviews**

Whenever a problem arises, add it *promptly* to the issues log. Work to uncover and resolve issues early, when it is more likely that you will be able to recover through actions under your control.

For each open issue, *identify an owner* by **delegating responsibility**, and set a *realistic due date* for resolution.

Monitor issues as part of your **status collection** and include issue discussions in your **meetings**, **presentations**, and **performance reporting**. Reporting on overdue items using "Red-Yellow-Green" stoplight indicators is an effective and public way to ensure that the issues are visible and getting the attention they require.

Work to resolve and close issues using techniques such as **creative problem-solving**, **cause-and-effect analysis**, and **conflict resolution**.

Dealing with issues may require project shifts requiring **integrated change control**. For problems that affect your project objective, the shifts may involve **stakeholder-expectation management** and revisiting **project baseline setting**.

Resolving an issue within the project team is always the most desirable option but is not always possible. For issues that are overdue or that the assigned owner cannot reasonably resolve, use your **problem escalation** process to engage your sponsor or someone else with sufficient authority to close the issue. Never hesitate to escalate major issues, but reserve this tactic for the most severe situations because it may interfere with your **team management** and can result in unintended consequences that create new problems.

32

Leadership

What: Inspiring others toward a shared objective.
When: Throughout a project.
Results: Improved team motivation and enthusiasm, and higher likelihood of project success.

Establish the Foundation

Project success depends on effective leadership. Whether you are a program manager with hundreds of people reporting to you, in charge of a short project staffed by volunteers, or anything in between, you must be a leader. If this is a new role for you, plan for **transitioning to project leadership**. *Identify leadership gaps* and decide what you must do to meet them.

Although the role of "manager" can be delegated, you must earn the role of leader from the people you work with. Some of the *critical leadership skills* necessary for this can be developed through practice. Good leaders pay attention, so you must become proficient in *active listening*. In discussions with others, frequently paraphrase and verify what they have told you, to ensure correct understanding and to let them know you are paying attention. Leaders have *credibility*, so strive to make your commitments clear and to deliver on what you promise. Effective leaders also display *integrity*. In your communications, ensure that you consistently say what you mean to say, and that your message is as reliable and factual as you are able to make it.

Lead the Team

Inspire people to get excited about the project. Use techniques for **influence without authority** to identify what matters to your team members. Emphasize aspects of the project that are fun and challenging, and build **motivation** with your enthusiasm and confidence. Projects are complex and difficult. They do not get done because they are easy; they get done *because people care*.

Understand the values of your team, and work to align your work methods, the **project vision**, the **project objective**, and all project communications

with these *shared values*. Help people understand why the project is important through discussions, collaborative planning, and frequent reinforcement of goals and accomplishments.

Develop a *leadership style* that works for your team. Some teams work best under a decisive leader who directs the team autocratically with little input. Other teams prefer **decision-making** through unanimous group consensus. Most project teams work best when the style is primarily consensus-oriented, with shifts toward "command and control" as necessary when the team gets stuck or time is critical. In dealing with some team members, it may be necessary to vary your style based on culture, individual preferences, or specific circumstances.

Build *trust and respect* within the team. Develop personal relationships through **coaching and mentoring** with team members, and establish effective **team management** with all project contributors. Let people know when you agree with them, and in situations where you may have a difference of opinion, let them know why you disagree in an uncritical, nonthreatening way. Display team loyalty, and initially take the side of your team members in any disputes with others. When you fail to defend the team, your leadership erodes quickly.

Communicate effectively. Keep project documentation up-to-date and factual. Distribute project reports on schedule. Make time for **informal communication**, and frequently provide acknowledgment and feedback to team members on their work. Encourage each team member to provide you with constructive criticism, and consider communication changes you could make to help the project.

Leaders succeed through others. Be generous in giving credit for accomplishments, take advantage of opportunities for **rewards and recognition**, and *foster a supportive environment* that people will enthusiastically return to for future projects.

Deal with Barriers

Guide **project plan development**, and use realistic information for **project baseline setting**. Resist unnecessary change through scrupulous **scope change control**, and visibly *monitor progress* throughout the project.

Practice aggressive issue management, and act quickly to *resolve problems* while they are small. In a crisis, you may need to lead as if your authority is greater than your official position. Sometimes leadership requires acting decisively rather than waiting for permission (the "act now, apologize later"

strategy). For situations you cannot resolve, do not hesitate to use **problem escalation**.

Be persistent in dealing with project issues. If the first attempt to deal with a problem fails, try again. Successful leaders who embrace difficult assignments often face challenges where multiple failed attempts at a solution precede final success. Remember that you can "lose some battles and win the war." Keep your team focused on the overall objectives.

33

Lessons Learned

What: Using analysis of current and past projects to improve the processes used for future work.
When: Project execution and closure.
Results: Perpetuation of good practices and identification of processes needing attention.

Prepare

Analyzing lessons learned may be done at any time, but it is most commonly part of **project reviews** or **closing projects**. *Schedule a meeting* for a process review at the end of a **project life cycle** phase or at project close to gather information while it is still fresh in people's memory. Allocate sufficient time for the review. Even shorter projects may generate enough information to justify a half-day retrospective analysis.

Verify that team members and others who should participate will be available, and get their *commitment to attend*. Face-to-face meetings are best, but for **virtual teams**, use the best meeting technology available.

Set a **meeting** *agenda*, including time for:

- Positive results: things that went well and practices to repeat
- Desirable changes: processes that need improvement or replacement
- Prioritization of recommendations
- Final thoughts from all contributors

Before meeting, collect accurate, up-to-date *project documents*. For a post-project analysis, ensure that final project reports are available. Also provide access to:

- Actual and planned schedule information
- Actual and planned resource information
- The project **integrated change-control** history
- **Issue-management** history and **problem escalations**
- **Project metrics** and **performance reports**

To support analysis of lessons learned, some teams fill out a *survey* in advance to stimulate thinking about practices to keep or modify and recommendations for change.

Review

Start with a review of the agenda and set the *ground rules* for the meeting. Strive to hear from everyone, roughly equally. Work to identify good practices and opportunities for improvement, not to solve problems on the spot. Keep the focus on project processes—avoid attacking individuals and "blame-storming."

Select a scribe to *capture ideas* generated where all can see them. If the initial scribe was involved in the project, rotate the responsibility for capturing data so everyone can focus on process issues, at least for most of the time.

Probe for *positive aspects* of the project first. Identify specific processes and other project aspects that were successful. Capture what went particularly well on your project; identify new practices that you should repeat or extensions to existing processes that were valuable.

When most of the positives have been listed, shift the focus to *needed changes*. Identify process areas that need improvement and practices that should be simplified or eliminated. If disputes arise, use project documentation and project metrics for **conflict resolution**. Examine issues and problems using **cause-and-effect analysis** to determine root causes, and use **brainstorming** and **process improvement** to generate responses. During the meeting, document other issues or action items that arise that are beyond the meeting scope.

Near the end of the meeting, prioritize the opportunities for improvement using group consensus and *summarize recommendations* for dealing with the most significant ones. If further analysis is necessary, capture action items with owners and due dates.

Close the meeting with reflections on the process. Encourage people to share how they plan to work differently in the future.

Take Action

Document the meeting and list key recommendations in a clear, short summary followed by the lists of information collected. Distribute the report to the participants and put a copy in the project information archive.

Take action on the *principal recommendations*. Implement any changes where you have the authority, and develop a business case and propose more

significant changes to your management. Following every lessons learned analysis, select a project aspect to change that will deal with at least one identified problem.

Monitor all changes in order to ensure that the expected results occur and that there are no unintended consequences

34

Market Research

What: Selecting and using techniques for assessing current requirements and future markets for products.
When: Project initiation and planning, with later review as appropriate.
Results: Reliable information for defining project scope and for making sound decisions.

Define the Problem

Market research has many purposes, but the primary use in projects is for **requirements collection** to assess user needs. Review what you need to learn, and document the *research questions* that you need to answer.

Prior to any new market research, review the *available information*. Check any research done for strategic planning at the organization level. Review internal information such as customer complaints, sales data, and customer requests. Also consider publicly available information from magazines, service bureaus, industry consultants, and the Internet.

Select the Method(s)

For general questions probing for motivations and alternatives, *qualitative techniques* such as **customer interviews**, focus groups, and general surveys are effective.

For testing alternatives, tracking trends, or estimating measurable criteria, *quantitative techniques* are useful; often professional marketing services can design and implement statistically valid models and controlled-experiment surveys. You can also use ergonomic testing, prototypes, mock-ups, simulations, and models to assess acceptance of new ideas.

Select techniques that will yield the information you require, and develop a plan for the research. Determine who will lead the research effort, and identify the skills and staffing required.

Develop a *proposal* for the research, and obtain approval for the time and

funding required. Get agreement on how to use the results in **decision-making**.

Execute Research and Document Results

Execute the research, and interpret the information for use in the **scope definition**. File all market research information centrally so other projects can benefit from the information.

Throughout the project, revisit the research as necessary as part of **integrated change control** and for **project reviews**.

35

Matrix Teams (Cross-Functional Teams)

What: Building and maintaining cooperation on project teams where contributors report to different managers.
When: Throughout a project.
Results: Effective teamwork among team members from diverse organizations.

Determine the Need for a Matrix Team

Most organizations are organized functionally, and managers are responsible for workers with similar job descriptions—for example, marketing managers manage the marketing staff, and research and development managers are in charge of engineers. In these companies, *complex projects* rely on teams drawn from several functions.

A member of a matrix project team (also called a cross-functional or multidisciplinary team) has *more than one manager*—a functional manager plus the person responsible for leading the project. When the project manager has greater authority, the matrix is called *strong*; when functional managers have more power (the more typical case), it is a *weak* matrix.

Weak-matrix project teams generally have greater job security and ongoing programs for **team development**, but their commitment to the project and **motivation** may be low. Matrix team projects are often staffed by a group of strangers, so project leaders must make the effort to establish **influence without authority** to be successful.

Build an Effective Matrix Team

Techniques for team-building and effective **team management** are necessary for matrix teams, but they are not sufficient. Pay *extra attention* to:

- Strong project **sponsorship**, needed whenever your sponsor must participate in **issue management**, **problem escalation**, and **conflict resolution**
- Explicit, formal commitments for time and effort from each team member's functional manager
- Clearly **delegating responsibility**, defining individual roles, and showing precisely why each team member must be on the project
- A cross-functional, thorough process for **project plan development**
- A communal space (an actual "war room" or a virtual location)

Relationships on all project teams are important, but they are more difficult to establish and more quickly destroyed on matrix teams. Identify and take advantage of everything that people on the team have in common. Start with the **project objective**. Identify the reasons that a successful project is important to each team member, and use it as a foundation for bringing the team together. The most effective way to build a common project vision and trust within the team is to hold a project **start-up workshop**.

High-performing matrix teams also identify and build on *shared personal backgrounds*, such as interests, hobbies, and experiences. Find and build on any past working relationships, especially previous work on successful projects. Personal relationships with mutually respected colleagues may also provide connections.

Doing things together also increases team cohesion. Small group project tasks and nonproject team-building activities (such as eating, or events chosen by the team) also contribute to trust.

Create a team identity by *naming the team*. Help people to focus more on the project overall and less on their individual concerns.

Maintain an Effective Matrix Team

Keeping a diverse team together and motivated depends on intense *loyalty*. Natural loyalties are functional; counterbalance this through unflagging support of team members. Manage conflicts within the team whenever possible, and deal with **performance problem resolution** one-on-one, involving the individual's manager only as a last resort. Although it is difficult, remaining loyal to the team can ensure project success.

Frequent, *effective communication* within the team is also essential. **Communicating informally** is especially important in keeping a cross-functional team motivated.

Communications planning for cross-functional and **global teams** also

requires ongoing vigilance in minimizing jargon, confusing technical language, and other sources of potential confusion. Use the best **virtual team technical tools** for ongoing communication. On longer projects, periodically *bring the team together*, face-to-face, for activities such as **project reviews**. Distant team members who have little or no personal contact will gradually come to mistrust one another, creating project problems.

Frequent *personal thanks* to team members for contributions, as well as to their managers, also builds connection to the project. Use available programs for formal **rewards and recognition** to maintain team motivation.

36

Meeting Execution

What: Facilitating efficient meetings and following up afterward.
When: Throughout a project.
Results: Accomplishment of stated meeting objectives and good use of participants' time.

Start the Meeting

First and foremost: *Begin on time*. Waiting for late participants rewards inappropriate behavior and leads to progressively later and later starts.

For small meetings where people do not know one another, begin with *introductions*. For larger meetings, when introductions may not be practical, consider using an interactive "ice breaker" activity.

Start the meeting with a review of the *meeting objectives* and the *agenda*. Make any necessary adjustments and post the agenda where it is visible. Resolve any details remaining from **meeting preparation**.

Get agreement on how to run the meeting. If you lack a list of standard *ground rules*, spend a few minutes and develop them. Typical meeting ground rules include:

- Attack issues, not people.
- Only one person speaks at a time.
- No audible pagers, cell phones, or other noise-making hardware are allowed in the meeting room.
- Participants take part in discussions by signaling the facilitator and are recognized in turn.
- Everyone has the right to finish speaking.
- Everyone has the obligation to be concise.
- Written records of the meeting must convey the words of the speakers.
- Facilitating and recording roles are rotated periodically.
- All participants are responsible for the success of the meeting.

It is never sufficient just to state and post meeting ground rules. The meeting facilitator must also actively *enforce* them throughout the meeting.

Run the Meeting

Manage time using the agenda to track progress through the meeting. If a topic on the agenda requires more time than planned, bring it to a close and schedule follow-up in a later meeting, or get agreement to revise the agenda. Extend a meeting only as a last resort, and only if the topic is urgent.

Focus on only *one issue at a time*. Whenever a relevant new issue arises, don't ignore it, but don't allow the meeting to get distracted from the current topic. Always record each new issue on a posted "parking lot" or "bucket list" in the meeting room. Avoid disrupting the planned agenda to deal with side issues unless they are truly urgent, but ensure that all topics are dealt with later in the meeting.

Record what occurs throughout the meeting. For each section of the agenda, have a *recorder* or scribe keep track of what is discussed. If one recorder cannot keep up, have more than one person capture information. Keeping the information legible and accurate aids understanding and allows even latecomers to participate without disrupting the meeting. Discourage paraphrasing that alters a speaker's meaning, and correct the notes whenever any speaker objects to the wording. Throughout the meeting, record decisions, recommendations, and conclusions. Also, record anything that requires further work on a list of "action items." For each action item, clearly define the deliverable(s), assign an owner, and set a target completion date.

Use **conflict management** to deal with problems that may arise during the meeting. Some conflict diminishes if you *enforce the ground rules*. When people interrupt, criticize, or otherwise fail to observe posted rules, deal with this immediately. If your meeting lacks a stated rule for problem behavior, consider taking a moment to add a rule to deal with it. Proactively *confront counterproductive behavior* in meetings. When you fail to deal promptly with inappropriate behavior, it will continue and may escalate.

For longer meetings, schedule periodic *breaks* to keep people engaged. Before each break, announce when the meeting will resume and ask for agreement to return. Always restart the meeting punctually. For meetings longer than an hour, structure the agenda so that the interactions and activities have *variety*. Doing the same thing for too long, especially sitting and listening passively, is boring and results in ineffective meetings.

Close the Meeting

At the end of the meeting, use **issue management** to deal with the action items, ensuring that each one is described unambiguously and has an as-

signed owner and a target for completion. If you deferred topics to the "parking lot" or "bucket list," decide how you are going to deal with them. If there will be a subsequent meeting with the same group, confirm the date, time, and place, and note any topics that will be on that meeting's agenda. Take time to review what has been accomplished, using the recorder's notes, and end each meeting positively.

It is also good practice to *evaluate* meetings. If you failed to reach any of the intended outcomes of the meeting, briefly discuss why not and what to do about it. Request specific suggestions to improve future meetings, and collect comments on anything in the meeting that went particularly well so you can repeat those things in the future. If necessary, adjust your meeting ground rules.

End the meeting on time or early. Chronically ending meetings late erodes motivation, discourages future attendance, and uses time that should be spent doing other work. Before you leave the room, take a few moments to ensure that it is in good order. Remove used flip-charts, erase the boards, dispose of any trash, and restore the seating if you rearranged it.

Follow Up

Based on the notes recorded during the meeting, prepare and distribute a meeting *summary* to the people who attended and others who need to know what happened. Contact any group members who were unable to attend the meeting, especially if they are responsible for any action items.

After the meeting, track the *issues* and follow up on any other business left unresolved, including any items on the "parking lot" list. If there will be a subsequent meeting, begin to prepare for it.

37

Meeting Planning

What: A structured process for planning effective meetings.
When: Throughout a project.
Results: Willing attendance at meetings that have business value.

Determine the Meeting Objective

Effective meetings require preparation. Begin by defining the *meeting objective*. Meetings are costly, so the outcome of any meeting must be valuable enough to justify it.

Based on the meeting objective, determine:

- The agenda and topics required
- Participants needed and their roles
- Meeting logistics

Set the Agenda

Create a draft *agenda* for **meeting execution** by listing the topics that support the objective. Allow time for starting the meeting and for reviewing, if necessary, any open issues from previous meetings. Sequence the meeting topics, scheduling the highest-priority items first. Allow time at the end to close the meeting. For each *topic*, define the issue, the outcome you expect, the process, and any special roles for participants. On the agenda, list the meeting day, date, starting and ending times, and location.

Whenever possible, send the agenda out before the meeting and ask what the attendees would like to accomplish in the meeting. If the meeting requires advance preparation, discuss the requirements with the participants involved, obtain their commitment, and allow adequate preparation time.

Confirm Participants

Meeting *participants* include people who are critical to decisions and recommendations that must be made, people who will be affected by the outcomes

of the meeting, and people with knowledge and expertise in the topics that will be discussed. Effective meetings depend on involvement, so get a commitment to attend from all the people needed.

Several *roles* are essential for effective meetings, and these are best established before the meeting. Leading an effective meeting requires two roles: *facilitation*, which focuses on the meeting processes, and *managing*, which focuses on the meeting content. Although one person can fill these two roles, it is generally much more effective to use different people. This is particularly true of large, formal meetings, where the facilitator can keep things on track and serve as a "traffic director" without getting distracted by agenda details. Effective meetings also require a *recorder* (or scribe), who captures what happens in the meeting.

Plan Logistics

Preparation for effective meetings also includes planning the *logistics*. Reserve a room or other space that is large enough and properly equipped for the meeting. Plan to bring pens, paper, tape, and any other supplies you may need. Arrange for refreshments if appropriate.

Before the meeting begins, *arrange the room* so that all participants can see the faces of others, as well as any screens or other presentation aids to be used.

If the meeting includes remote participants, obtain any equipment necessary for **virtual team** telecommunication.

38

Motivation

What: Enhancing project team performance.
When: Throughout a project.
Results: Enthusiastic project contributors and successful projects.

Motivate Contributors

Effective project **leadership** requires setting individual goals that people care about. Discover what people want to do and align with their wishes as much as possible when **delegating responsibility**. *Assign ownership* of the work in the project **activity definition** to team members who express interest in it and are competent to do it. Document an owner, by name, for each piece of project work. Involve the owners in analysis, **activity duration estimating**, **activity resource estimating**, and **cost estimating** for their tasks to reinforce their ownership and secure their buy-in.

People will be more motivated to deliver on commitments when they receive something in exchange that they desire, so use the *principle of reciprocity* to increase your **influence without authority**.

Measurement drives behavior, so establish and use diagnostic **project metrics** to support the project performance you seek. Motivating measurements are objective, nonthreatening, and used for process improvement, *not* for punishment.

Ensure that people care about one another and work effectively together through effective **team management**. *Identify roles* for individuals that draw on their strengths and make them crucial to the project's smooth operation. Understand individual values and establish team values that are compatible.

Establish a *productive environment*. Review the project plan for inefficiency and find opportunities for **process improvement**. Replace or upgrade older equipment, and investigate and deploy more effective methods for communication.

Create an environment of *respect and fairness*. Praise people publicly, but discourage criticism, finding fault, or other negative behavior in front of others. Practice collaborative **decision-making**, and encourage participation in

project plan development and other work. Keep project communications open, bidirectional, and truthful, providing people with the information needed to maintain project progress.

Make the overall project matter. Create a **project vision** that is compelling and that the team vigorously supports. Work together as a team to set high standards for achievement, quality, and excellence that everyone will strive for.

Maintain Motivation Using Motivation Factors

Use **rewards and recognition** for individual and team performance. Tailor rewards to *team preferences*. Use a mix of public and private, tangible and intangible types of positive feedback in response to good performance. Never underestimate the power of intermittent reinforcement.

Frequently identify personal and group accomplishments and *thank people* for them individually. Give credit for significant accomplishments in project **performance reporting**, and when it is culturally appropriate, recognize people for their work publicly in organizational **presentations**.

Celebrate success. Take time after **project reviews** or at significant project milestones to get the team together and congratulate one another. In some situations, *monetary rewards* can be motivating. Use them *infrequently*, to prevent them from becoming expected, and use them *privately*, so that they do not demotivate contributors who do not receive them.

Minimize Demotivating Factors

Promptly deal with *team problems*. Work to detect and deal with missed individual commitments quickly through **performance problem resolution**. When disagreements exist, work within the team to restore cooperation with collaborative **conflict resolution**. For situations beyond your control, promptly use **problem escalation** to request help.

Work to *minimize unnecessary changes* through disciplined **integrated change control** and **scope change control**. When changes prove necessary, plan your response with the people on the team and work to minimize the disruption.

Identify and *remove valueless project overhead*. Cancel unneeded **meetings** and shorten meetings that are too long. Stop preparing reports that no one reads, and remove activities from the project that are not necessary. Locate and eliminate any other needless work.

39

Multiple Dependent Projects

What: Planning projects responsible for independently developed components that are part of a large, complex system.
When: Project planning, execution, and control.
Results: Proactive identification and resolution of project interdependencies and successful complex programs.

Define and Decompose the Program

Program management, which is the responsibility for very large, complex projects, begins with overall **scope definition**. As with any project, the goals must align with business strategies and rely on **requirements collection** from users. The success of large programs depends on very strong **sponsorship** to get the significant undertaking underway, to deal promptly with complex decisions, and to resolve internal conflicts.

Project management principles alone are not sufficient when work becomes too large and complex, so it's logical to break programs into smaller pieces. The program planning process begins with overall scope analysis. Where scope planning for a project results in a **work breakdown structure** (WBS), *program decomposition* results in a number of independent but interrelated projects. Very large programs decompose into a hierarchy of projects, arranged in levels analogous to a WBS. The methods used for program decomposition vary with program types, but they include techniques such as defining software architecture, systems analysis, concurrent engineering, and simultaneous development.

Identify the *program staff*. Delegate responsibility for the program as a whole to a program manager. Select owners to lead each of the identified projects of the program, as well as leaders for any intermediate levels in the program hierarchy. Large programs may require additional staff, reporting directly to the program manager, for overall planning, tracking, managing escalations, and reporting. Ensure that all program staff members are capable of managing their parts of a program of this size. Seek staff with skills in high-end **software tools for project management**, facility with complex **communication planning**

and management, facility exerting **influence without authority**, and a tolerance for ambiguity.

Get the program off to a *fast start* by conducting one or more program **start-up workshops**. Introduce the overall program objectives and clearly define contributions to the overall goals and the role of each project team member.

Plan the Component Projects

The next step in the planning process is **project plan development** for all of the lowest-level projects in the program hierarchy. With awareness of the program objectives and constraints, each project team builds a thorough *bottom-up project plan*.

Because the projects are all interrelated, many of the dependencies for **activity sequencing** will link to other projects. For each project, identify all *required inputs* coming from outside the project that could slow it down or stop it.

Document all your *external input dependencies* as program *interfaces*. You are the "customer" who needs an input, so begin a dialog with the leader of the related "supplier" project that you expect will produce it. Figure 39.1 shows how this works.

Work to *resolve the interface* by securing a commitment from the leader of the project whom you expect to supply what you need. Focus interface discussions on completion criteria, and obtain an output description for your required input consistent with your requirements. Treat interface agreements as formal contracts. For each of your interfaces, document an agreement between a supplier and at least one customer, including deliverable descriptions and early schedule dates from each project's **schedule development** work.

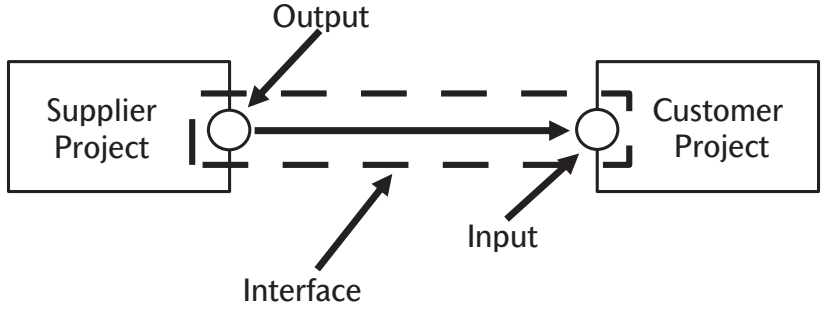

Figure 39.1. A program interface.

The program manager or staff will be responsible for *interface management*: coordinating the discussions, escalating and resolving disagreements, locating outputs to match up with unresolved inputs, and formally documenting all program interfaces.

Integrate Plans

If the identified interfaces seem *excessively numerous*, revisit the initial program decomposition to look for a program structure that has greater project independence. Managing too many interfaces is risky and requires excessive effort.

Create a *program timeline* using data from the interface agreements to show the project connections. Show summary activities for project work (with no detail), and identify dependencies wherever inputs and outputs link the work of two or more projects. Uncover any interruptions or gaps in any of the project schedules.

An initial program schedule rarely meets program timing objectives, and it may also reveal resource overcommitments, budget overruns, and other problems. The program staff and project leaders must work together to develop *alternative project-level plans* using **constraint management and plan optimization** techniques to resolve the program issues. More than one incremental pass may be necessary, especially when working with a hierarchy of projects, adjusting both project timing and **human resource planning**. Some problems may require modification of overall program objectives.

Once the overall plans are acceptable to the program sponsor and stakeholders, *document the program baseline* plan.

Track and Manage the Program

Manage project plan execution for each lowest-level project in the program. At the program level, *track the interfaces*, variances and **issue management** affecting several projects, and **problem escalations**.

Periodically conduct program and **project reviews** to *revalidate plans* and interface management, especially for long-duration programs.

40

Multiple Independent Projects

What: Managing unrelated projects that depend on shared resources.
When: Project planning.
Results: Predictable execution of all projects and resource-planning data supporting organizational decisions.

Plan *Each* Project

Taking on *too many projects* is a common problem. Good project ideas often exceed staffing limits, and working on all of them is a formula for chaos, low morale, poor **team management**, and low **motivation**. Successfully bringing projects to closure requires disciplined attention to detail and concentration on the most critical few.

Focus on *each project individually*. Set a **project objective** and do **project plan development** for each project. Complete **activity duration estimating** and **schedule development** using consistent units of measure to simplify resource analysis.

Develop resource-loaded schedules for each project based on **activity resource estimating** and **cost estimating**. Develop a week-by-week *resource profile*, similar to those used for **resource leveling**. Prepare staffing-requirements summaries for the individual projects, both in total and by skill set. Accumulate your data in resource histograms using a **software tool for project management** or analyze weekly summaries with a computer spreadsheet.

Develop a second set of resource profiles identifying all available *committed project resources* (overall and by skill set) for each week using the same process you used for your weekly project-effort analyses. Take into account holidays, scheduled time off, and other personal conflicts and commitments.

Prioritize the Set of Projects

Use a systematic **decision-making** process to *rank order* all of the projects, based on factors such as the value of the deliverables, urgency, overall impor-

tance, strategic contribution, cost, length, or other considerations. If the initial list of projects is lengthy, rank order them before developing plans. Create detailed plans for only the top projects that you believe can be staffed.

List the projects in sequence, from the highest priority to the lowest.

Roll Up Resource Requirements into an Overall Resource Plan

Starting with the highest-priority project, assign available staff to project activities and summarize the effort profile in a *master resource plan* using a scheduling tool or spreadsheet.

Continue allocating staff to lower-priority projects in sequence until you add a project that causes the master resource plan to exceed your available resource profile, either overall or for a specific type of contributor. Complete the process by considering smaller projects with slightly lower priorities (if there are any) that could be staffed using remaining resources. Though it is tempting to fully book all staff, it is prudent to leave some capacity uncommitted (10 percent is typically recommended) as a reserve for managing risk.

Adjust Project Objectives

Set the baselines of the highest-priority projects and proceed with **project plan execution**.

Begin **negotiating project changes** for the remaining projects based on your resource analysis. Investigate:

- *Accelerating the high-priority projects* using any uncommitted resources in the master resource profile
- *Obtaining additional resources* to meet the timing and scope objectives of the next several projects on the list
- *Extending the deadlines* for the remaining projects, consistent with freeing up of staff after higher-priority work completes
- *Reducing the scope* for some of the remaining projects so they can proceed
- Using **procurement planning** to *outsource* work and increase staffing
- *Replanning the work* on lower-priority projects to reduce resource requirements
- *Delaying activities on higher-priority projects within schedule float* to increase available resources

- *Increasing efficiency* through **process improvement**, training, automation, equipment replacement, software upgrades, or other means
- *Scheduling overtime*, but only as a last resort

Monitor Progress and Manage Resources

Document the projects that have committed resources and communicate the status of lower-priority projects with insufficient resources. Make resource allocation decisions visible, and use **stakeholder-expectation management** to ensure that sponsors, team members, and others accept the scheduling decisions.

Track project work by project, and protect staff and resources needed for the highest-priority projects.

Manage changes through **integrated change control**, and ensure that the priorities of scheduled work are current.

Update the resource profiles and list of current projects periodically and during **project reviews** to reflect staffing changes, new project requests, and completed projects.

41

Negotiating Contracts

What: Obtaining a formal agreement in a way that leaves all involved parties better off than they would be without the agreement.
When: Project initiation and planning.
Results: Documentation of unambiguous, explicit commitments and a signed agreement that represents value to all.

Note: Although the process described is from the point of view of an acquirer of contract services, similar considerations are relevant when contracting to provide services.

Prepare

In the course of **procurement planning** and **procurement initiation**, learn what you can about the *other party*. Brainstorm about the other party's viewpoints and perspectives. Determine who can make commitments for the other party, and always negotiate directly with these decision-makers (or with the people they empower).

Document your most important *negotiation objectives*. Identify significant interests, such as completing the *statement of work* (SOW), cost, or other priorities. Define the worst result (such as the highest price or longest schedule) that you can accept. Use your "Best Alternative to a Negotiated Agreement" (BATNA) to define this limit. Be prepared to walk away from a negotiation that fails to meet your preset limits.

Develop a negotiation *strategy*. Include the objectives, prioritized interests, the predefined limits, and criteria for decision-making. If you lack negotiation experience, seek help from legal, procurement, human resources, or purchasing specialists. Know your own authority, and stay within your negotiating limits.

Before negotiating, *rehearse* your approach. Have someone else role-play the other party and critique you to improve your negotiation strategy.

Conduct Negotiations

Establish a good *working relationship*. You intend to work with the other party after reaching agreement, so strive to build trust. Seek common ground in areas such as interests, experiences, education, or background.

Establish a negotiation *deadline* consistent with the needs of your project, and stick to it.

Communicate honestly and clearly during negotiations. Use facts, data, and metrics to make your points. Clarify your understanding by frequently asking questions and actively listening to what the other party says. Maintain objectivity in lengthy negotiations by scheduling periodic breaks.

Learn what matters to the other party, and relate your discussions directly to these factors. Conduct *principled negotiations*, concentrating on the matters that you and the other party most care about. Avoid taking positions that will lead to deadlock, and probe for underlying interests ("Can you help me understand why that is important to you?") when the other party proposes a one-sided solution. When discussions become emotional, acknowledge the situation and then resume using data, or take a break to allow everyone to cool off.

As the negotiation continues, acknowledge areas of agreement, and focus your discussions on any remaining differences. If the negotiations stall, use **brainstorming** and **creative problem-solving** to generate possible *alternatives*. Discuss them with an open mind and work to resolve the most significant issues first. If it becomes obvious that there can be no mutual agreement meeting your criteria, terminate the negotiation.

Reserve final agreement until all the issues are resolved, but *document specifics* of deliverables, completion criteria, costs, timelines, penalties, and other important criteria as you proceed. For each deliverable, ensure that specifications, ownership, and timing are very clear. Discuss all acceptance and testing criteria, and establish procedures for **scope change control**. Negotiate terms that support your project; align any payments with achievement of specific results.

Close Negotiations

Once you reach an acceptable *final agreement*, formally document it using plain language. Whenever possible, use a standard format or preprinted form to capture the essential points of your agreement.

Acknowledge the accomplishment and express appreciation to the other party.

Finalize and Implement

Complete the agreement by obtaining *authorized signatures* from individuals representing each party. Process necessary paperwork and begin **procurement administration**.

42

Negotiating Project Changes

What: Using bottom-up project planning data to gain support for necessary changes in project objectives.
When: Project planning, execution, and control.
Results: Modified expectations for the project that are consistent with a credible plan.

Assemble Your Data

The results of your **project plan development** may fail to support the **project objective**, even after your best efforts at **managing constraints and plan optimization**. When this happens, *assemble factual data* from your bottom-up planning process and prepare to negotiate project changes with your project sponsor. Include:

- A high-level *plan summary* with a milestone project schedule
- The **work breakdown structure**
- A *Gantt chart* or other schedule showing project timing based on **activity duration estimating**
- *Resource and budget summaries* from **activity resource estimating** and **cost estimating**
- One or more *proposals for alternative projects*

Build a case demonstrating that the initial project objective is *infeasible* using your planning data. Gaining agreement to necessary project changes requires fact-based, principled negotiation. Sponsors have more power and authority than project leaders and may easily dismiss arguments based only on your concerns or opinions. Negotiations lacking plausible data will likely fail.

Practice

Develop your *negotiation objective*. Decide what you wish to accomplish from the negotiation, and document it. If you need more time or more re-

sources, build a good business case to support your request. If changes to the project deliverable seem necessary, show why, and be able to demonstrate the value of the modified result. Develop project alternatives that provide for mutual gain, such as exploring opportunities that could extend beyond the original project request, or segmenting the project into a sequence of smaller projects that might deliver value earlier. Prepare compelling **presentations** to support your proposals using unambiguous, nontechnical language.

Before setting up a meeting with your sponsor, *rehearse* what you will say. Ask a team member to pretend to be your sponsor, and go through your case for change. Seek criticism, and use it to improve your negotiation approach.

Negotiate

Confirm your **sponsorship** and *schedule a meeting* with the project sponsor to discuss the results of your planning and your alternative plan(s).

Begin your discussions by showing with your *planning results* why you will be unable to achieve the target project goals. Begin with your planning summary, and support it with additional detail as necessary.

Present your *best alternative*, along with any other good options you developed. Encourage questions and discussion of alternatives, and support your proposals using historical, documented project data.

Strive for *"win-win" negotiations*, where both you and your sponsor get a good result. In project negotiations where only the sponsor "wins," everyone loses. If the objective is impossible, the project contributors lose because they will be stuck on a doomed project, and sponsors and project stakeholders lose too, because they will not get what they want.

Use your planning alternatives to guide discussions toward *problem-solving* and get everyone involved in seeking better options. Focus negotiations on resolving project issues. Work to shift the project objective in line with a realistic plan.

Close the Negotiation

Request agreement for a project objective that you can execute using a realistic plan. Following agreement, you can use the plan for **project baseline setting**.

If a realistic analysis of your best project plan leads to recognition that the

project is a bad idea, *take it no further*. Early **cancellation of projects** that cannot succeed is better for everyone.

If your presentation fails to convince your sponsor or falls on deaf ears, you might be forced into an *infeasible project*. If so, document the situation for future reference, and then do your best while continuing to seek alternatives.

43

Organizational Change

What: Modifying how people do their work.
When: As necessary.
Results: Support for a needed process change, with minimal resistance and prompt adoption.

Document the Need

When **project metrics** reveal an *ineffective process* (as part of **project variance analysis**, **issue management**, **quality control**, **project reviews**, or **lessons learned**), use **process-improvement** techniques to develop a better method and to document a new standard operating procedure.

Unless the new process is completely automated, developing a new process is only part of the job; you must also provide **leadership** to *gain acceptance* for the new way of working and convince people to switch from the old process.

Define Roles

Effecting change in an organization depends on a number of roles:

- *Advocates*. Project leaders often advocate project process changes. As an advocate, you recognize a need for change, develop a business case, and use **consensus-building for your ideas** to gain **sponsorship**.
- *Sponsors*. Managers of project leaders generally sponsor project changes after advocates show that change is desirable.
- *Agents*. Change agents manage the project to develop and introduce the new process.
- *Targets*. The individuals affected by the change need to be persuaded to modify how they work.

Plan for Change

You should develop a plan for implementing the change by including four key elements (see Figure 43.1):

1. Outline *sponsor* responsibilities, and get commitments for sending memos, leading meetings, and other contributions.
2. Develop *objective metrics* that define the initial process baseline and can demonstrate the results of the new process.
3. Describe *success stories* from earlier, similar efforts (such as a pilot) to persuade the people who are the target of the change to cooperate.
4. Prepare the target users for the change through *training*, and involve them in planning for the change.

Get funding for the communication, training, and other costs of the transition, and set realistic expectations for the rate of change. Significant changes may take six months or longer to integrate fully into normal operations.

Implement the Change

Persuade the people affected of the benefits of change. Clearly demonstrate "What's in it for me" from their perspective. Build **motivation** for the change.

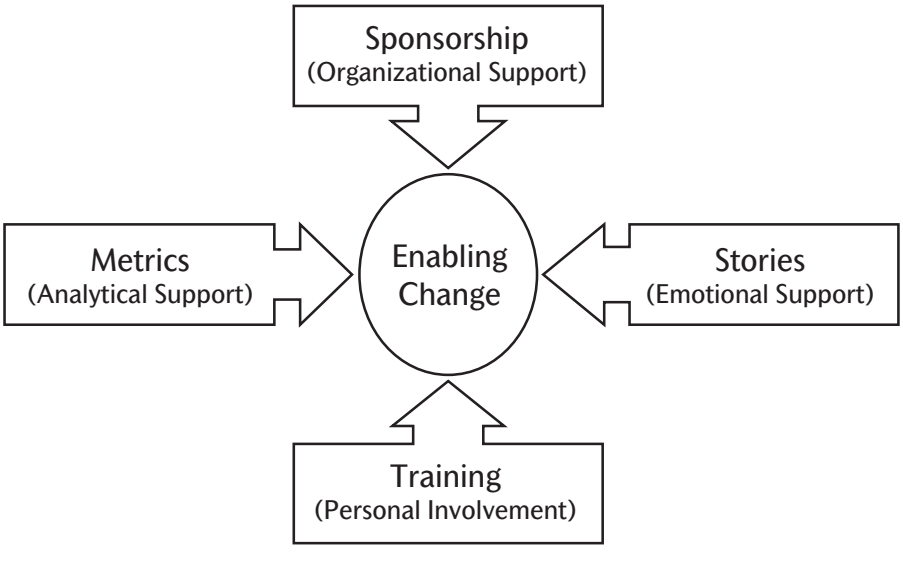

Figure 43.1. The four elements of implementing change.

Use *metrics* to measure the initial results of the change. If the diagnostic **project metrics** fall short of expectations or significant unintended consequences develop, be prepared to modify the process to further improve it or to restore the old process.

Reinforce cooperation and successful change. Develop **rewards and recognition** for target users who embrace change, and develop additional success stories using their experiences to support later phases and to improve change acceptance by people who are lagging behind.

Continue efforts throughout the transition until process measurements indicate you have achieved your objective. At the conclusion of the change effort, analyze the project **lessons learned** and make recommendations that will *improve* future change efforts.

44

Organizing for Project Management

What: Defining and implementing the foundation for effective project management.
When: Prior to the project and project initiation.
Results: An environment for successful projects.

Establish Support for Project Management

Maximizing the effectiveness of project management processes requires a combination of organizational will and well-defined, consistent methods. If your environment lacks elements outlined here, conspire to establish them.

Some attributes of high-performing project management organizations include:

- An effective *project manager selection process*. There are few "accidental" project managers in these organizations, because they appoint project leaders based on what they know an individual needs to have for successfully **transitioning to project leadership**.
- *Ongoing support and interest from higher-level managers* (but *not* day-to-day involvement). Strong **sponsorship** of projects is crucial in avoiding the problems of "too many projects," "decision delays," and "resource erosion." Sponsors who initiate projects and then lose interest in them set them up to fail.
- Readily available *project management training*, mentoring, and support. Competent project management develops more quickly in these organizations.
- *Project-oriented recognition programs*. **Rewards and recognition** are structured to encourage effective **team management**, not individual acts of heroism.

Encourage Use of Project Management Methods

Well-defined *methods and processes* for project management are also essential. The method that you choose matters less than that you document, adopt, and *consistently use* a process that supports thorough **project plan development** and competent **project plan execution**.

Project processes are necessary but may not be sufficient. The *other methods*, **project life cycles**, and development techniques used must align and support your project processes. If your latest fad for software application development is based on the concept that thinking and planning represent unnecessary overhead, projects will fail.

Project metrics, stored in an organization-wide *project management information system*, also contribute to project excellence. Better estimating, more thorough **risk identification**, and shared templates of planning information are all valuable intellectual assets.

A final ingredient for maximizing project success is a process to directly align **project objectives** with *organizational strategies*. Formal coupling of projects to visible, high-level objectives will protect resources, ensure priority, and remove barriers, significantly improving the chances of project success.

45

Performance Problem Resolution

What: Promptly recognizing unmet individual goals and resolving them.
When: Project execution and control.
Results: Consistent delivery on commitments while maintaining motivation and self-esteem.

Identify the Situation and Probable Causes

When project **status collection** or other communication reveals that a team member has *missed* or is in jeopardy of missing an individual goal, identify the problem and outline the consequences to the project (in schedule slippage, budget overrun, or other adverse results). Use **cause-and-effect analysis** to uncover the root causes. Some possibilities are:

- **Delegating responsibility** and ownership is unclear.
- The individual lacks knowledge, skill, or aptitude for the work.
- The individual has more work to do than he or she can accomplish.
- There are insufficient resources to complete the work.
- The work is dependent on an input that is late.
- **Information distribution** regarding the work is inadequate.
- The individual is from another organization, where the priority of the work and commitment is low.
- There are no **rewards or recognition** tied to achieving the goal.
- There are no visible **project metrics** associated with the activity.

Confront the Problem

Meet, face-to-face if possible, with the individual to discuss the situation. Reconfirm the commitment to the goal, reviewing the expected results, timing, and other specifics. Outline the consequences of missing the commitment, emphasizing the ones that affect the individual personally.

Discuss the *cause of the problem*. Start by allowing the project contributor to describe the reasons in his or her own words. Probe for the root cause, not just a surface rationalization.

Develop *possible solutions*, again beginning with suggestions from the individual. Seek solutions that align with the root cause: **team development** such as training or **coaching and mentoring** for a skill gap, or **problem escalation** to resolve a delayed input or resource shortage. After the team member has had an opportunity to suggest a path forward, offer your own suggestions.

Agree on Next Steps

Select an option that will mitigate or solve the problem, and document it.

Get the individual's agreement and *commitment* to follow through, and express your confidence in his or her ability to deliver. Revise the specifics of any affected goals and update your project plans as necessary. Integrate actions affecting the project into **issue management**.

Implement and Track

Track progress toward recovery of the goals.

Explicitly *recognize improvements* by thanking the individual (and his or her manager, if it is not you) for improved performance.

If problems persist, meet again. If several cycles yield no improvement, consider alternative ways to meet your project's requirements, or, as a last resort, engage your project sponsor or management in **problem escalation**.

46

Performance Reporting (PMBOK® 10.5, Report Performance)

What: Formally documenting project performance against the baseline plan.
When: Project execution and control.
Results: Visible tracking of project results compared with expectations.

Assess Progress

Performance reporting is central to **project plan execution**. It is the final part of the project-tracking cycle, following **status collection**; **plan-variance analysis**; and if necessary, actions for project recovery. Before documenting project performance, *verify status* of significant variances in schedule, cost, and other **project metrics**, and ensure that all project actions are consistent with:

- **Integrated change control**
- **Scope change control**
- **Cost control**
- **Schedule control**
- **Quality control**
- **Project priorities**

Review Performance

Use diagnostic project metrics such as **earned-value management** for *measuring project performance* and **forecasting project completion**.

Periodically, such as during **project reviews**, *analyze trends* in project data to identify potential issues, poorly performing processes, and potential project risks.

Report Performance

As defined in **communications planning**, prepare a *written status report*. Reporting is most effective when it is neither too cursory nor too rambling. Both too little and too much information result in confusion and loss of project control. Confine your reporting to factual information and be consistently honest, even regarding bad news.

Adopt a standard reporting format, and always begin with a *short executive summary*. Limit it to about one-half page, and include a list of no more than seven brief descriptions of key project accomplishments, next steps, and issues. Make the summary clear; some of the people who get your report will read no further.

Follow your summary with *additional information*, in order of relative importance. Customize reporting for different audiences by truncating the less essential information rather than by rewriting. A typical project-status report may include:

- The executive summary of accomplishments, plans, and issues
- Status of change requests
- A schedule summary with planned, actual, and expected future dates
- A resource summary with planned, actual, and expected future resource requirements
- A detailed project analysis, including an explanation of any variances
- Risk reporting, including status of ongoing risk-recovery efforts
- Additional detail, charts, and other information as needed

Always *proofread your report* for errors, omissions, and unclear language. Correct any problems, and replace technical jargon, acronyms, and idioms with terminology that all the readers will understand.

Send the report to team members, appropriate stakeholders, and others as part of project **information distribution**. Use project-status information to support effective **stakeholder-expectation management**. Archive all reports for later reference and use them in analyzing **lessons learned**.

47

Presentations

What: Organizing, summarizing, and formally presenting project status.
When: Project execution and control.
Results: Broad awareness of project progress, accomplishments, issues, and future plans.

Define

Clearly outline the *purpose* of the presentation. State your objective for the **meeting** and the reasons the presentation is necessary. Some presentation objectives include **project review** summaries, **problem escalation**, **project life cycle** transitions, and other project reporting.

Determine *who will be attending* the presentation and find out what about your project matters most to them. Identify issues and questions that they are likely to want addressed. Invite them, and confirm their attendance.

Schedule the presentation at a time that is convenient for the attendees. Decide how you will provide information in the presentation: projected slides, prepared posters or charts, handouts, or other media. Reserve a place for the meeting (or for a distributed audience, reserve the network and telecommunications facilities) and determine that the presentation method is appropriate.

Prepare

Set an *agenda* for the presentation, including introductory material, specific content covering all necessary areas, time for questions and discussion, and a conclusion. Start by telling attendees what you will tell them, then tell them, and end by telling them what you told them.

Organize all the project information that you intend to include into a logical sequence. If the information is detailed and complex, analyze it and work to summarize the content using graphs, tables, and simple bulleted lists. Keep lists and presentation slides short—four or five listed points maximum, using large lettering. Add interest to presentations using relevant figures, pictures, and some color, but don't overwhelm your message with clip art. For

necessary material that is more complex, prepare a supporting handout, and consider distributing it in advance.

Develop an introduction for your presentation that focuses the group's attention. If the group is small, begin with any necessary introductions. For larger groups, "break the ice" using an appropriate humorous story or a thought-provoking question.

Edit your presentation, repairing errors and potentially confusing text. Prepare no more than about one presentation slide for every five minutes, and keep the overall length to a minimum. Leave at least 10 minutes of planned time in the presentation for questions and discussion.

If you need any markers, sticky notes, paper, or other *supplies*, get them in advance or ensure that the meeting place has what you need.

Rehearse

Practice your presentation in advance in front of at least one other person. Work on smoothly saying what you need to say to support any visual slides, providing explanations and transitions *without reading the text verbatim*. If you prepare a script, use it only as guidance. Practice saying your message naturally, the way you normally speak.

Get feedback on your *body language*. Your speech patterns, gestures, and attitudes convey much of your message. Work on maintaining a positive, friendly demeanor, and keep eye contact with the people attending the presentation. If you plan to demonstrate or use something complicated, practice it until you can do it without having to think about it consciously.

Make adjustments to your presentation based on the feedback you receive.

Deliver

Arrive early, and *begin on time*. As people arrive, greet them and thank them for attending. After you open your presentation with an introductory activity or a story, review your agenda.

Present your content confidently and efficiently, pausing for questions as appropriate. Move around during the presentation and vary your delivery to avoid monotony. Ask questions every few minutes that relate to your presentation to keep people involved. Resist becoming defensive or emotional in reaction to what people say or ask; use humor and factual data to restore order.

Close with a *summary* of what you have said. Capture any open issues or questions that came up, and commit to responding promptly. Thank everyone for attending and end the presentation on time.

48

Problem Escalation

What: Delegating responsibility for resolution of decisions, differences, issues, and conflicts upward.
When: Throughout a project.
Results: Timely resolution of situations impeding a project that are beyond the influence of the project team.

Establish the Escalation Process

Develop a process for problem escalation consistent with your organizational policies, expected project requirements, and your **project infrastructure**. Identify when to use the process, expectations for timing, and who is responsible for responding to escalation requests. *Document* the process in clear language.

Confirm your **sponsorship** and get explicit *commitment* for the process during **project initiation** from your sponsor, key stakeholders, and any others who may be involved in escalation responses. Reconfirm commitment to the process periodically during **project reviews**.

Escalate as a Last Resort

Attempt resolution using *other options* first, such as:

- **Issue management**
- **Performance problem resolution**
- **Conflict resolution**
- **Influence without authority**
- **Decision-making** process
- **Negotiating project changes**

If the problem persists even after your team's best efforts, document a summary of the problem. Include the results of all of your attempts to deal with it.

Outline *possible approaches* for solutions that might be available to others with more authority, including any that you may not necessarily favor. Quantify the costs and other consequences of these alternatives as thoroughly as you are able. Also quantify any consequences of failing to resolve the problem promptly.

Provide the data to your sponsor or some other appropriate decision-maker in your organization. Assign a due date for a response, and get an explicit ownership commitment from the decision-maker.

Track the status of the escalation as an action item in your project **performance reporting**, explicitly assigned to the decision-maker. Continue tracking until resolution. If there is delay, report the status and *name names*.

Implement the Response

Implement the decision made, managing any major project shifts using **integrated change control**. Do your best to minimize adverse project costs or consequences and impact on **stakeholder-expectation management**. Work to repair any bruised relationships.

49

Process Improvement

What: Identifying and developing beneficial changes in processes used to do recurring work.
When: Throughout a project.
Results: More effective, efficient work methods.

Plan

Identify a poorly performing process (for example, through **issue management**, **quality control**, **quality assurance**, **performance reporting**, **project reviews**, or **lessons learned**). List the problems and defects of the process. Discuss the situation within your team and with others affected. *Gain support* for a process-change effort through **consensus-building for your ideas**.

Assign an owner to manage the improvement project, and plan the project, defining the time, staffing, and other resources necessary for the improvement effort. Set a deadline and quantify the improvement target. Verify **sponsorship** and *commitment* for the work required.

Establish the Process Baseline

Describe the *current process* using a system flowchart map or a detailed description of the present standard operating procedure (SOP). List the inputs and outputs for the process and the circumstances that trigger its execution. Use **cause-and-effect analysis** to identify the root causes of problems with the "as-is" process.

Gather data on the current process through interviews, project **status collection**, **project metrics**, observations, and trend analysis. Document the *measurement baseline* for the present situation, and validate your quantified performance improvement goals against it.

Develop Changes

Analyze the "as-is" process and develop *options for a new process*:

- Inspect the process for work that adds little or no value.
- Identify decisions and branches in the process that are unnecessary or too late in the process.
- Find opportunities to reduce or eliminate rework.
- Consider automating repetitive process steps.
- Refine inputs or process steps to minimize effort.
- Devise ways to reduce or eliminate process loops.
- Consider methods that increase process flexibility.

List the options you found, and select the most promising alternatives. *Describe the "to-be" process* that incorporates these changes.

Present the new process to your stakeholders and get *approval* to proceed with replacement of the old process. Apply **integrated change-control** principles.

Implement

Document a new SOP, using system flowcharting and written descriptions. Create any reference documentation, training, or other supporting materials needed. Develop a clear description of the benefits and objectives for all those affected.

Introduce the new process using good **organizational change** practices, and put the new process into practice.

Measure Results

Measure the results obtained using the new process, and compare them with the original process baseline and your improvement goals. If the goals have been met and there are no significant unintended consequences, close the project.

Your changes may *fail to meet* the goals or the new process might display unintended consequences. If so, revert to the old process, fix the process using further changes, or initiate a new process-improvement project.

50

Procurement Administration (PMBOK® 12.3, Administer Procurements)

What: Managing outsourced work and supplier relationships based on an existing contract.
When: Project execution and control.
Results: Open, two-way communication; appropriate and timely deliverables; management of changes; and payment for services.

Manage the Relationship

Make one project team member responsible for each supplier relationship. This person's initial *liaison* duty is to discuss the contract thoroughly with the assigned primary contact for the other party to ensure that everyone understands the contract terms. In addition, he or she will be responsible for routine communications, managing any changes, contract and payment matters, issue and problem management, and problem escalation.

Periodically, especially following any changes to the contract or staffing, *review* the terms and conditions in the contract.

Work to build **motivation** on the staff for outsourced work. Recognize people by thanking them for their efforts and praise good results. Strive to assign work required to *individuals who care* about it, and make ownership of tasks explicit.

Communicate

Collect status reports for outsourced work at least once per week in writing. Find ways to *verify progress*: Participate in inspections, walk-throughs, interim tests, and other reviews. Schedule well-defined milestones with deliverables frequently in subcontracted work, especially with new suppliers.

Make outsourced work as visible as possible. Maintain a record of all formal communication with suppliers in your project archives.

In addition to status communication, schedule a *general discussion* meeting with suppliers at least once a month, face-to-face if possible. **Communicating informally** is also necessary; keep the channels of communication open, and work to maintain trust and a good, honest working relationship. When there are problems, focus on recovery and problem-solving, not on fixing blame.

Measure Progress and Pay for Services

Evaluate all interim and final deliverables using criteria consistent with the terms of the contract and the statement of work finalized during **procurement initiation**. Include contracted work in your project **performance reporting**.

Note any *deviations* from the contract requirements, such as timing, accuracy, or quality. Work with the supplier and use effective **issue management** to resolve them or at least minimize their impact on the project. If resolution proves beyond your control, promptly move to **problem escalation**.

Ensure that all *payments* called for in the contract are made based on successful achievement of project milestones and satisfactory acceptance criteria. If payments are reduced due to performance or other issues, document the situation in writing, and support any deductions by including relevant contract terms in your communications to the supplier.

Manage Contract Changes

Manage all changes using the *documented process* in the contract and being consistent with your **integrated change-control** process. Contract changes are often expensive and have other undesirable consequences, so avoid them whenever possible. If a necessary change goes beyond the terms of the contract or exceeds its financial limits, amend the contract and get both parties to re-sign it, or replace it by **negotiating a contract** to replace it.

51

Procurement Close-Out (PMBOK® 12.4, Close Procurements)

What: Verifying successful performance at the conclusion of outsourced work, completion of documentation, and closure of the contract.
When: Project execution or closure.
Results: Receipt of all contract deliverables, payment of final invoices, and termination of the contract.

Verify Completion

At the completion of contracted work, compare the results achieved with the contract requirements (and any approved changes). Validate satisfactory achievement of each *specified requirement*.

Work with the supplier to resolve any *remaining variances*, successfully completing all needed work. If the supplier cannot complete some portions of the work, determine the consequences in terms of payments, penalties, or other actions.

If early *contract termination* becomes necessary due to **canceling projects** or other circumstances, do it using the terms set out in the contract. Document all the completed work, and determine the financial and other consequences of early termination.

Make Final Payment

Review the contract terms and the contract payment history. Approve prompt payment of the *final invoice*, consistent with the financial obligations remaining on the contract.

Close the Contract

Evaluate the performance of the supplier and document it for your project **lessons learned**. Be particularly thorough whenever the contracted work ends substantially before the end of the project.

File all contract communication, accounting reports, status and other project reports, change history, and other relevant *documents* in your project management information system for use on future similar projects.

52

Procurement Initiation (PMBOK® 12.2, Conduct Procurements)

What: Determining and using the process for outsourcing project work and establishing a contractual commitment.
When: Project initiation and planning.
Results: A satisfactory signed contract consistent with project requirements.

Define the Proposal Process

Most outsourced work relies on evaluation of submissions from potential suppliers. Whether they are called *proposals*, bids, quotations, or something else, you must carefully define both the information that the responders need to analyze and what you expect them to submit.

Verify the *statement of work* (SOW) from **procurement planning** that you plan to outsource. Include any performance or measurement requirements, acceptance and testing criteria, interface specifications, standards to follow, deadlines, and any other essential information.

Document all of the information you require in a proposal, being as clear and specific as possible. Cover such areas as:

- The details of a proposed solution
- All fees and pricing information
- Schedule dates
- Staffing and expertise
- Equipment and facility capabilities (if relevant)
- Related experience and references

Define an objective basis for **decision-making**. Verify supplier *selection criteria*, such as cost, experience, and price. Prioritize the decision criteria and quantify how you plan to evaluate each proposal regarding each criterion.

Identify who will *evaluate* the proposals and who will make the final decision. Document the evaluation process and get support to proceed from the decision-makers.

Write an RFP

Collect all the information that potential suppliers will need into a comprehensive *request for proposal* (RFP). Some other names for a solicitation document include "invitation to bid" or "request for quotation." Whatever it is called, include:

- The due date for proposal submission and your schedule for a decision
- A SOW consistent with your **scope definition** and project timing
- All of the required information expected in a complete proposal
- Contact information for any questions or related communication
- Presentations, bidder conferences, or other meetings (if any)

In preparing an RFP, take full advantage of any guidelines, procedures, forms, or other available reference materials. Before finalizing the document, *have it reviewed* by legal, purchasing, personnel, procurement, or other specialists in your organization who have expertise in outsourcing to ensure that it is consistent with organizational and other requirements and regulations.

Identify Potential Suppliers and Distribute the RFP

Determine potential suppliers who would be interested in your work and capable of following through. Review lists of known suppliers, looking for those with successful past experience. *List the potential responders*, including the individuals involved if you know who they are.

Send the *request for proposal* to the potential suppliers you identified. Ideally, you should send out a sufficient number to ensure three or more responses. Allow enough time between receipt of the RFP and the proposal due date to permit a comprehensive response. Follow up to verify confirmation of RFP delivery.

Manage the Bidding Process

Encourage *communication*. Ask for questions, and clarify anything in the RFP that is not understandable. Reply promptly to all inquiries, and provide copies of the questions and your responses to all prospective bidders.

Approximately one week before proposals are due, send a *reminder* to each potential supplier.

As proposals arrive, check them quickly for completeness, and formally *acknowledge receipt* to the bidders. If proposals arrive late, determine how you will deal with them and communicate the status to the bidders.

Log in each submission received. Review each one to determine that it is *complete and consistent* with the requirements of your RFP. If necessary, request additional or clarifying information for any proposals that have minor defects. *Screen out* any proposals that fail to meet specific stated RFP requirements. If there are too few complete proposals (a typical minimum is three), determine how to proceed. Possible options include:

- Evaluating what you do have
- Extending the time and soliciting more responses
- Deciding not to outsource the work

Evaluate the Proposals and Contact the Finalist(s)

If you get a large number of proposals, read through them quickly and select the most credible three to six.

Follow up on *references* the suppliers provide and evaluate any work samples they submit with their proposals. Use the quality of the proposal itself to judge the thoroughness and care the bidders bring to their work. Document any personal experience you have with each bidder.

Use a systematic decision-making process to sequence the proposals, and *thoroughly analyze* each submission. Determine how well each meets your established evaluation criteria, and rank order the proposals.

Before finalizing the selection, contact each bidder you are considering and *discuss the details* of the proposal with at least one person who would be involved with the work. Use the discussion to assess whether you will be able to establish an effective working relationship and to ensure that the bidder understands what is required.

Negotiate and Sign the Contract

Pick the proposal that best meets your needs, and finalize the selection by involving individuals who are empowered to enter into a binding legal agreement.

Negotiating contracts (or other agreements) for projects requires setting *terms and conditions* aligned with project work. Include incentives and penal-

ties based on performance when necessary, and use preestablished contracting forms whenever possible to comply with your organization's standards and to simplify and shorten the approval process.

Verify that the contract contains an unambiguous *statement of work* (SOW) that defines all milestones and metrics and includes a clear change-management process. If the contract does not set a fixed price, set a "not-to-exceed" limit that will trigger reexamination of the contract and guard against runaway costs.

Before signing any contract, thoroughly discuss the terms and conditions to ensure that all parties have a clear and consistent understanding of what the contract states. *Sign the contract* and put it into force. Use the contract for **procurement administration**.

53

Procurement Planning (PMBOK® 12.1, Plan Procurements)

What: Determining whether and how to outsource project work.
When: Project initiation and planning.
Results: Analysis of costs and benefits, a defined *statement of work*, and good procurement decisions.

Review Project Information

Identify activities in the project **work breakdown structure** that are candidates for outsourcing. Review your **required skills analysis**, **responsibility analysis**, and **human resource planning** to determine whether there are skill gaps on your team or portions of the project with resource shortfalls.

Before beginning to consider contracting project work, review the process your organization uses for procurement. Familiarize yourself with all of your available sources of *procurement expertise*. Identify all the individuals who will need to be involved; other resources you will need; and all the forms, approvals, and communication required.

Decide Whether to Make or Buy

Evaluate *issues* related to project activities that may be outsourced:

- Will outside work be more expensive than internal?
- Does the work involve anything proprietary, confidential, or related to a competitive advantage?
- Will it be difficult to define the expected deliverables precisely enough to avoid integration problems?
- Does the work required involve one of your core competencies?
- Are changes in the specifications unlikely?

- Will someone on the project team have the time and expertise to manage the solicitation and contracting process, serve as liaison, review outsourced work, and approve payments?

Outline any expected *benefits* of outsourcing:

- Access to otherwise unavailable skills and expertise
- Faster execution by increasing the amount of work in parallel
- Advantages resulting from use of specialized equipment or other capabilities not needed after the project

Consider the *risks* of outsourcing:

- Outsourcing work involving new technology or methods may cause staff **motivation** problems and may interfere with **team development**.
- Delays and problems may be hard to detect in advance.
- Staff turnover in contracting organizations may result in delays and excessive "learning curve" overhead.
- Communication problems and misunderstandings are more likely.
- There are high penalties for imprecise early planning and changing design specifications.
- Finding and qualifying vendors may take more time than you have.
- Contracting for follow-on work may be impossible or expensive.
- Selecting the lowest-cost proposal may result in quality problems.
- There is potential for exposure of confidential information.

Weigh the issues, benefits, risks, probable costs, and other factors. Determine whether to outsource based on solid *business criteria* and good **decision-making**. Avoid contracting out project work based only on the lack of available staff.

Document the Work

For all project activity that you intend to outsource, develop a thorough *statement of work* (SOW), including detailed feature specifications, deliverable performance and acceptance criteria, any other relevant requirements, and the necessary timing. Ensure that the SOW is consistent with your project **scope definition**. Develop a rough estimate of anticipated cost.

Consider contracting options (such as fixed-price or time-and-materials)

and describe how you will select a contract type. Determine how many proposals you will need to consider. Develop a *procurement management plan* that is consistent with your organizational practices and outlines criteria you will use for procurement **decision-making**. Identify timing and staffing for all necessary work.

Get Approval

Present a summary of your SOW, supporting business data, and your procurement plans to your project sponsor. Be prepared to support the summary with your detailed data. *Obtain approval* to initiate the **procurement initiation** process and secure stakeholder commitment for the expected expense.

Initiate contact with contracting, legal, human resources, or other *procurement specialists* who participate in the process, and also get their commitment to support your efforts.

54

Project Baseline Setting

What: Committing to a project plan based on bottom-up project information.
When: Project planning and execution.
Results: A solid basis for project tracking and control, with project expectations, deadlines, and budgets aligned with reality.

Review Plans and Objectives

Setting the project baseline is the *final component* of **project plan development**.

Assemble your project plan components and verify that the planning is thorough, realistic, and capable of delivering the results desired. Inspect your plans for omissions, excessive optimism, and other defects. Compare the total number of effort months your project plan requires with the actual effort used previously to complete successful similar projects. Adjust your estimates and plans if the comparison seems too optimistic. Schedule periodic **project reviews** on long projects.

Identify any differences between your plan and the initial **project objective** in terms of timing, budget, staffing, or other stated goals. If there are important goals that are not consistent with your current bottom-up plans, confirm your **sponsorship** and work to remedy them through **constraint management and plan optimization**.

If the result of your best bottom-up planning still fails to meet key goals of the project, prepare *several plan variations* that do deliver on the highest **project priorities**.

Prepare

Summarize the data from planning to present to your project sponsor. Include an executive summary of the plan, as well as resource and cost analysis, schedule, risk plans, and other pertinent information. Presenting great volumes of planning information may be more distracting than helpful, so plan to bring detailed information along mainly for reference.

If you will be **negotiating project changes** before setting a baseline, prepare to *justify necessary modifications* with credible information, and develop two or more proposals outlining realistic projects with solid business cases.

Set up a meeting with your sponsor, requesting sufficient time to discuss the project and gain agreement on your plans. Before the meeting, practice your **presentation** with a team member or two and encourage their criticism. Following the planning process, you are the world authority on your project; rehearse your presentation until you confidently sound like it. Work to improve your presentation, and use your strengths: your project experience, your background and skills, and your enthusiasm for the project.

Set the Baseline

Meet with your sponsor and present your project data.

When it is necessary, *shift project objectives* using fact-based negotiation and **consensus-building for your ideas**. Convince project sponsors and stakeholders to support a project that makes sense and serves everyone's interests.

Following presentation of the project plans, seek agreement on a specific deliverable, a resource commitment, and a deadline, all consistent with a feasible plan. *Validate the plan* and verify that the resulting objective is acceptable both to the project sponsor and to your project team. Confirm stakeholder support and use your baseline for **stakeholder-expectation management**.

Set the baseline plan of record using your project plans.

- *Publish the final versions* of the project documents.
- *Communicate plans* and arrange for distribution to and access by the project team, online if possible.
- *Save a baseline schedule* if you are using a **software tool for project management** and begin tracking status in the database.
- *Freeze all specifications*, and begin **integrated change control** and **scope change control**.

Manage the Project Baseline

Use the project baseline for **project plan execution**. Structure **status collection** with it, and use it as the foundation for **performance reporting**.

Never change a baseline without using your change-control processes, and keep track of any modifications made during the project.

Compare the baseline with actual results during project reviews and for analysis of **lessons learned**.

55

Project Charter (PMBOK® 4.1, Develop Project Charter)

What: Developing a high-level formal project description to launch a project.
When: Project initiation and planning.
Results: A reference document used to guide project planning and staffing.

A project charter is a *formatted collection of information* assembled as a part of **project initiation** or soon afterward. Because projects may differ, this documentation may also be known as a:

- Project definition document
- Project datasheet
- Proposal
- Reference specification
- Statement of work
- Plan of record

Whatever the project description documentation is called, the important thing is for it to be written down.

Collect Inputs

Review **sponsorship** information, including the business need, problem statement, or other rationale for the project. *Summarize* the desired results and goals, constraints and assumptions, and initial project staffing information. Document the business standards and organizational requirements relevant to the project.

Develop the Charter

A project charter begins with the *sponsor*. Review each part of the charter information the sponsor provides, and validate your understanding of the information.

Charters vary in specific *content*, but most include:

- **Project objective** statement, with measurable success criteria
- **Project priorities**
- High-level **scope definition**, describing all expected deliverables
- Description of the expected users or customers
- Results of **stakeholder identification**
- Business case for the project (benefit or **return on investment analysis**)
- Rough cost estimates
- Target milestones and deadlines
- Project leader and initial staffing information
- Identified dependencies
- **Project life cycle** and any methodology requirements
- Key constraints and assumptions
- Known issues and high-level risks

Document and Distribute

Validate the content of the charter with the project sponsor and use it to begin **stakeholder-expectation management**. If the project is for an external organization or customer, use it in **contract negotiation** and incorporate charter information into the signed formal agreement.

Add the charter to the project information archive, and provide it to the project team and stakeholders *in writing*. Putting the charter online is best, but if it is on paper, set up a process for updating and replacing it following any necessary changes.

Use the charter as a basis for detailed **requirements collection**, other **project plan development** activities, and **project reviews**.

56

Project Infrastructure

What: Establishing a framework for project planning and control.
When: Set in project initiation; used in project planning, execution, and control.
Results: Documented decisions ensuring comprehensive planning and efficient project execution.

List Key Decisions

Infrastructure decisions provide a *foundation* for planning, execution, and control. Documenting infrastructure decisions clarifies how the project will operate. Infrastructure planning varies in length from a few hours to several days of effort, depending on project scale.

Begin infrastructure planning early in a project by reviewing **project initiation** information. Make infrastructure decisions early; midproject structural change is difficult.

Create a list of *infrastructure decisions*. Model your list on one from an earlier project, one from a suitable template your organization uses, or the sample list in Figure 56.1. Add, delete, or change items as necessary for your specific project.

Consider the problems, challenges, and issues recently completed projects faced. Include questions to address issues likely to create trouble for your project.

Figure 56.1. A sample infrastructure decisions list.

Make Project-Initiation Decisions

- Is project **sponsorship** clear and well established? What is the stated business purpose of the project?
- How will you develop the **project charter**? Who will write it? Who will approve it?

- How will you determine the initial **scope definition**?
- How will you ensure **stakeholder identification** for this project?
- How will you complete **team acquisition**? What **team development** will be required?
- What will our **communications planning** include? What communications facilities and tools will we use?
- How will we implement **integrated change control**?
- What process will we use for team **decision-making**?
- How will we perform **issue management**?
- What criteria will **problem escalation** use?
- How will we manage **conflict resolution**?

Make Project Planning Decisions

- What **project life cycle** will we employ? Will we need any changes?
- What standards or methodologies will we use?
- What are the major project checkpoints, phase exits, stage gates, or milestones? What deliverables do those events require?
- What are the agenda and timings for our project **start-up workshop**?
- What process will we use for **project plan development**?
- If we have links to **multiple dependent projects**, how will we identify, document, and agree upon the interfaces?
- What **software tools for project management** will we use? Will training be required?
- Who in addition to the project leader will be involved in planning?
- What are the deliverables of the project planning process?
- If outsourcing work, how will we manage **procurement planning**?
- What plan-based predictive **project metrics** will we track?
- How will we use the overall project plan for **project baseline setting**?
- How will we manage **scope change control** and other project changes? Who will have change-approval authority?
- How much deviation from the plan will we accept before initiating a new project baseline derived from a modified project objective?
- Where will we store project planning and other documents? How will we manage security for our project management information system (PMIS)?

Make Project Execution and Monitoring Decisions

- How, overall, will we manage **project plan execution**?
- Where and when will we hold project **meetings**? How will **virtual team** members take part?
- How will we do **status collection**? How frequently?
- Who will assess project progress using **project variance analysis**?
- Who will generate project **performance reporting**? How frequently?
- Who is responsible for **information distribution**?
- Who will get project-status reports? How?
- What criteria will trigger exception reports? Who will receive them?
- Who will archive and manage project documents in our PMIS?
- How will we ensure ongoing **stakeholder-expectation management**?
- How will we manage **risk monitoring and control**?
- How will we encourage frequent **informal communications** with and among project team members?
- How will we ensure adequate **procurement administration**?
- How will we manage team member **performance problems**?
- When will we conduct **project reviews**? Who will participate?

Make Project Closure Decisions

- What criteria will determine **project cancellation**?
- How will we complete testing and **scope verification**?
- What sign-offs and stakeholder approvals will be required?
- When will we meet to determine post-project **lessons learned**? Who will participate?
- How will we complete **procurement close-out**?
- How will we celebrate project completion with the project team?
- What will we do to ensure that all contributors and teams receive personal thanks and appropriate **rewards and recognition**?

Resolve Issues and Document Decisions

Review your list of infrastructure decisions. Eliminate any questions that seem unnecessary and distribute the list to your team.

Solicit recommendations, either in writing or at a meeting. Convene a

team meeting to discuss the recommendations and *reach agreement* on each issue.

Document your decisions and your key assumptions. Distribute a summary of the decisions to team members and other stakeholders. Use the decisions in managing your project.

Update the infrastructure as necessary following project changes and during project reviews.

57

Project Initiation

What: Obtaining formal commitment to begin a project.
When: Project initiation.
Results: Clear documentation of the project objective and naming of the project leader and initial staff.

Select the Project

Projects emerge when a perceived need or opportunity results in organizational **sponsorship** to take action. Identify why the organization is considering this *particular project*. Projects originate for a wide variety of reasons:

- To solve a current problem
- To respond to a stated request
- To meet (or create) a market demand
- To comply with shifting legal requirements or standards
- To improve a process or lower costs
- To exploit a technical advance or perform basic research
- To pursue a business strategy or opportunity

Define the *expected value* of the project overall and describe why the project will make a difference, beginning with the process of setting a **project vision**.

Create a rough estimate of both the project *benefits and costs*. Draft a preliminary scope statement describing the project deliverables. For each defined deliverable, determine the timing required and document the anticipated value represented. Document known project constraints, and make a rough appraisal of likely staffing and other project costs. Summarize the scope, schedule, and resource information in a preliminary **project objective** statement.

Consider the results of (or initiate) a high-level feasibility analysis to validate that the project deliverables are *realistic*.

Document the Project

Draft the initial **project charter**, collecting:

- The overall business case for the project
- **Requirements collection**
- **Project life cycle** and methodology requirements
- High-level descriptions of project deliverables, with timing and cost goals
- Any relevant constraints and assumptions
- Information from **stakeholder identification**

Commit Initial Resources

Secure funding, equipment, and other *resources*, at least for **scope definition** and **project plan development**. Identify the project leader and initial core team members, and formally assign them to the project. To get the project off to a robust start, establish the **project infrastructure** and schedule and hold a project **start-up workshop**.

58

Project Life Cycle

What: Establishing and using an overriding structure for project execution.
When: Set in project initiation and used throughout planning and execution.
Results: Enhanced project control and coordination with related projects.

Define Life Cycle Requirements

Even small, informal projects will have a few key milestone events to mark the *flow of work* that represent a simple life cycle. The Project Management Institute's PMBOK® process groups (Initiating, Planning, Executing, Monitoring and Controlling, and Closing) can be thought of as an informal, high-level life cycle, as Figure 58.1 shows.

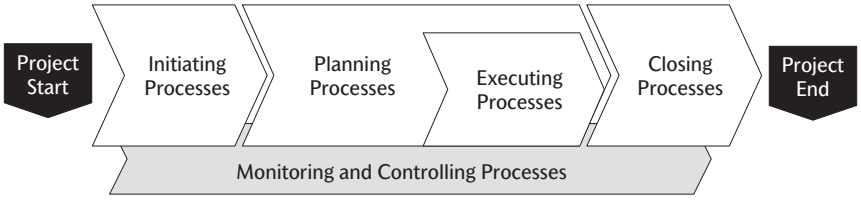

Figure 58.1. PMBOK® process groups.

Larger, more complex projects generally will benefit from a *formally defined* life cycle made up of either a linear sequence of phases or of repeating work cycles. Factors determining the type of life cycle most appropriate for a particular project include organizational requirements, adoption of a specific project methodology, the need for interproject coordination, and the project details.

Decisions on the project life cycle are part of the **project infrastruc-**

ture and occur during **project initiation** and are documented in the **project charter**.

Project life cycles are closely related to *product* life cycles and run parallel to them, often sharing descriptions of the work and decision points. Product life cycles usually contain defined phases that follow **closing projects**, with activities that may not be part of the project life cycle.

Use Life Cycles with Sequential Phases

Where projects are structurally very similar to previous and expected future projects undertaken in the organization, life cycles are generally made up of a linear succession of phases. These high-level aggregations of effort connect the initial concept for the project with the ultimate delivery of a result. Projects using this type of life cycle progress through milestone decision points (called phase reviews, stage or review gates, or something similar) at the end of each portion of the defined life cycle. Because this progression flows step-by-step from one phase to the next, it is often called a *waterfall* life cycle. Although there are at least hundreds of variations for this sort of life cycle, the initial portion always focuses on thinking, the middle on doing, and the last part on checking and delivery.

A key milestone or decision point in all sequential life cycles involves making the business decision to commit full resources and proceed to delivery. For projects done within an organization, this point generally follows an early phase following analysis, feasibility investigation, and planning. The business decision results in **project baseline setting**. A typical project life cycle for product development, information technology, and infrastructure projects appears in Figure 58.2.

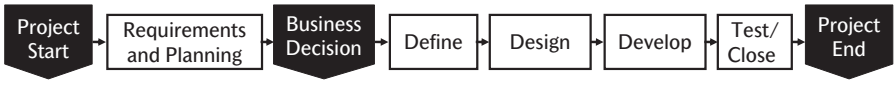

Figure 58.2. A typical project life cycle for development projects.

The corresponding product life cycle would extend through phases with names such as Support and Retirement.

For projects undertaken for another organization, generally on a fee-for-service basis, there are often more initial phases leading to the decision to commit, with acceptance of a project proposal and **negotiating contracts**.

Figure 58.3 shows a sample life cycle for a construction, solution, or other fee-for-service project.

Figure 58.3. A typical project life cycle for proposal-based projects.

The corresponding deliverable life cycle would typically extend through Warranty and Support phases.

Use Life Cycles with Cyclic Phases

When managing projects that are not very similar to past work, it may be useful to adopt an *iterative*, step-by-step approach. Small software-development projects and other efforts where requirements collection can be difficult may benefit from delivering functionality incrementally using feedback from live users to ensure that the ultimate deliverable will be accepted and meet their needs. Although these "spiral" projects are generally longer and more costly than "waterfall" approaches, taking an evolutionary approach may be the only reasonable option for truly novel situations. "Agile," cyclic, or other evolutionary methodology projects adopt a life cycle such as the one shown in Figure 58.4.

Figure 58.4. The typical project life cycle for spiral life cycle projects.

The product life cycle would typically extend through Support.

Customize and Use the Life Cycle

Consider the specific *decisions and deliverables* at each life cycle transition point, and include additions that will help you in controlling your project. If some defined life cycle requirements are unnecessary for your project, modify or drop them if you can.

Incorporate effort for *life cycle deliverables* in your **work breakdown structure**, and ensure consistency with your life cycle during **project plan development**. Synchronize life cycle decisions and review milestones if you are part of a program comprising **multiple dependent projects**.

Use your life cycle throughout the project to enhance monitoring and control throughout **project plan execution**.

59

Project Metric Implementation

What: Using a set of project measures.
When: Project planning, execution, and control.
Results: Encouragement of desired behaviors, objective baselines for measuring progress and performance, and timely triggers for process improvement.

Define a Set of Measures

A project is a complex system, so one metric will generally not be sufficient. Too many metrics are also undesirable; important information will be lost in the jumble. Strive in **project metric selection** to define a *minimum set* of metrics to give a balanced project view.

Select metrics for:

- *Objectivity*. If different people evaluate metrics, all get similar results.
- *Accessibility*. Useful metrics are easy to collect.
- *Clarity*. All involved understand the measurement process and use consistent units of measure.
- *Frequency*. Data-collection frequency supports the results you desire but does not represent unduly high overhead.
- *Importance*. Metrics collected are meaningful and will lead to action.
- *Tension*. Metrics in aggregate contribute to desired performance. (Assessing *speed* or *accuracy* alone could cause undesirable behavior, but together their tension results in appropriate trade-offs.)
- *No gaming*. Factors that can improve the measurement without achieving desired results have been minimized.

Define and document each project metric clearly in a *metric datasheet*. Include information such as the name of the metric, the intended objective, required data, measurement units, frequency, collection method, any formulas used, the target acceptable range, who will make the measurement, and how it will be achieved.

Establish a Measurement Baseline

Before using the metrics, collect data to define a *normal range*.

Baseline *predictive* project metrics using planning data from **project plan development**. Verify predictive metric baselines using corresponding retrospective metrics from earlier similar projects. For example, compare the predicted financial **return on investment analysis** (ROI) with previously achieved actual returns.

Diagnostic metrics are central to control and **project plan execution**. **Status collection** is the *source* of most data. For new diagnostic metrics, you can begin with planning data or educated guesses and then confirm the baseline using the first several cycles of data collection. For diagnostic metrics, ask these questions:

- Is the data reliable?
- Are issues detected in **project variance analysis** due to a chronic or onetime factor?
- What project-improvement options arise from positive variances?
- What are the consequences of negative variances?

Baselines for *retrospective* metrics are generally set using prior project history and trend assessments. Retrospective metrics are backward-looking and may be assessed only when **closing projects** or project phases. These metrics are most useful for longer-term **process improvement**.

Use the System of Metrics

Metrics drive behavior, so selecting appropriate factors to measure can have a significant effect on **motivation** and project progress. As Hewlett-Packard founder Bill Hewlett has been quoted saying, "*What gets measured gets done*."

Collect project data to support project **decision-making**, **information distribution**, and **performance reporting**. Project metrics also provide the basis for project control. Following significant project changes, review the measurement baseline and acceptable range for each metric.

Throughout the project, make the measurements *visible*. Use them for **issue management** and analysis supporting **integrated change control**. Report the metrics and use them to ensure ongoing **stakeholder-expectation management**.

Finally, work to ensure that any collected metrics are primarily for process monitoring and improvement, *not for punishment*. Metrics used to rank people or for **canceling projects** are unreliable and will be gamed.

60

Project Metric Selection

What: Defining a coherent set of project measures.
When: Project planning, execution, and control.
Results: Encouragement of desired behaviors and an established basis for objective baselines and project control.

Document Desired Behaviors and Outcomes

Before deciding what to measure on projects, define the behaviors you seek. Measurement affects behavior, so clearly define *desired results* and use them to guide selection of metrics.

There are three types of metrics: *predictive*, *diagnostic*, and *retrospective*. Useful systems of metrics will generally include a good balance of measurement types.

- Predictive metrics use analysis to provide forecasts of future conditions. Most predictive project metrics are based on the estimates and analysis of **project plan development**.
- Diagnostic metrics provide current data on **project plan execution**. Based on **status collection**, they are used for **project variance analysis** and **performance reporting**.
- Retrospective metrics report on process performance and health following completion. Some retrospective metrics validate predictive metrics. Retrospective measures are integral to **lessons learned**, and for the overall project they are part of **closing projects**.

Using your own project analysis or the following lists, choose a set of appropriate measures for **project metric implementation**.

Define Predictive Metrics

Predictive metrics are useful for developing a *deeper understanding* of the work and for comparing projects. These metrics support analysis for **inte-**

grated change control and for **negotiating project changes** when necessary. Although the emphasis on predictive metrics is highest during early planning and analysis, they are also central to **forecasting project completion.**

Predictive *schedule* metrics include:

- **Activity duration estimating**
- Project duration (calendar time)
- Aggregated schedule **quantitative risk analysis**

To assess project investment, identify predictive *resource* metrics, such as:

- **Activity resource estimating**
- **Cost estimating**
- Budget at completion
- Maximum staff size and other staffing statistics
- Aggregated resource and cost quantitative risk analysis

Predictive *scope* metrics can be useful in developing estimates that incorporate:

- Project complexity (interfaces, algorithmic assessments, technical analysis)
- Size-based deliverable analysis (component counts, number of major deliverables, lines of noncommented code, blocks on system diagrams)
- Volume of anticipated changes

Some *other* predictive metrics for projects include:

- **Return on investment analysis** and financial forecasts
- Number of identified risks

Define Diagnostic Metrics

Throughout a project, you need to collect and communicate data on the *overall health* of the project. These metrics help by focusing on prompt detection of adverse variances and providing visibility of project problems while they are still small.

Diagnostic *schedule* metrics include:

- Critical-path activity slippage
- Cumulative project slippage
- Number of added activities
- Activity closure index (the ratio of actually closed activities to the number expected)

Some diagnostic *resource* metrics are:

- All **earned-value management** metrics
- Excess consumption of effort or funds
- Estimate at completion
- Amount of unplanned overtime

Diagnostic *scope* metrics concern the project deliverable. Consider:

- Results of tests, inspections, and walk-throughs
- Number and magnitude of approved scope changes

Other diagnostic metrics that may be worth keeping track of include:

- Risks added after **project baseline setting**
- **Issue-management** statistics
- Communication metrics, such as volumes of e-mail and voice mail

Define Retrospective Metrics

Retrospective metrics are backward-looking and are generally assessed at the end of a project or phase. These metrics are most useful for longer-term **process improvement**. These backward-looking measures are an important part of **lessons learned**.

A few retrospective *schedule* metrics are:

- Actual durations and assessment of estimation accuracy
- Number of added unplanned activities
- Performance to expected estimates for standardized project activities

Retrospective *resource* metrics include:

- Actual budget
- Total project effort and assessment of estimation accuracy
- Life-cycle phase effort percentages
- Effort required late in a project for defect correction as a percentage of total effort
- Staff turnover
- Variances in travel, communications, equipment, outsourcing, or other expense subcategories

Retrospective *scope* metrics relate to your development processes. The metrics might include:

- Actual "size" of project deliverable analysis (components, lines of non-commented code, system interfaces)
- Number of accepted changes
- Number of defects
- Performance of deliverables compared to **project objectives**

Other retrospective metrics worth considering are:

- Number of project risks encountered
- Project issues tracked and closed

61

Project Objective (Mission)

What: A brief, high-level description of the desired project deliverable, timing, and investment.
When: Project initiation and planning.
Results: A clear, unambiguous statement of what is expected of the project, validated by its sponsor.

Draft the Project Objective

The initial project objective should be based on **project initiation** data. A project objective is a simple, *short statement* describing the project. The project leader is usually the author, who develops it using inputs from the project team. The project sponsor, a customer, or other project stakeholders may also draft the objective.

As Figure 61.1 shows, a project objective defines the deliverable(s) (*scope*), the deadline (*schedule*), and the overall investment (*cost*). A good objective is about 25 words in length and captures project essentials concisely. It should avoid technical jargon, acronyms, idioms, or other language that can lead to misunderstandings. Describe deliverables using ordinary language that all project stakeholders will understand. Translate the information into any languages necessary, and validate the translations before distribution. For

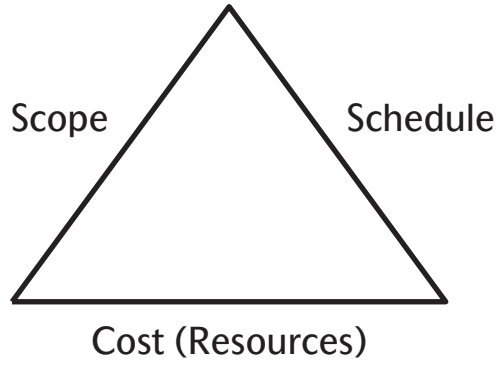

Figure 61.1. The three components of a project objective.

timing, include the day, month (by name, not number), and year. Specify resources in clear monetary terms or in unambiguous effort.

Here's an example: "*I believe this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to earth . . . $531 million in fiscal '62.*" (President John F. Kennedy, May 25, 1961)

Validate the Project Objective

Validate the project objective with the project sponsor before continuing with **scope definition** and other project planning. Show the objective statement to the sponsor and other stakeholders to probe for potential misunderstandings about the project. Work to clarify the details and to test interpretations, so you can correct any omissions or errors prior to detailed project definition and planning. The project objective is merely a restatement of the initial top-down goal, not a firm commitment, so ensure that the result of this validation is only a *mutual agreement on the project goals*.

Document and Use the Project Objective

Discuss the project objective with the project team, and document it as part of the **project charter**. Add the objective to project documents and use it in project meetings and communications.

Use the project objective to set **project priorities**, to establish the **project vision**, to define the **project infrastructure**, and as the basis for **project plan development**. Make the project objective central to **decision-making**, **scope change control**, and **project reviews**.

62

Project Office

What: Using specialized staff to consolidate many project management responsibilities for a group of related projects.
When: Throughout large projects.
Results: Consistent processes and reporting for related projects, minimized overhead, and increased likelihood of success.

Justify

A competent and well-staffed project office (also called a program-management office, a project management center of excellence, a project support team, and many similar names) brings many *benefits*, such as:

- Centralized use of high-end **software tools for project management**, avoiding excess investment in training and tool deployment
- Improved cross-project resource planning and control
- Better support for distributed and **global teams**
- Avoidance of the "too many projects" problem through coherent portfolio management

Functions that staff members of a project office perform include:

- Facilitating project **start-up workshops**
- Supporting **project plan development** and **communications planning**
- Creating consistent and efficient project planning documents
- Enforcing planning standards and auditing for completeness
- Centralizing **status collection**, **information distribution**, **performance reporting**, and **integrated change control**
- Assisting with **project variance analysis** and recommendations for resolution
- Collecting and analyzing **project metrics** during **project plan execution**

- Assisting with **conflict resolution**; **decision-making**; management of timing, specification, resources, staffing, and other project issues; and facilitating **problem escalation**
- Planning, executing, and reporting for **project reviews** and **lessons learned**; and assisting in **closing projects**

A project office also has *costs* for staffing, communication, setup, training, equipment, and related expenses.

Before **organizing for project management** by establishing a project office, determine what functions and specialties are worth implementing. Carefully consider the *net value* of creating a dedicated project-support team.

Implement

Identify the functions that will be centralized in the project office, and estimate the required staffing. Use **required skills analysis** to determine what the staff members need to know, and work to *build the skills* through training, hiring, or other strategies. At a minimum, project office staffing should be adept at:

- Planning
- Project communication support
- **Process improvement**
- **Coaching and mentoring** for project leaders
- Managing **organizational change**

63

Project Plan Development (PMBOK® 4.2, Develop Project Management Plan)

What: Developing a detailed, bottom-up description of the project work.
When: Project planning, execution, and control.
Results: A basis for effective communication and a map for project success.

Prepare for Planning

Like a chess player, a good project manager looks several moves ahead. This process is an *overall summary* of many other processes throughout this book. The summary flowchart in Figure 63.1 indicates how some of the planning processes are linked, but project planning is iterative, so there are many other possibilities.

Prepare for planning by reviewing **project initiation** information, the **project objective**, and other available documentation such as the **project charter**. Document **project life cycle** requirements and **project infrastructure** planning decisions to guide your efforts.

Involve the core team in planning, as well as any other stakeholders you need to model and document the overall project plans effectively.

Develop the Plans

At the start of planning, information about *expected deliverables* is often the clearest, so **requirements collection** and **scope definition** are generally where planning begins. The **work breakdown structure** (WBS) serves as the bottom-up foundation for other planning activities, including **risk-management planning**.

Activity definition (derived from the WBS) supports *preliminary scheduling*, which is usually next. **Activity duration estimating** and **activity se-**

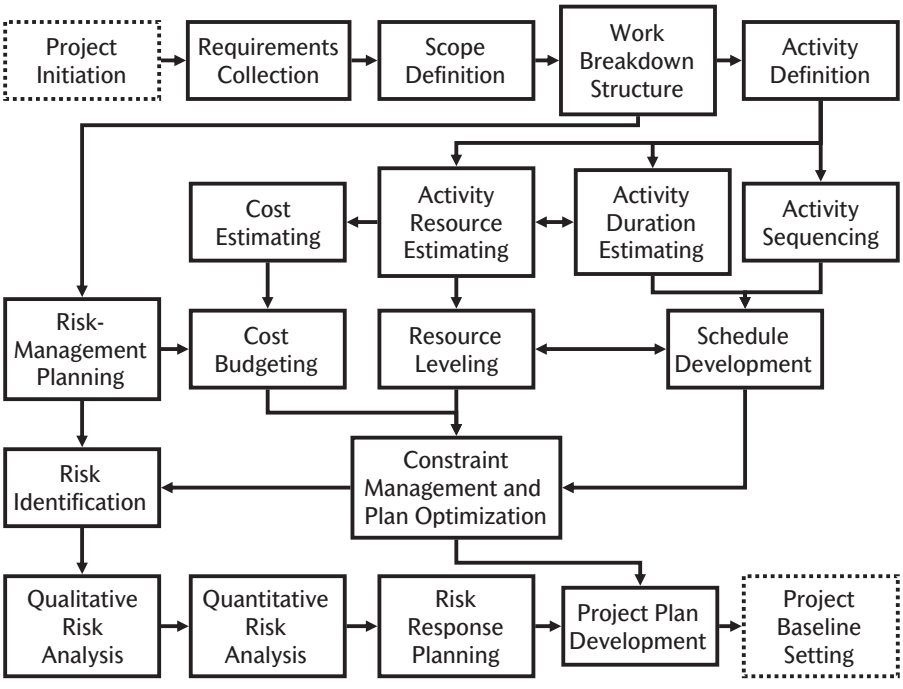

Figure 63.1. Summary planning flowchart.

quencing for each defined activity provide the information needed for workflow analysis. Done in parallel, their outputs feed into **schedule development**, often facilitated by **software tools for project management**. Using the preliminary schedule, you can create Gantt charts, activity networks, a critical-path analysis, and other time-based deliverables.

As the timeline for the project takes shape, the focus of planning shifts to determining *resources* and staffing. **Activity resource estimating** uses the WBS data to do **required skills analysis** and **responsibility analysis**, and to support **staff acquisition**. You then use activity resource estimates for effort analysis and **cost estimation**. Reconciling the cost (based on effort) and duration (based on availability) estimates leads to a resource-loaded refinement of the preliminary schedule and permits **resource leveling** analysis. You can then aggregate the cost estimates, other resource data, and your risk planning for initial **cost budgeting**.

Unfortunately, the results of the initial bottom-up analysis rarely are consistent with the project's top-down objective, so *replanning* and "what if?" analysis using the techniques of **constraint management and plan opti-**

mization are needed. Use **project priorities** to explore trade-offs in your preliminary plan. If you are unsuccessful in creating a satisfactory plan through replanning, develop several alternative project plans that are as close to the stated goals as possible.

The final part of plan development, because it relies on all other planning data, is *risk management*. **Risk identification** is a good idea throughout planning, as your analysis reveals uncertainty, lack of enthusiasm, potential failure modes, and other exposures. As initial planning approaches completion, **brainstorm** and list additional risks. **Qualitative risk analysis** prioritizes identified risks, guiding risk-management decisions. **Quantitative risk analysis** may assess significant risks, supporting your **risk response planning**. Integrate any risk prevention tactics into your plans, and document any contingency plans you create.

If your project involves contributors outside your organization, include **procurement planning** and **procurement initiation** effort in your plans.

Plan development culminates in inspecting the plan for any defects, correcting them, and *documenting* all planning deliverables in the appropriate format.

Finalize Your Plans

If your best plan fails to support the top-down objective, use plan alternatives to **negotiate project changes**. *Validate the plan* with your sponsor and complete **project baseline setting**.

64

Project Plan Execution (PMBOK® 4.3, Direct and Manage Project Execution)

What: Executing and controlling a project, using the baseline plan.
When: Project execution and control.
Results: Early detection of issues and problems, accurate and timely progress reporting, and effective project communications.

Prepare for Project Monitoring

This process is an *overall summary* of many other processes described throughout this book. The summary flowchart in Figure 64.1 indicates some process dependencies.

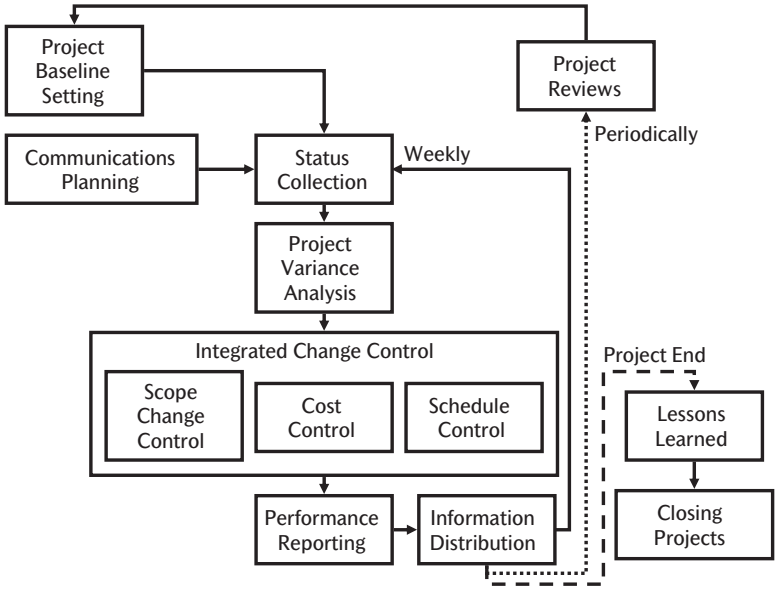

Figure 64.1. Summary execution flowchart.

Project-tracking and control processes commence with **project baseline setting**. Once deliverable specifications are frozen and you have a baseline plan, you have a foundation for project *tracking and control*. Review the process for **scope change control** with the project team and begin using it to resist unnecessary changes.

Refine your *communication processes* to meet the needs of your team, stakeholders, and sponsor. Document your **project infrastructure** execution decisions and your **communications plan**. Establish and deliver on expectations for communication, meetings, and reporting.

Set Up the Status Cycle

Project monitoring depends on a *four-stage cycle* that repeats (weekly for most projects) until the end of the project.

The first stage is *inbound communication*, engaging the project leader in **status collection**.

The second stage of the cycle includes comparing status data to the baseline plan and conducting **project variance analysis**. The *data analysis* also involves evaluation of diagnostic **project metrics**, including those used for **earned-value management** and **forecasting project completion**.

The third stage is for *project control*, which involves responding to any timing or resource problems using the processes of **integrated change control**, principally **cost control**, **schedule control**, and **scope change control**. When project variances are beyond your ability to remedy, promptly seek help from those with more authority through **problem escalation**. If your project team includes outside contributors, also attend to **procurement administration**.

The fourth and final stage is *outbound communication* to inform people of what has happened on the project. Examples include **performance reporting**, **information distribution**, and any project **presentations**. These follow the analysis and planning of the prior stages so that you can include credible plans for recovery along with any bad news you need to deliver. In all communications, emphasize accomplishments and recognize your team's contributions to enhance **motivation**.

At the end of each cycle, *archive* all status, change, and other project reporting in the project-management information system.

Review the Project

For projects longer than six months, conduct periodic **project reviews** to *revalidate* the project plans and collect new information. When necessary, **negotiate project changes** and validate a new project baseline to reflect current reality.

Close the Project

When the project is *completed*, get formal acceptance of your deliverable through **scope verification** and prepare a final status report to inform everyone that the project is over. **Closing projects** involves a number of tasks, including analyzing the **lessons learned** on the project. Document and act on your recommendations for change.

Thank all the team members for their contributions, and use programs for **rewards and recognition** when appropriate to recognize significant accomplishments. *Celebrate* your successes.

65

Project Priorities

What: Explicitly identifying decision criteria for the project.
When: Project planning and execution.
Results: Effective management of project changes and prompt, consistent decisions.

Document Objectives and Constraints

Review the **project objective** and the assumptions and constraints identified during **project initiation**. Explore the reasons for the goals and constraints, and document the *consequences* of failing to achieve them. If necessary, probe for more information on constraints and goals with the project sponsor and key stakeholders.

Set the Priorities

For most projects, all three parameters—scope, schedule, and cost (resources)—are important. Setting priorities enables the project team to determine which of the three is *most essential*. These priorities support **scope definition**, **decision-making**, **constraint management and plan optimization**, **negotiating project changes**, and **integrated change control**.

Consider the *trade-offs* among scope, schedule, and cost by specifying small changes to the stated project objective. Would it be worse to slip the schedule a week beyond the deadline, or increase the project budget by 5 percent? Would it be more appropriate to drop a feature of a project deliverable or to add staff to the project team? Would a slightly longer project that delivers a more robust product be desirable? Questions such as these often arise late in a project, but it is better to deal with them early.

In exploring the costs, pain, and appropriateness of small changes, relative priorities emerge. Document priorities using a *three-by-three matrix* (see Figure 65.1). Place one mark in each row, showing which parameter is *constrained* (least flexible), which one is to be *optimized* (somewhat flexible), and for which of the three change may be *accepted* (most flexible).

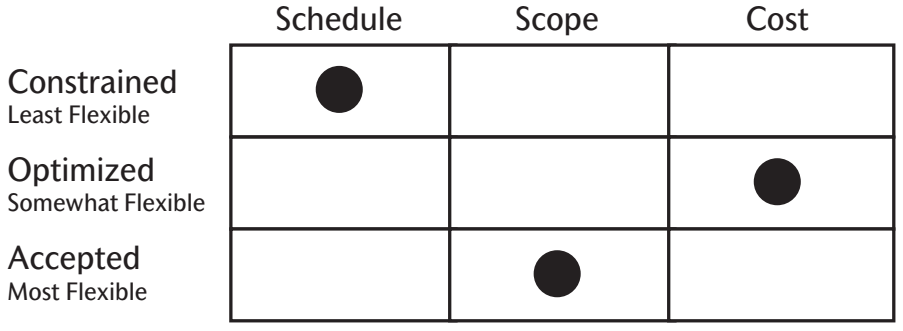

Figure 65.1. The priority matrix.

Consider the options (there are six), and discuss them within the project team to develop *consensus* on the priorities.

Validate your prioritization with your project sponsor, and make modifications if needed based on the sponsor's feedback. For some projects, agreeing to constrain two of the three parameters may be necessary, but it is always unrealistic to limit all three, especially prior to **project plan development**. Strive for agreement, and clearly document the lowest priority. Use your prioritization for **stakeholder-expectation management**.

Periodically Review Priorities

Keep the matrix *up-to-date*. If your project changes, reevaluate the priorities to ensure they remain appropriate. Revisit the priorities following business reorganizations and during **project reviews**. If the priorities shift, revalidate them and update the project documentation.

66

Project Reviews

What: Periodically revisiting project plans, assumptions, and constraints during long projects.
When: During project execution.
Results: Revalidation of project objectives, improved project plans, and renewal of team motivation.

Plan and Schedule Periodic Reviews

Projects are all unique, so planning more than a few months in advance with precision is difficult. Depending on the project type, reviews aligned with the *planning horizon*, every three to six months, allow necessary **project plan development** adjustments.

Weekly **status collection**, **performance reporting**, and **integrated change control** are all necessary, but on longer projects they are not sufficient. Periodic reviews provide the project equivalent of planned *preventive maintenance*.

Project reviews are most useful at natural *project transitions*, including:

- At **project life cycle** or phase transitions
- At major milestones or checkpoints
- Following significant project changes
- When project staff members join or leave
- After business reorganizations
- At the end of a fiscal quarter

Plan the review in advance, allowing sufficient time (several hours, minimum) to cover the items on your agenda, such as:

- Recognition of significant accomplishments
- Reinforcement of **team management**, building trust and relationships
- Review of the **project objective**
- Revalidation of project constraints and assumptions

- New **activity definition** and **risk identification**
- Revisions to **activity duration estimating** and **activity sequencing**
- Review of **activity resource estimating** and **cost estimating**
- Review of **procurement administration**
- Adjustments to **project infrastructure**
- Analysis of project trends and changes
- Collection of **lessons learned** and opportunities for **process improvement**

Determine the *team members* who need to attend, and choose a time when they are available. Get their commitment to attend in person whenever possible.

Assemble *needed information* from the project archive, and update any information such as **market research** or **customer interviews** that might be out of date.

Review the Project

Begin the project review by discussing the agenda. Discuss lessons learned, starting with things that went well and major accomplishments.

Focus the remainder of the review on new information and on potential *project changes*. Review the future project plans, and test the assumptions, estimates, and other information in your project plans using what you now know.

During the review, *capture decisions and action items* in writing, and add items requiring later attention to your **issue-management** log.

Close the review with a discussion of all the recommendations, suggestions, and decisions. Assign owners and due dates for all added project activities and action items. Set a date for updating any affected project documents.

Implement Recommendations and Follow Up

Document the review. Summarize the meeting and distribute a report, generally to the same people who receive your project-status reports. Replace any project plans and documents that are updated, and archive all older versions, marking them as obsolete.

Implement recommendations that you have authority to make. For project changes, use your change-control process, and make approved changes as soon as practical. If the project needs major changes, use your data to support **negotiating project changes** and for revised **project baseline setting**.

After the review, prepare a **presentation** to summarize the project's progress to date and your plans going forward. Invite stakeholders and people from related projects and *use the presentation* for **stakeholder-expectation management**. Accentuate the positive to enhance project team **motivation**.

Also use project reviews as an opportunity for **rewards and recognition**. *Thank people* personally for their contributions, and consider scheduling an event for the project team to recognize accomplishments. Long projects, especially, need more parties.

67

Project Variance Analysis (PMBOK® 4.4, Monitor and Control Project Work)

What: Identifying differences between baseline plans and actual performance.
When: Project execution and control.
Results: Prompt recognition of problems and issues.

Verify Status

Project variance analysis is central to **project plan execution**. It follows **status collection** in the project-tracking cycle. Before beginning to analyze variance, *validate* the status information. Check it for completeness, consistency with past data, and credibility compared with other current status and project information.

Determine Variances

Compare the status reported with your commitments from **project baseline setting**. Note all *differences*, both beneficial and adverse. Positive variances may provide options for project acceleration, and even small negative variances deserve your prompt attention while they are still manageable. Determine the overall effect of any changes, issues, problems, and risks to the project schedule and budget.

Schedule variances are generally the most visible. Note all work that is completed either early or late. For continuing activities expected to finish late, forecast the delay. Determine variances for all current activities, not just critical ones.

Assess any *resource variances*, noting differences between resource estimates and actual results. For **earned-value management**, determine the baseline for variance analysis each cycle using a consistent method, such as the 50/50

rule (assuming half of the estimated cost at activity start, and the remainder at the end).

Also note any *other variances*, such as performance issues related to project scope.

Analyze Impact

For each variance, determine the *impact* on the project. For positive schedule or budget variances, investigate whether estimates for future project work might also be larger than necessary. Determine how negative variances affect the project. Use status data to **forecast project completion** to determine any shift from the baseline.

For each timing delay, estimate the *schedule impact* (if any) on project milestones and the deadline. Even for noncritical activities, use **cause-and-effect analysis** to determine the root cause of each slip. Similar optimistic duration estimates may recur later in the project, resulting in delays in finishing other work.

Determine the overall budget impact of any resource variances. Unlike schedule variances, all resource variances affect the project; every activity resource or cost estimate that is too low contributes to budget overrun. Even early in the work, an excessive money or resource "burn rate" is a strong predictor of budget problems. It is very difficult to reverse resource overconsumption.

Assess the *overall impact* of other variances from the project baseline plans and objectives. If results of tests, feasibility studies, or other work fall below expectations, determine how they are likely to affect the project. Significant variances may result in:

- Scope changes
- Schedule slippage
- Increased budget or other resource requirements
- Impact on other projects

Analyze Trends

Trend analysis is not necessarily part of each tracking cycle, but it is useful to examine the trends in the status data at least during **project reviews**. Use trend analysis to detect budget, schedule, and other problems *proactively*. If trend analysis reveals a need for **negotiating project changes**, such as the project end date, the budget, staffing, or project deliverables, deal with this

as soon as possible. The earlier you propose needed changes, the more likely you will get support and agreement. Waiting too long to confront trends often leads to **canceling projects**.

Periodically also scan the variance data for new risks, and update your risk register through **risk identification**.

Document Findings

Probe for the root cause of each significant variance, and document both the *source* and *impact* of each problem for use in **schedule control**, **cost control**, **performance reporting**, and overall project problem resolution.

68

Project Vision

What: A clear and motivating statement of why the project matters.
When: Project initiation and planning.
Results: Sustained team enthusiasm for the project.

Assess the Current Environment

Review the status quo. *Collect information* about:

- **Sponsorship** of the project
- The project basis from **project initiation**
- The **project objective**
- The history and any specific problems preceding the project
- Data from **requirements collection** and long-term trends
- Overall business strategies and stakeholder opinions
- Organizational values
- Project team values

Draft the Project Vision Statement

Gather project team members to craft a vision statement. Some projects may not need a vision statement, but a well-worded description of a desired future state provides a good foundation for **team management** and group **motivation**. Building a shared vision strengthens relationships and trust.

Discuss the *improved future* following successful completion of your project (or, if your project is a part of a larger program, after completion of the overall effort). Think about the future for yourselves, your organization, users or customers, and your project stakeholders.

Develop a *vivid description* of the resulting future, capturing the benefits and stating why they are important to you and to others. Emphasize how the project contributes to the desired future, and use clear, engaging, and emotional words to convey a strong image.

Keep the end in mind. Describe why you want to get there, in *qualitative*

terms. Metrics are necessary for individual goals and project objectives, but visions are more inspirational. Effective visions are short, simple, and easy to remember.

Test each proposed vision statement within the team. Ask:

- Is it consistent with the values of the project team?
- Does it pass the "What's in it for me?" test?
- Is the vision challenging and one the team can take pride in sharing?
- Is it sufficiently realistic to be motivational?
- Is it memorable?

Here is an example vision, used by Henry Ford:

I will build a motor car for the great multitude. . . . It will be so low in price that no man making a good salary will be unable to own one. The automobile will be taken for granted . . . [and we will] give a large number of men employment at good wages.

Pursue the Project Vision

Document the project vision, and make it part of **meetings**, **presentations**, **project reviews**, and reporting. Keep the vision visible using signs, websites, and other methods.

Frequently *remind* team members and stakeholders of the vision, and use it in **informal communications**. Show enthusiasm for the vision and reinforce it until people see it as inevitable. Projects do not succeed because they are easy; they succeed because people care about them.

Use the vision to overcome barriers, to manage change, and to support **decision-making**. Align **rewards and recognition** with the vision.

69

Qualitative Risk Analysis (PMBOK® 11.3, Perform Qualitative Risk Analysis)

What: Assessing and prioritizing known project risks.
When: Project planning, execution, and control.
Results: Identification of the most severe project risks, based on relative probability and project impact.

Understand Risk Assessment

Risk analysis involves using the processes defined in the project **risk-management planning** on each of the risks listed as a result of **risk identification**. All assessment of risk depends on determining risk *probability* and risk *impact*. Qualitative analysis combines range estimates of these two factors to prioritize project risks. **Quantitative risk analysis** depends on numerical estimates to determine the precise consequences of project risks.

Define Probability Ranges

The likelihood or probability for a risk event must always be between zero and one. Qualitative risk assessment depends on defined *probability ranges* between these limits, using defined percentages.

Projects may use two, three, or more ranges for assessment, trading off between fewer (to simplify the process) or more (to improve precision). *Three ranges* offer a reasonable balance between obtaining team agreement and ability to sort potential risks by severity. Risk assessment using this method uses ranges of high, moderate, and low, often defined as:

- High: 50 percent or higher probability
- Moderate: Between 10 and 50 percent probability
- Low: Less than 10 percent probability

The team might define additional probability ranges, with associated percentages suitable for your projects.

Define Impact Ranges

Risk impact can be difficult to define as it has many dimensions. Impact may be measured in many different ways, such as time, cost, effort, scope change, team confidence, and customer trust. As with probability, the minimum is zero, but the maximum value is specific to the risk. *Impact ranges* for qualitative risk assessment generally rely on categories defined by the magnitude of risk consequences.

Although any number of impact categories may be defined, for most projects adequate qualitative analysis can be done using *three ranges*, typically defined as:

- High: Project objectives must change (scope, schedule, or resource)
- Moderate: Project objectives are safe, but replanning is necessary
- Low: No significant changes to objectives or plans

Perform Assessment

Risk-assessment tables begin with the risk-register list and determine overall risk for each potential problem by combining the probability and impact assessments. This may be done by simply combining the range categories or by assigning numeric values to the categories (such as 9, 3, and 1 for High, Moderate, and Low) and multiplying the factors together. An example risk-assessment table appears in Table 69.1.

Table 69.1. Sample risk-assessment table.

Risks	*Probability (H/M/L)*	*Impact (H/M/L)*	*Overall Risk*
Expert busy	M	H	HM
Component late	M	M	M
Test gear unavailable	L	L	L

A similar qualitative-assessment method uses a risk-assessment matrix to place risks in a two-dimensional grid. Categories of probability and impact define where in the matrix each potential exposure falls, with the most severe toward the top and the right. Again, any number of categories may be used, defined as appropriate for your project, and risk-assessment matrices do not need to be square. Figure 69.1 is a sample risk-assessment matrix.

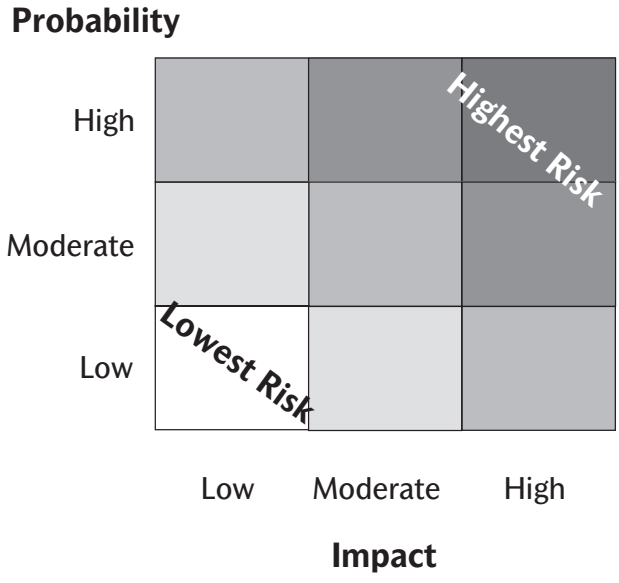

Figure 69.1. Sample risk-assessment matrix.

Prioritize Risks

Use qualitative risk assessment to *rank order* the risks identified in your risk register, listing the most serious potential problems at the top and the more trivial risks at the bottom. Identify severe risks for quantitative analysis and **risk response planning**.

Use the sorted list to determine *overall project risk* and to increase the visibility of the potential consequences of the most significant risks.

70

Quality Assurance (PMBOK® 8.2, Perform Quality Assurance)

What: Routine tracking of project output against quantified objectives.
When: Project execution and control.
Results: Prompt detection of process issues and revision of work methods.

Quality assurance serves two primary purposes on projects. It detects processes in need of revision, so they can be improved. It also enforces established standards on work done using inappropriate methods.

Perform an Audit

Maintaining project quality requires periodic *process reexamination*. Some process audits are scheduled as part of **quality planning**. **Project variance analysis**, **quality-control** problems, **project reviews**, or **lessons learned** may also trigger audits.

Whatever the motivation, quality assurance begins with a list of all known problems related to project processes and then probes to detect any additional issues. When **project metrics** are not as expected (both adverse and beneficial variances), there may be a process problem. Investigate situations on your project where the outputs may be acceptable but the execution efficiency is poor. Interview team members involved in project activities to discover processes that are ineffective or unsuitable for the work. List all *issues and exceptions* for analysis.

Analyze Variances

Initially, check that the measurements are valid and that the work is using the appropriate process. If you detect that measurement inaccuracy or alterna-

tive work methods are causing problems, confront the situation. Discuss it with the individuals involved, and get their commitment for *accuracy and compliance*.

For other issues, use **issue management** to track the problems and **cause-and-effect analysis** to reveal *root causes*. Work with the project team and appropriate stakeholders to find options for **process improvement**.

If the problems affect project scope and seem irresolvable, prepare to **negotiate project changes** and use **scope change control** to manage any specification changes. Resolving process problems that arise from organizational dependencies may require changes that are beyond the authority of your project team. "**Influence without authority**" techniques can be effective, but you may ultimately need to try **problem escalation**. Through your analysis, determine necessary process and other changes and document the situation and your *proposed response*.

Implement and Track Actions

Get any necessary *approval* for process changes, using project **integrated change control**. Document all new processes, and communicate the reasons for **organizational change** to all the people affected.

Implement your recommended process changes.

Monitor the new process for expected results. If results are inadequate, or there are unintended problem consequences, initiate further analysis.

71

Quality Control (PMBOK® 8.3, Perform Quality Control)

What: Ongoing monitoring of project work compared with plans and standards.
When: Throughout a project.
Results: Prompt recognition of quality problems and effective project control.

Collect and Analyze Data

Project quality control depends on the *quality management plan* from **quality planning**. Establishing project metrics and methods for keeping them within acceptable limits are integral **project baseline setting**.

Project **status collection** and *project deliverable data* from testing, checklists, and inspections provide the information needed to detect variations between the measured and expected results.

The field of statistics provides many *techniques* for detecting problems in deliverable quality and defects in development processes. Among them are:

- Scatter diagrams
- Histograms and sampling distributions
- Trend and control limit analysis
- Pareto charts

These techniques can differentiate normal project execution from problem situations, such as:

- Results that are outside an acceptable range
- Results displaying excessive variability
- Results that change in suspicious, nonrandom ways
- Results that display disturbing trends

Plan

Examining the situation using **cause-and-effect analysis**, interviews, discussions, inspections, and observations will generally reveal the *problem source*. Use **issue management** to track quality-control issues. For significant quality problems, you may need to enlist assistance from specialists in quality or other disciplines.

Depending on the source, find an *appropriate response*. **Performance problem resolution** is necessary if the individuals doing the work are at fault. If the inputs to a process are faulty, resolution will require better monitoring and control of those dependencies. Other situations may require recalibration, replacement, or repair of equipment used in the development process. If the process itself is suspected to be the problem, a process audit as part of ongoing **quality assurance** or a **process-improvement** project might be the answer.

Select the most promising approach and document it.

Do

If necessary, obtain approval for any changes through **integrated change control**. *Implement* the approach you selected for resolving the quality problem. If needed changes are beyond your control, you may need to resort to problem escalation.

Check

Monitor project performance to verify the outcomes you expect and to detect any unintended adverse consequences.

Act

If there are remaining problems or new ones, initiate a *new quality-control effort*. Back out any changes that result in outputs that are worse than the original situation.

If the changes are effective, *update* the project plans, process documentation, and other materials affected.

Communicate all changes made to affected individuals, and incorporate the results of your efforts in project **performance reporting**.

72

Quality Planning (PMBOK® 8.1, Plan Quality)

What: Defining measurable standards for project results that matter to stakeholders and determining how to achieve them.
When: Project planning.
Results: Quantified project standards and objectives supported by explicit plans.

Quality management for projects borrows heavily from methodologies primarily associated with production and manufacturing such as "Six Sigma" and Total Quality Management (TQM). The primary goal of project quality management is defining and delivering *realistic project deliverables*, so it is closely related to scope management.

Determine Customer Requirements

Quality planning is essential to successful customer- and **stakeholder-expectation management**. Use techniques such as **customer interviews**, **market research**, and product benchmarking to complete a thorough **requirements collection**. Probe to *quantify the value* of the needs, and state why they matter using the "voice of the customer."

Determine the cost of achieving the requirements through **cost estimating** and **project plan development**. Establish the cost of quality for the project and use *cost/benefit analysis* to decide which requirements are appropriate. Prioritize the list of requirements and use the top items to set specifications for the project deliverable.

Document Specifications

Review organizational quality policies, requirements, and standards (for example, programs from the International Organization for Standardization [ISO] or similar groups), and use them in project **scope definition** to integrate the accepted specifications into the final *project scope statement*.

Quantify each specification, and develop any acceptance tests that will be required for **scope verification**. Define the *final approval criteria* for project results at the project start, and get sign-off for acceptance tests from appropriate stakeholders and customers during project planning. If necessary, seek assistance from statistical experts in the design of experiments and test development.

Establish Plans

Review your development processes for defects or potential problems. Use **process improvement** and mapping techniques to determine opportunities; quality is planned in, not inspected in. Capture any issues you are unable to resolve in your project **risk identification**.

Add all quality-related activities, such as process audits, tests, and approvals, into the project *work breakdown structure* during **scope definition**. If there is significant cost or effort involved, seek and obtain appropriate approval. Include costs for process conformance and any reserves established against nonconformance in your **cost estimates** and **cost budgeting**. Document your quality plans, either separately or as part of the overall project plan. Develop any needed checklists, guidelines, and process documentation you will require.

Establish **project metrics** with control limits you plan to use to ensure project quality.

Determine the *people* who have responsibility for project **quality assurance** (process assessment) and **quality control** (results assessment), and get their commitment for the work. If your project will require participation from quality specialists, discuss your project with them to ensure that they understand and approve of your overall plans.

73

Quantitative Risk Analysis (PMBOK® 11.4, Perform Quantitative Risk Analysis)

What: Assessing risk severity in numerical terms.
When: Project planning, execution, and control.
Results: Risk-impact assessments in absolute units, such as time, cost, or effort.

Quantitative risk analysis applies processes defined in the **project risk-management planning** on risks determined using **risk identification**. Generally **qualitative risk assessment** is done for all listed risks to determine which project risks may justify more precise quantitative analysis. Quantitative analysis requires greater effort, but it generates *absolute estimates* of risk probability and impact for the most severe project risks. Quantitative assessment relies on specific estimates.

Convert Probability Ranges into Estimates

In the place of the ranges used for qualitative risk analysis, quantitative assessment uses a specific numerical percentage between zero and 100. There are *three ways* to estimate probabilities:

1. Calculate a prediction based on a mathematical model.
2. Perform an empirical calculation using historical data.
3. Select a number based on the best analysis available.

Some risk situations may be modeled and in other cases there may be sufficient data to use in statistical forecasting. However, because many project risks are unique, complex, and rare, the third technique (better known as *guessing*) is most frequently used. Quantitative risk probability estimates are often inexact.

Convert Qualitative Impact Ranges to Estimates

The categories of impact used in qualitative analysis also must be precise, requiring defined units (possibly several) and a *numeric estimate* of project impact measured in these units. For some risks, a single estimate will be appropriate, but for others it may be best expressed as a statistical distribution or a histogram. Quantitative risk impact is measured in days of project slip, money, effort, or some other suitable unit. Most risks have impact in more than one of these units, such as both time and cost.

Cost impact is straightforward, using resource and **cost estimating** techniques and measured in dollars, yen, Euros, or some other monetary unit. *Effort impact*, measured in units such as person-days, uses effort-estimation methods.

Schedule impact is more complicated. Timing impact analysis requires new **activity duration estimating**, but not every activity duration increase will necessarily change the overall project schedule. Only the slippage in excess of any float determined in **schedule development** represents measurable project impact.

Other impact categories, including staff productivity, scope modifications, and other changes, must also be identified and estimated as precisely as possible using the techniques of **project plan development**. Although the foundations of quantitative risk analysis impact may seem precise, the quality of the estimates is quite variable.

Measure Risk

Risk assessments using *tables, grids, and matrices* comparable to those used for qualitative risk analysis are similar, substituting the actual probability percentages and numerical estimates of impact for the ranges and categories. Two-dimensional graphs generally replace matrices using numerical data. Because impact may be estimated in cost, schedule, and other possible units, more than one representation can be necessary.

For simple projects, a quick inspection of the plan using the risk assessments will reveal the risks most likely to cause the most damage. For more complex projects, *sensitivity analysis*, done using a copy of the schedule data entered into a **software tool for project management**, is a fast way to identify risks (and combinations of risks) that are most likely to result in project delay. Sequentially entering risk data and then backing it out reveals overall schedule sensitivity, using quantitative "what if?" scenario analysis.

For complex, multioption project branch points in the plan that are depen-

dent on data not yet available, *decision trees* may assist in quantitative outcome assessment and project risk analysis. Decision trees may be constructed for time, cost, or other measurable project parameters.

Analyze Quantitative Models and Use Computer Simulation

Using a range of estimates for time (or cost) provides the basis of the Program Evaluation and Review Technique (PERT). PERT was originally created to assess overall project risk quantitatively based on three estimates (optimistic, most likely, and pessimistic) and defining the mean and variance (risk) for each activity estimate.

You can also use *three-point* activity duration estimating for Monte Carlo computer simulation to assess project schedule risk, and may also conduct a similar analysis of three-point cost estimating to determine overall project budget risk.

Document Risks and Specific Consequences

For significant activity-related risks assessed quantitatively, document measured *risk consequences* in the project risk register. Select significant risks for **risk response planning**.

Aggregate the quantitative risk assessment information to assess *overall project risk*. Calculate **project metrics** to determine aspects of the project that are larger or more complex than you have managed in the past.

74

Required Skills Analysis

What: Determining the skills required to complete the project.
When: Project planning.
Results: A summary of the skills needed for project work, including experience and proficiency levels.

Review the WBS

Skills analysis is a key portion of **human resource planning**. For each **activity definition** from the project **work breakdown structure**, list the owner and any other contributors who are committed to the work. A **responsibility analysis** matrix is one way to summarize *activity staffing* for WBS activities.

Determine the Skills Needed

List the *necessary skills* and background needed to complete each activity, including:

- Knowledge in specific areas
- Proficiency with tools and equipment
- Experience with applications and systems
- Communication and language abilities
- Amount and level of experience in a given field

Drawing a "mind map," such as the one in Figure 74.1, for each identified project activity is an effective way to get started.

Identify Gaps and Document Capabilities

List unmet skill needs. Identify all specific skill requirements where you lack a credible commitment from a capable, named individual.

Also list the *available skills*. Resolve any skill gaps through **team acquisition**, or seek alternative methods for the work using skills available on the team during **project plan development**.

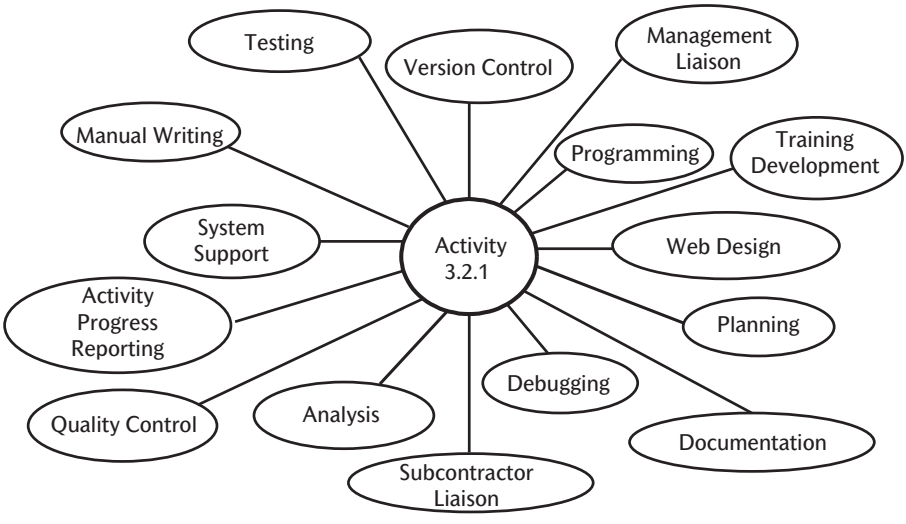

Figure 74.1. Example resource map.

Staffing a project with only specialists can be risky, as problems will undoubtedly arise that cross functional boundaries or fall outside the fields covered by staff specialists. Include "*generalist*" as a required skill at the project level, and work to include people who are adept at handling unexpected situations.

75

Requirements Collection (PMBOK® 5.1, Collect Requirements)

What: Understanding what users of your project outputs require and will accept.
When: Project initiation and planning.
Results: Project deliverables that meet needs and deliver business value.

Organize and Set Objectives

Deliverable requirements emerge from **project initiation**, but you rarely begin with sufficient data. Fill in any gaps by working with stakeholders who will interact with your project deliverable(s), including:

- People who use it to do their jobs
- People who buy or pay for it
- People who deliver, install, or maintain it
- Testers, evaluators, and approvers
- Managers of any of these people

Requirements are based on user needs, both *stated and unstated*. Stated needs are generally the easiest to uncover, and they relate to features and performance. Unstated needs include basic needs (requirements that most users may take for granted) and "excitement" needs, which may be based on new technology or ideas that are not familiar to most users. Discovering all the needs requires observation, research, creativity, and imagination.

Identify the user information necessary for **scope definition** that is not available. For any missing information, frame clear, specific questions that must be answered, and decide in advance how you will apply the information (regardless of what you learn). *Set objectives* and plan the activities required to achieve them.

Project teams may lack skills required for thorough assessment of user needs, requiring *assistance* from specialists experienced in product management or marketing. Identify any cross-functional talent and outside resources that may be required. Even if you are not directly involved in collecting user information, ensure that staff from your core project team is at least involved setting objectives at the start and in analyzing and summarizing the results at the end.

User assessment may require significant time and effort. If so, obtain necessary funding and *management commitment* in advance.

Identify What You Know

Review *available user information*. Strategic planning at the organizational level generally summarizes information on customers and users. Look for any other relevant research or published data.

Document what you know about user needs based on existing data.

Resolve Unmet Information Needs

Determine *additional information* you require. For projects that develop products or services for sale, plan for **market research**. For projects having a predefined finite number of users, plan and schedule **customer interviews**. If needed, conduct workshops and facilitated meetings with users and stakeholders to determine and validate requirements.

Work to *understand opportunities* for new technology or ideas, and test alternative options and combinations of concepts. Use **brainstorming** and **creative problem-solving** techniques to seek the best options.

Document and Use the Data

Summarize user-needs information and discuss it with your project sponsor, the team, and other stakeholders. Determine what the information means for the project and use it to complete your scope planning and **project plan development**. Use requirements data in setting **project priorities** and to manage **scope change control** and **integrated change control**.

Develop a process for validating requirements throughout the project, using a procedure such as a traceability matrix. Verify that planned development efforts and testing are consistent with your documented requirements and that they fully integrate with your project **work breakdown structure**.

For longer projects, *revisit* the user-needs assessment during each **project review**.

76

Resource Leveling

What: Reconciling project plans with available resources by minimizing overcommitments and identifying underused staff.
When: Project planning.
Results: A bottom-up project resource plan and schedule consistent with committed project resources.

Profile Required Resources

Use **activity resource estimating** and **schedule development** to develop a resource-loaded schedule. **Software tools for project management** assist in automating this, but you can also create *resource histograms* for staffing and other important project resources with spreadsheets, project databases, and other methods. Figure 76.1 shows a sample resource histogram (from Microsoft Project).

Identify Deficits and Surpluses

Inspect the analysis from a histogram or spreadsheet. For each project contributor, identify *overcommitments*—periods when his or her planned work exceeds the available capacity. Also note any periods for contributors where the current draft plan indicates that they potentially have available time.

Repeat the analysis for the project as a whole to identify the places in the preliminary project plan where *overall staffing* is inadequate.

Reconcile Differences

Project management software tools generally have an *automated function* for resource leveling. Although the function may sometimes prove useful, always back up the data in your plan before you try it; automated leveling generally makes projects unrecognizable.

Another approach to resource leveling is to identify resource bottlenecks

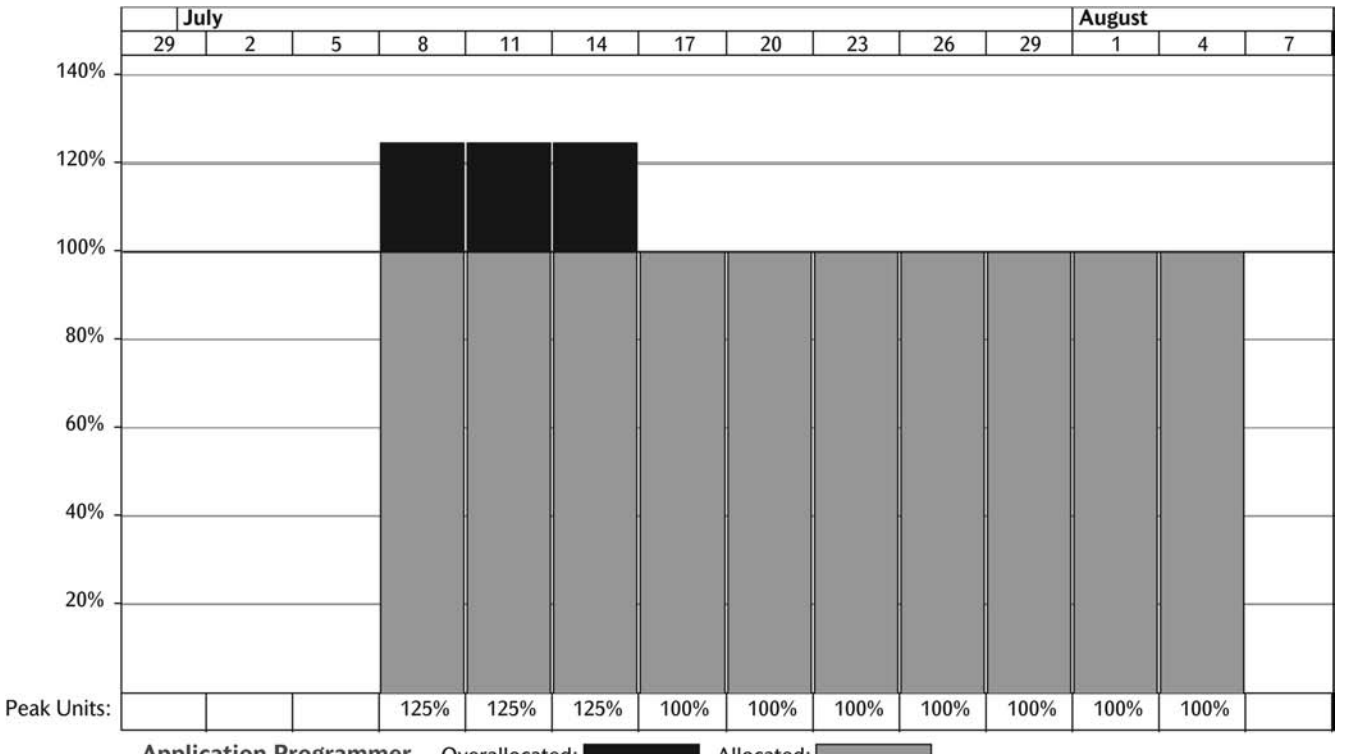

Figure 76.1. Sample resource histogram.

in the plan and then to make revisions *manually*. Consider modifications to minimize resource conflicts, such as:

- Splitting activities into discontinuous work with one or more timing gaps
- Changing the planned rate of effort by revisions to **activity duration estimating**
- Shifting planned resource use to better conform to the available pool
- Shortening some activity durations using undercommitted project staff
- Proposing scope modifications or delays in delivery
- Building a case for additional **team acquisition**

Identify options available for your project using suitable "what if" analysis (a separate copy of a scheduling tool database is a quick and effective way to do this), and *select ideas* that resolve your resource capacity constraints.

Update project plans, schedules, and other planning documents.

77

Responsibility Analysis

What: Determining that all defined project activities have an owner, and when needed, sufficient additional staff.
When: Project planning.
Results: A two-dimensional responsibility matrix summarizing coverage and responsibilities for project work.

Establish Roles

Review your **activity definition** and use it to *define roles* for project work using a RACI analysis:

- R: *Responsible* (Contributor)
- A: *Accountable* (Owns the work—one "A" per activity)
- C: *Consulted* (Approvers, decision-makers)
- I: *Informed* (Provided with information)

Construct a RACI Matrix

Examine the staffing for project activities using a two-dimensional responsibility-assignment matrix listing the defined project activities on one axis and the project staff *by name* on the other. Include an extra "to be hired" (tbh) column on the staffing axis to keep track of unmet staffing needs. Table 77.1 shows a simple RACI example.

Table 77.1. Sample RACI matrix.

	Hawkeye	*Margaret*	*Trapper*	*Radar*	*tbh*
Activity 1.1.1	A		R	C	R
Activity 1.1.2	C	A			
Activity 1.2.1	R		A	C	RRR
Activity 1.2.2	C	R	R	A	

Analyze the RACI Matrix

Inspect the matrix to ensure that each activity has one, and only one, accountable owner. For each activity, assess whether the staffing seems adequate and whether you believe that the contributors involved are capable of the work. For each individual, ensure that he or she is not assigned more project responsibility, particularly ownership accountability, than seems appropriate. Check that the talents available are consistent with your **required skills analysis**. Use the "tbh" data to assist in **team acquisition**.

78

Return on Investment Analysis

What: Analyzing project costs and benefits.
When: Project initiation and planning.
Results: A quantitative assessment of a project's overall financial worth.

Review ROI Methods

All project return on investment (ROI) estimates are predictive **project metrics**. ROI analysis estimates a project's value by contrasting its *costs and benefits* (project-related monetary outflows and inflows). Because ROI calculations are based on future benefits estimates, which are often unreliable, the accuracy of ROI metrics can be highly variable.

Most ROI methods are based on the *time value of money*, assuming a discount rate (or interest rate) that makes a sum of money in the future *less valuable* than the same sum of money today. The formula for this is: $PV = FV/(1 + i)^n$, where PV is the present value, FV is the future value, i is the periodic interest rate, and n is the number of periods. If the period is a year and the interest rate is 5 percent (.05) paid once annually, then $1.00 today is equal to $1.05 one year from now.

There are a number of ways to calculate ROI, and each has benefits and drawbacks. Although all ROI measures rely on similar data, they may yield different results when used to compare projects. Typical *methods* include:

- Simple payback
- Discounted payback
- Net present value
- Internal rate of return
- Economic monetary value

Evaluate Simple Payback

The easiest method for project ROI assessment calculates a *payback period* assuming no time value of money. Project costs are estimated using **cost**

budgeting. Forecasts of project benefits, savings, or revenues following project completion are then made sufficiently far into the future until the cumulative value of the benefits balances the project costs. The payback period is the time required to get to the break-even point where the project has paid for itself. One benefit of this method is that it is easy to calculate and you can validate it against actual data in a reasonable time frame. However, it ignores any benefits occurring after the payback period, and it disregards project magnitude.

Evaluate Discounted Payback

This method is identical to simple payback but uses a *discount rate*, so estimates of future costs and benefits are worth less than those closer to the present. Because project costs are in the near future and project benefits are more distant, the discounted payback period is always longer than the simple payback period. For short projects, the difference is negligible, but for longer projects it can be substantial. Benefits and drawbacks are similar to those associated with the simple payback ROI.

Evaluate Net Present Value

Net present value (NPV) uses the same process as discounted payback analysis, but it continues past the break-even point defined by payback analysis. NPV is based on the project budget but considers *all* the estimated benefits for the life of the project deliverable. Instead of estimating the amount of time required to recover costs, NPV adds up all the discounted estimated benefits and then subtracts all the discounted project costs. The resulting calculation yields the project's total *monetary worth*. You can use NPV to compare projects with very different financial profiles and time scales. However, NPV favors large projects over smaller ones, requires more estimates, and the time frame for validation is very long.

Evaluate Internal Rate of Return

Internal rate of return (IRR) is the most complex of the ROI metrics. IRR uses the same estimates for costs and returns required to calculate total NPV, but instead of assuming an interest rate and calculating an overall project value, IRR determines the *implied interest rate* that results in a project net present value equal to zero. IRR is useful for comparing projects of different sizes and lengths, but it requires spreadsheet software or at least a financial

calculator. Also it requires more data, and, like NPV, it takes a long time to validate.

Evaluate Economic Monetary Value (EMV)

EMV has the same basis for calculation as net present value, but it provides for more than one scenario. Each individual scenario has its own cash flows and associated likelihoods. Although EMV introduces decision-tree and **quantitative risk-management** techniques into ROI analysis, its accuracy remains based on estimates of probability and financial return, both of which are usually imprecise.

79

Rewards and Recognition

What: Formal acknowledgment of individual and team accomplishments.
When: Throughout a project, but particularly at project closure.
Results: Better cooperation and teamwork, as well as successful current and future projects.

Rewards and recognition are a key aspect of **team management**. Generally they are most effective when *tailored* to the individual or team, so determine in advance whether recognition should be public or nonpublic and verify what rewards people are likely to appreciate through **communicating informally**.

Use Intangible Rewards and Recognition Frequently

Recognition using techniques involving little or no out-of-pocket cost is a powerful way to increase **motivation**. Use them frequently, as they have negligible cost. Intangible rewards are most effective when they are *unexpected*, so employ them randomly. Here are some examples:

- *Thank people personally* for their accomplishments. Do it face-to-face if possible or by telephone or e-mail for **global teams** and **virtual teams**. Keep alert and express gratitude even for small things.
- *Use team members' names* in **performance reporting**, **lessons learned**, and other project documents when discussing results. Be specific, and include a summary of why the accomplishments matter.
- *Formally recognize achievements and results* of **matrix teams** to the team members' supervisor in writing. Submit thorough reports on team members in advance of their performance evaluations.
- *Thank people in public meetings* (if culturally appropriate) for significant contributions.
- *Discuss individual and team results* in project-status meetings, **project reviews**, and **presentations**.
- *Let people represent the project team* at management or customer meetings.

- *Expand responsibility* within the team.
- *Issue certificates or tokens* (buttons, pens, and other small items) to acknowledge performance.

Use Tangible Rewards and Recognition (Public) with Discretion

Public recognition using rewards with financial cost can be effective if the rewards are *appreciated and aligned* with individual preferences. Expensive events and items that people do not like can actually be demotivating, as can undesired public attention. Some examples of effective rewards are:

- *Team-planned events or celebrations* to commemorate project successes
- *Nomination of individuals or teams* for monetary or other award programs, either internal or external to the organization
- *Substantial rewards for performance* such as clothing, food, or other visible gifts
- *Travel and support for attendance* at professional conferences or training classes
- *Promotion* or other formal expansion of responsibility

Use Tangible Rewards and Recognition (Nonpublic) When Appropriate

Most rewards involving money are private. *Monetary rewards* are most effective when infrequent, because when they are expected they are no longer perceived as rewards. Based on the project structure and the authority of the project leader, some of these are:

- Recommendations for *salary increases*
- *Financial rewards* such as bonuses or stock options
- *Gift certificates,* allowances for meals, tickets to an event or other individual rewards that cost money

Where *programs* for such recognition exist, take full advantage of them.

80

Risk Identification (PMBOK® 11.2, Identify Risks)

What: Documenting and diagnosing potential project problems.
When: Project planning and control.
Results: A robust list of known potential project problems.

Review Risk History

Review *previous project problems*, historical data, **lessons learned**, and databases containing risk information, both inside your organization and from public sources. Find and note the things that went wrong.

Note Risks Uncovered in Project Planning

Throughout **project plan development**, note all project risks you notice as you *analyze the work*. Follow the processes you defined in **risk-management planning**.

In **scope planning** and **scope definition**, consider *scope risks*, such as:

- Technical system complexity
- Conflicting or inconsistent specifications
- Extreme performance, reliability, or quality requirements
- Mandatory use of new technology
- Requirements to invent or discover new capabilities
- Incomplete or poorly defined acceptance criteria
- Unclear or potentially changing customer requirements
- Impact of component availability or defects
- External sourcing for a key subcomponent or tool
- Overall size of the project work breakdown structure
- Large work segments that resist breakdown

In **activity definition**, **activity duration estimating**, **activity sequencing** and **schedule development**, identify *schedule risks*, looking for:

- Activities without a willing owner
- Activities with durations longer than two weeks
- Activities with uncertain duration estimates
- Activities with significant worst-case (pessimistic PERT) estimates
- Activities on the project critical path or with minimal float
- Simultaneous critical activities
- Activities or milestones with multiple predecessors
- Activities with external dependencies and interfaces
- Scheduled work beyond the realistic planning horizon
- Cross-functional and subcontracted activities

During **organizational planning**, **activity resource estimating**, **cost estimating**, **team acquisition**, and **procurement planning**, document *resource risks*, including:

- Activities with unknown staffing
- Activities requiring skills not currently available
- Activities dependent upon a specific, key individual
- Activities staffed using part-time or remote team members
- Activities with uncertain cost estimates
- Understaffed activities or groups of activities
- Outsourcing and contract risks

Uncover Additional Risks

Uncover *additional risks* outside the overall planning process by determining other risks, such as:

- Communications or language difficulties
- Regulatory or other external changes
- Market or user-requirement shifts
- Business reorganization or loss of project sponsorship
- Loss of proprietary or confidential information

Augment the risk list of identified risks with the whole project team. Gather to **brainstorm** additional risks by:

- Examining project assumptions and constraints
- Inspecting project documents
- Discussing all worst-case activity duration and cost estimates

- Capturing potential risks from Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis
- Analyzing scenarios for risk
- Assessing the impact of potential delays and slips

Document Risks

Create a *risk register* containing all identified risks. Clearly describe each listed risk. Define the potential consequences to the project for each risk. For every risk, identify a trigger event that reveals that the risk has occurred or is about to occur.

81

Risk-Management Planning (PMBOK® 11.1, Plan Risk Management)

What: Documenting how you will deal with project risks.
When: Project planning.
Results: Understanding of project stakeholder risk tolerance and a systematic approach for dealing with project risk.

Assess Stakeholder Risk Tolerance

Different organizations have radically different *perceptions of risk*. Assess the willingness to accept risk among the sponsors and team members through:

- Meetings
- Discussions and interviews
- Examination of organizational policies
- Review of the project charter and other initial project documents

Test project assumptions by asking clarifying questions of the people listed in **stakeholder identification**. *Validate risk tolerances* with project stakeholders.

Determine Risk-Management Process

Ensure that risk management is part of **project plan development** and **project plan execution**. Use templates and standards for risk identification and management, and *integrate risk activities* in the project methodologies and development methods you will use. Use historical project information and **lessons learned** on earlier work as a foundation for risk management.

Risk management on large programs represents a significant effort. As part of **cost budgeting**, secure *commitment for funding* and staffing of risk management.

Adopt an overall process including:

- **Risk identification**
- **Qualitative risk analysis**, and as appropriate, **quantitative risk analysis**
- **Risk response planning**
- **Risk monitoring and control**

For small projects, risk planning may be informal, but for large, complex projects, you may want to document your *risk-management plan*. Typical risk-management plans include:

- A summary of your risk-management approach
- Stakeholder information
- Planning processes, tools, and **project metrics**
- Risk-management standards, definitions, and report formats
- The risk-related activities during periodic **project reviews**
- Planned project risk-related activities

Use Risk Surveys and Overall Assessments

Use *risk questionnaires*, surveys, or other methods to assess overall project risk. Probe for exposures related to the project objectives, customers and users, development methods, and your **project infrastructure**.

Using paper forms, online surveys, or interviews, identify sources of overall exposure for the project and *propose changes* to reduce systemic project risks.

82

Risk Monitoring and Control (PMBOK® 11.6, Monitor and Control Risks)

What: Tracking identified project risk triggers and responding as necessary.
When: Project execution and control.
Results: Fewer project surprises, and prompt and effective response to problems.

Monitor Risks

This process is part of **project plan execution**. Based on your **risk-management planning**, both the known risks documented during **risk identification** and unanticipated risks that arise must be monitored and resolved. The owners of each contingency plan developed as part of **risk response planning** monitor for specific *risk triggers*, and overall project **status collection** and **project variance analysis** provides general risk monitoring.

Use *trend analysis* of project **performance reporting** and **project metrics** such as **earned-value management** to identify potential future risks.

Periodically reevaluate project risks during **project reviews**. Update the risk register, analyze and prioritize the risks, and plan responses for all significant *new risks*.

Respond to Risks

When a risk occurs, whether anticipated or not, *respond promptly*. If there is a contingency plan for the problem, begin its execution as soon as practical.

For passively accepted or unexpected risks, involve the project *team members* in the response planning and use your **issue-management** process.

Develop a response to the risk using techniques for **schedule control** and **cost control**, and attempt to *recover quickly*. Seek workarounds and ad hoc responses that are consistent with your **project infrastructure** decisions.

If *major changes* are necessary, validate the response using **integrated change-control** processes before committing to it. Discuss any major changes with the project sponsor and appropriate stakeholders. If necessary, use **problem escalation** to obtain approval. Responses to major risks may require **negotiating project changes** and result in new **project baseline setting**.

Inform the project team and appropriate stakeholders of your plans and *implement the risk response*.

Verify the Response Was Effective

Following your response, monitor to ensure that your response obtained the *expected results* and did not lead to adverse unforeseen consequences.

If the risk situation continues, seek a better solution through *additional planning* for risk response.

Document Risk History

As part of risk control, *update project documents* affected by your responses, and communicate the results of your efforts in project performance reporting.

Add the information on encountered risks to your project information archive, and add descriptions of new risk situations encountered to *risk checklists*, templates, and databases. Analyze risk data during project reviews and in capturing **lessons learned**.

83

Risk Response Planning (PMBOK® 11.5, Plan Risk Responses)

What: Determining how best to deal with high-severity known risks.
When: Project planning, execution, and control.
Results: Adjustments to the project plan dealing with preventable risks, and contingency plans for other risks.

Identify Risks Requiring Response

Read down the risk register sorted using **qualitative risk analysis** or **quantitative risk analysis**. *Select* the significant risks from your **risk identification** that you will manage (typically, these will have at least moderate probability and impact).

Review the *trigger events* for these risks, and determine the point or points on the project timeline when the risk is most likely to occur. As Figure 83.1 shows, risk management involves prevention and planning in advance of the trigger and risk responses after the trigger.

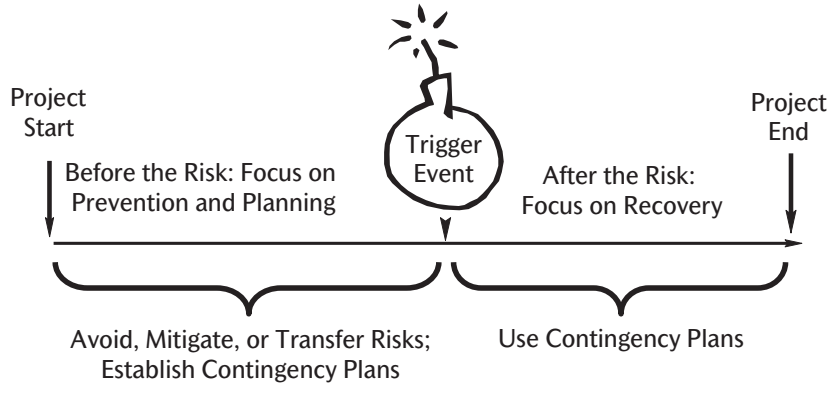

Figure 83.1. Project risk timeline.

Categorize Each Risk

Seek the *root cause* of each risk to manage. Use **cause-and-effect analysis** to determine the source(s) of the risks, striving to better understand the risks and to determine whether they are controllable or uncontrollable. Probe deeply to uncover the source of each risk, not just its symptoms.

When risk sources are under your control, *prevention strategies* may provide solutions; for uncontrollable risks, risk management requires *recovery strategies*, as shown in Figure 83.2.

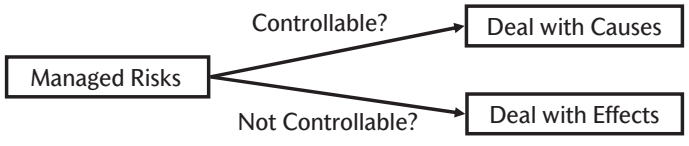

Figure 83.2. Risk response strategies.

Deal with Risk Causes

Risk prevention strategies include *avoidance*, *mitigation*, and *transfer*.

Risk *avoidance* involves replanning the project to remove the source of the risk entirely. Avoiding risks may involve tackling three types of risks:

1. *Scope risks*. Committing to the minimum acceptable deliverable, eliminating new technology, buying instead of making components.
2. *Schedule risks.* Reducing the number of activity dependencies, scheduling the high-risk activities early, decomposing lengthy activities.
3. *Resource risks.* Getting names and commitments for all work, building needed skills, eliminating overcommitments.

For risks that you cannot plan around, **brainstorm** ideas for *mitigation*, reducing the risk probability or impact (or both). Several types of mitigation tactics exist:

- *General.* Improving communication, securing strong **sponsorship**, employing **stakeholder-expectation management**, keeping users involved, documenting and enforcing **project priorities**.
- *Scope.* Freezing specifications, rigorously managing **scope change control**, building models and prototypes, keeping all documents current.
- *Schedule.* Using "expected" **activity duration estimating**, scheduling the highest-priority work early, holding **project reviews**, tracking rigorously.

- *Resources.* Avoiding overtime, building trust and teamwork, rigorously controlling **procurement administration**.

For some financial risks, *transfer* may be effective. For some projects, insurance against large unexpected expense may be justified in the project budget.

Examine all ideas for risk prevention, comparing their *costs* (such as time, money, and effort) with their *benefits* of risk reduction. Select the ideas that lower project risk impact at justifiable cost, and update your project plan.

Deal with Risk Effects

When risk prevention is impossible or not cost-effective, plan for *response*. Determine the responses either in advance (*contingency planning*) or coincident with the risk event (*acceptance*).

For most significant risks you cannot prevent, prepare *contingency plans*. Use your **project plan development** process to create a plan for recovering from each type of risk.

- *General.* Using schedule or budget reserve, **negotiating project changes**.
- *Scope.* Relaxing some specifications, reprioritizing features.
- *Schedule.* Postponing noncritical activities, shifting staff, rescheduling work.
- *Resources.* Using overtime, outsourcing, getting staff from lower-priority projects.

For each contingency plan, identify *triggers and owners*. Assign an owner to monitor each risk, and clearly specify the trigger event that the owner will monitor.

For some risks, it may be impractical to plan specifically for risk recovery. When a specific risk response is not an option, you may choose to *accept* the risk, proceeding with no specific risk response. This tactic is generally used for very minor risks (including all the risks on your risk register that you chose not to manage).

Use Risk Information

Document all risks and keep them *visible*. Post a "top ten" list.

Use contingency planning and other risk data to establish schedule and budget *reserves*.

84

Schedule Control (PMBOK® 6.6, Control Schedule)

What: Monitoring project activities and managing project timing.
When: Project execution and control.
Results: Accurate project activity tracking and plan adjustments as required to meet milestones and deadlines.

Determine Status and Analyze Variances

Schedule control is central to **project plan execution**. It follows **status collection** and **project variance analysis** in the project-tracking cycle. It is necessary in any cycle where you discover a significant schedule variance. For each variance use **cause-and-effect analysis** to understand its *root cause and impact* on the project timeline. If the root cause relates to contributor underachievement, work toward **performance problem resolution**. Determine whether the impact is a onetime or short-term issue, or whether the root cause is a longer-term chronic problem.

Plan Responses

Review your **project infrastructure** decisions and **integrated change-control** process to *ensure consistency* with agreed-upon principles.

Involve the project *team* in **issue management** and response planning; engage as many perspectives and points of view as practical.

Determine the impact of schedule variances on the overall project by **forecasting project completion**. Depending on the severity of the problem and the nature of its root cause, the *response* may be:

- A minor change that preserves the **project objective**
- Implementation of a contingency plan developed during **risk response planning**
- A major change to the project

For *short-term* schedule problems, consider "brute force" solutions, such as working overtime in the evenings or on nonworkdays.

For more significant problems, **brainstorm** approaches that could bring the project back on schedule. Explore options using the processes of **project plan development**, especially **constraint management and plan optimization**. Develop plans that deal with the root cause of the problem, not just the symptoms. **Software tools for project management** may be very useful in exploring "what if?" planning scenarios. Avoid adopting the first alternative you develop; work to generate a number of credible *responses*. Typical responses include:

- Changing the logical flow of the work
- Breaking future activities into smaller, simultaneous tasks ("fast tracking")
- Finding new, faster ways to do project work
- Adding resources to compress duration estimates ("crashing")
- Working extra hours (though "planned overtime" adds risk and reduces **motivation**)
- Reassigning available team members (or the project leader) from noncritical activities
- Reducing the scope of the project deliverable
- Implementing responses that were effective in similar past situations

For problems that you can't solve using conventional analysis, use **creative problem-solving**. Allocate a reasonable amount of time to plan a response, but avoid "analysis paralysis." Set a time limit for planning and use systematic **decision-making** to choose the *best idea* available within that limit.

Take Action and Document Results

Validate the response you select before you implement it. Verify that your proposal is consistent with your **project priorities**. If the response involves changes to the deliverable, get approval for it through **scope change control**. Discuss any major changes with the project sponsor and appropriate stakeholders. If necessary, use **problem escalation** to obtain approval. Very major changes may require new **project baseline setting**.

Inform the project team and appropriate stakeholders of your plans and *implement the response*.

Following implementation, monitor to ensure that your response obtained

the *expected results* and did not lead to adverse unforeseen consequences. If problems persist, seek a better solution through additional planning.

Update any project and *planning documents* that are affected by the actions, and communicate the results of your efforts in project **performance reporting**.

85

Schedule Development (PMBOK® 6.5, Develop Schedule)

What: Developing a project schedule based on calendar dates.
When: Project planning, execution, and control.
Results: Identification of critical paths and a schedule that can be used for analysis, negotiation, and tracking.

Document Relevant Nonproject Dates and Factors

Schedule development is a central component of **project plan development**. It combines **activity duration estimating** with **activity sequencing** to determine *calendar dates* for the project, based on bottom-up analysis.

Begin the process by creating a *project calendar*. Identify all significant dates important to the project, including the project start date, any project constraints, interim and final deadlines, and any key dates when your project interacts with other scheduled work. Also include information about the project team from **human resource planning**, such as:

- *Weekends* you plan to work (if any)
- *Holidays* and other nonworkdays—for *all* locations doing project work
- Each team member's *planned vacations* and other timing conflicts
- *Organizational meetings*, key dates, and events
- Planned *site closures*
- Scheduled *equipment downtime* for maintenance

If you are using a **software tool for project management**, *enter calendar information* into the tool's database. Establish the calendar *before* you enter project activity estimates and dependency data.

Analyze and Document the Project Schedule

By integrating duration-estimate information with project-activity dependencies, you can determine the project's *critical path* (or paths). A critical path has the longest total duration of any continuous connected string of activities in the project. You can perform critical-path analysis either manually or using computer software. Manual analysis is impractical for projects larger than about 100 activities.

Critical-path methodology (CPM) relies on two analytical passes through the project: a *forward* analysis pass to calculate the earliest date each activity could be scheduled and a *reverse* analysis pass to calculate the latest date for each activity consistent with the end date of the forward pass.

Determine the *early schedule* for each activity first, working forward in time along each of the project network's activity paths. The *early schedule* defines the dates when work can begin and should end. The early schedule is normally used for project execution and tracking.

Perform the same type of analysis by working backward in time from the end of the longest (or critical) activity path to determine the *late schedule* for each activity. The late-start and late-finish dates show the most delayed timing for each activity that preserves the project critical path.

Project activities that have late schedules showing dates after their early schedules are identified as *noncritical*, and the timing difference between the two calculated schedules is called *float* or *slack*.

Project activities with zero float have identical early and late schedule dates and are therefore *critical*. All activities with no float connect to other critical activities through dependencies, and these linkages define one (or more) project critical paths. (Activities are also critical when they have *negative float*, which occurs when the project deadline is an earlier date than the end date for the calculated critical path.)

Computer scheduling tools *automate the analysis* (which can be quite tedious); they generally display the noncritical activities in soothing blue and the critical activities in scary red.

Computers are able to generate time-scaled bar charts of project activities, also called *Gantt charts* (after their originator, Henry Gantt). Simple Gantt charts, such as the one in Figure 85.1, can display dependencies (as in this example from Microsoft Project), but network charts are best for showing workflow for large projects.

ID	Task Name	Duration	Predecessors
1	**Project Skywalker**	**50 days**	
2	Start	0 days	
3	Determine Specifications	5 days	2
4	Design System	5 days	3
5	Develop Test Plan	2 days	3
6	Document System	7 days	4
7	Buy Hardware	10 days	4
8	Write Software	15 days	4,5
9	Identify Test Users	3 days	5
10	Build System	10 days	6,7,8,9
11	System Built	0 days	10
12	Install User Systems	5 days	11
13	Perform User Tests	2 days	12
14	Fix User Test Defects	7 days	13
15	Release System	1 day	14
16	End	0 days	15

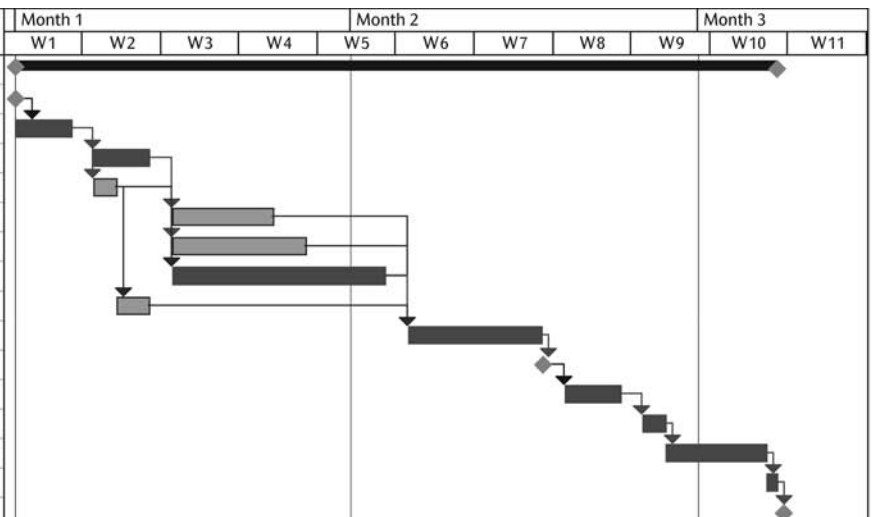

Figure 85.1. Sample Gantt chart.

Adjust Plans to Meet Project Constraints

With activities aligned with the calendar, work in parallel becomes visible. *Modify activity timing* to resolve timing problems. Adjust dependencies and delay work as necessary to avoid simultaneous conflicting activities. Change activity timing as necessary to manage dependencies and interfaces among **multiple dependent projects**. Analyze the effort requirements needed throughout the project timeline, and use **resource leveling** to extend the schedule if necessary when the work requires more effort than the project team can deliver.

Refine the plan to *manage risks* through **risk identification**, analysis, and **risk response planning**. Add any new activities for risk avoidance and risk mitigation to the project plan, and adjust the schedule accordingly.

The schedule resulting from timing, resource, and risk analysis rarely supports the deadline in the **project objective**. Work to *minimize schedule issues* through **constraint management and plan optimization**. If an acceptable alternative plan emerges from your analysis, document it, and use it for **project baseline setting**.

If your best planning efforts fail to support stated project objectives and constraints, develop several realistic project *plan alternatives* that are close, and use them to **negotiate project changes**.

Document and Use the Schedule

Alternatives to the Gantt chart for *schedule documentation* include tables, computer spreadsheets, databases, notebooks, and project dictionaries.

Computer simulations of project risk, such as automated tools for Program Evaluation and Review Technique (PERT), display project schedules using distributions and histograms, showing the probabilities associated with project completion on given calendar dates.

Use the early activity schedule dates for **project plan execution**, and keep the schedule *current* through **schedule control**.

Revalidate the overall schedule periodically during **project reviews**, especially on lengthy projects.

86

Scope Change Control (PMBOK® 5.5, Control Scope)

What: Managing specification changes to the project deliverables.
When: Project execution and control.
Results: Acceptance of changes that represent net benefits, and rejection or deferral of other proposed changes.

Define the Change-Control Process

Once the project **scope definition** and the **project baseline setting** are complete, use a *documented* scope-management process to control scope changes. Managing the specifications for project deliverables is essential to **integrated change control**. Although the formality of the control process may vary, even on short projects a written process helps to maintain scope stability. Figure 86.1 offers an example. Effective processes default to a response of "reject," forcing all proposed changes to establish their business value before becoming part of the project.

Effective change control also requires appropriate *authority* for the people who will review, analyze, and decide on proposed changes. To guard against frequent unnecessary change, approvers need the power to say "no" (or at least "not yet") and make it stick.

Review Change Proposals

People generally propose scope changes either to solve project problems or to respond to opportunities. Whatever the source, document any proposed changes *in writing*, and include information such as:

- The situation that makes a change necessary
- A quantitative assessment of benefits from the change
- The estimated impact of the change on schedule, cost, and other factors
- Specific resources needed for the change

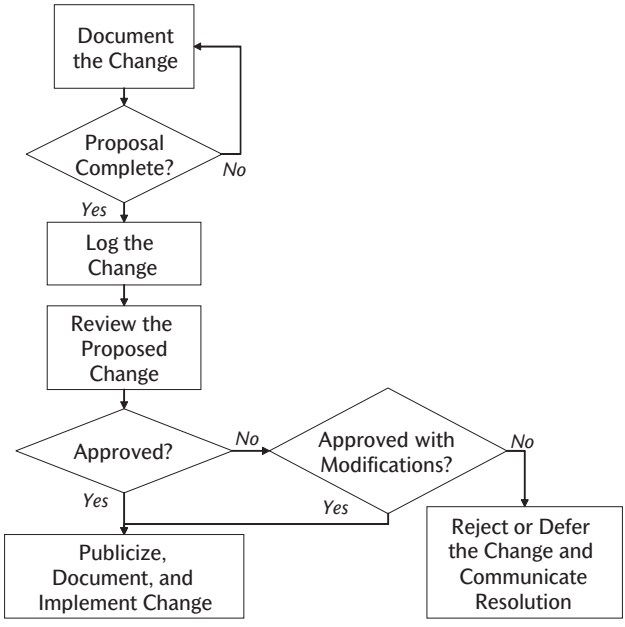

Figure 86.1. A typical change control flowchart.

Following submission, review each submitted change proposal for *completeness*. If the information is unclear or data is missing, return the request to the author for revision before considering it further.

When the proposal is satisfactory, *log* the submission and set a time for its review. Provide information on the change to the people who are responsible for evaluation, review, and approval, and let the submitter know when to expect a decision. Some find it useful to categorize changes as *small* (negligible effect on the deliverable or project), *medium* (some change to scope but low impact to the project plans), or *large* (significant change to both scope and the project baseline).

Analyze and Decide on Each Proposed Change

For each change, review the original situation and verify that the change proposed is the best response available. *Validate* that the change proposed is feasible and that it is likely to obtain the desired result and avoid unintended consequences.

Analyze the *impact* of the proposed change. Determine the effect on:

- The project schedule
- Additional project activities and effort
- Costs for additional equipment, components, training, rework, and scrap
- Contracts for purchasing materials or outsourced services
- Customer satisfaction
- **Project priorities**
- Other projects

Assess the *benefits* of the proposed change. For problem-solving changes, determine avoided expense or schedule slippage. If the change relates to an external factor (modified legal requirements, new standards, competitor actions), estimate the impact of failing to respond. Project changes that respond to opportunities must be supported by credible (not optimistic) estimates for increased sales, value, or usefulness as a result of the change. If a change is in response to a customer request, determine why the customer needs it and what he or she believes it is worth.

Analyze the *net benefits* of each change. Determine the overall value of the change by contrasting the costs and other consequences of accepting the change with its reasonably expected benefits.

Use a consistent process for **decision making**, and *make decisions* promptly. For each potential change, there are four alternatives: approval, approval with modification, deferral, and rejection. Reject all changes that lack a compelling, credible business case. Before approving a beneficial change, verify that all of it is necessary, and determine if it might be deferred to a later time. Approve changes sparingly, and only when supported by significant business needs.

Communicate and Document

Document each change-request decision in writing. Note the reason for the decision and *communicate the results* to team members, appropriate stakeholders, and the submitters.

Log the *disposition* of each change, and add the change decisions to your project information archive, for use in **project reviews** and analysis of **lessons learned**.

Update project plans and documentation as necessary, and revalidate the project baseline following any accepted major changes.

Implement all approved changes promptly, and monitor results for expected or unintended consequences.

87

Scope Definition (PMBOK® 5.2, Define Scope)

What: Formally specifying the project deliverables.
When: Project initiation and planning.
Results: A clearly written scope statement and specifications for all deliverables.

Assemble Deliverable Data

Collect project information that emerges from the **project initiation** process. Input data for scope planning includes:

- **Project objective** statement
- **Project charter**
- **Requirements collection**
- Constraints and assumptions

Involve the core team and others as needed to review the available information.

Assess project data for completeness, considering aspects such as:

- Regulatory, legal, and standards compliance
- Analysis of alternatives and competition
- Measurable performance and other goals
- Delivery, support, installation, distribution, and other logistical issues
- Technical and other risks

Document what is known about each project deliverable, and *identify data gaps*.

Resolve Unknowns

For missing user-needs information, conduct or encourage **customer interviews** or other **market research**. For other significant *missing information*,

add activities to the project work breakdown structure during scope definition. If needed information remains unavailable, note it in project **risk identification**.

For each project deliverable, minimize fuzzy specifications using an "*Is/Is not*" list. Document all requirements and constraints that must be met in the "Is" part of the list. List features and aspects of the scope that are desirable, but not required, in the "Is not" part of the list. Include all project wants initially in the "Is not" list. Use **brainstorming** and **creative problem-solving** techniques to explore alternatives, and select your best deliverable options.

Define *measurable standards* for each project deliverable and define the process for testing during **scope verification**. Identify who must approve the results of testing and sign off for approval.

Document Scope

Write a high-level *scope statement* that includes a brief description of all project deliverables.

For *each deliverable*, specify:

- What it is, and what it is not
- Needed functionality
- Interface and usability requirements
- Quantitative standards for performance and reliability
- Documentation, training, and support needs
- Acceptance tests

Document the *scope-management* process (or adopt an existing one) that will be used for **scope change control** throughout the project.

Obtain Approval

Validate the scope statement, deliverable definitions, and your scope-management plan with the project sponsor and with users, customers, and other stakeholders as needed. Resolve misunderstandings early in planning to avoid later rework and changes. When necessary, get formal sign-off for your scope documentation.

Use the scope planning data for activities as a basis for your **work breakdown structure** and other **project plan development** efforts, and for your **integrated change control**.

88

Scope Verification (PMBOK® 5.4, Verify Scope)

What: Obtaining formal acceptance of project deliverables.
When: Project execution, control, and closure.
Results: Sign-off by customers and others as necessary for intermediate and final project outputs.

Review Acceptance Criteria

As part of **schedule development**, incorporate activities for testing, validation, and obtaining *formal approval* of project deliverables. This is an important part of **closing projects**, but verification activities may occur throughout a project. Coordinate scope verification with **quality assurance** and **quality-control** efforts.

Review the **requirements collection**, **scope definition**, **work breakdown structure**, performance objectives, and other scoping documentation. Document the processes, standards, and equipment required for acceptance testing, and ensure that the resources will be available and operating properly when they are needed. Whenever requirements are modified through **scope change control**, update the specifications and acceptance tests as necessary.

Test and Evaluate

As project outputs are completed, do an *internal assessment* within the project team, inspecting, examining, and checking the results. Identify any defects or problems and revise your plans to correct the deficiencies.

When project deliverables require *external validation*, conduct tests to verify that the deliverables meet all the requirements set by the people who must sign off on them.

If the project deliverables are consistent with the specifications, get *formal approval*. If the deliverables *fail to meet* the measurement standards, do one of the following:

- Address the issues promptly and obtain sign-off.
- **Negotiate project changes** consistent with results and obtain sign-off.
- Capture status information and plan for additional effort.

Document Sign-Off (or Status)

Incorporate the *outcome* of your scope-verification effort in project **performance reporting**, and add the results of all inspections and tests to your project-management information system.

89

Software Tools for Project Management

What: Using computer applications to facilitate project management processes and communications.
When: Throughout a project.
Results: Lower overhead and effort, and better-quality project information.

Select Tools for Planning and Scheduling

Determine your needs. Small projects are easy to manage without specialized software, and the overhead of learning and using a new application can easily represent a net increase in overall work. Projects longer than a few months or with more than 100 tasks in their **activity definition** easily justify the use of at least a low-end project management tool. Considerations in selecting software include:

- *Cost* (software, training, support, upgrades, or other expenses)
- *Adoption by peers* (with resulting access to local expertise)
- *Ease of use* (installation, learning curve, operation, updates)
- *Compatibility* with organizational standards and related applications
- Need for specialized *risk analysis*
- Extensive *resource analysis* and tracking requirements
- *Customized reporting* capability
- Requirements for *import and export* of project information
- *Multiproject (program) analysis*
- *Web or remote network access*

Adopt a tool that *meets your needs* without a lot of excess capability that increases the cost and makes operation confusing. For projects lasting six months to one year and having a modest number of external dependencies, midrange tools (such as Microsoft Project) are generally adequate. For larger projects or projects needing more access and analysis capabilities, high-end

tools (from Primavera and similar suppliers) may be a better choice. Although server-based multiuser packages are more costly and difficult to master, they offer capabilities not present in the midrange scheduling tools and can be useful in establishing a **project office**.

Learn the tool. To use any project management tool fully, you need to find a mentor or attend training. Build your skills through practice and use of the tool.

Increase efficiency through sharing experiences with others who use the same software. Create templates that contain all the standard activities typically included in project work in the format of your tool. Share the templates with others and improve them over time.

Use the tool effectively. A project scheduling tool is merely a database with some specialized reporting and analysis capabilities. Although it cannot plan or manage your project for you, it can make your job easier. The tool's database can help in collecting and organizing project information for **project plan development**. If you build your plans using bottom-up analysis of project work (as opposed to "must start on," top-down imposed deadlines), the scheduling tool will be a great help in "what if?" analysis, **constraint management and plan optimization**, and **risk response planning**.

Track the project. Use the tool to collect and compare actual schedule and cost information with plans for performance reporting. Use the software throughout **project plan execution** to support **schedule control** and **cost control**.

Choose Communication Tools

All communication technology works best when supported periodically with *face-to-face interaction*. Build teamwork and trust to enhance your use of technology.

Consider all available *communications capabilities* in your **communications planning**. Use technology to support **information distribution** and archiving project data.

When working with *distributed teams*, adopt and use **virtual team technical tools** to effectively maintain teamwork and accelerate project progress.

Consider Other Tools

Risk-management software packages (such as Risk+ and @Risk) are useful for **quantitative risk analysis**.

Decision support software (examples are Crystal Ball and Expert Choice) can be very effective for **decision-making** in complex project situations.

Issue-tracking systems, either purchased or based on a spreadsheet or other database, may be needed for effective **issue management** and **integrated change management** on large programs.

Time-and-resource tracking software can support detailed reporting requirements for government and some commercial projects. They can also support collection of **earned-value management** metrics and accurately **forecasting project completion**.

90

Sponsorship

What: Establishing and maintaining management and organizational support.
When: Throughout a project.
Results: A fast project start, protection of project resources, prompt decisions, and removal of barriers.

Define the Role of the Sponsor

Project sponsors have *responsibilities* throughout projects, not just at the start:

- *Initiation*—committing resources, providing data, getting work started
- *Planning support*—providing guidance, validating plans
- *Execution support*—making decisions, solving problems

Initiating Sponsorship

Sponsors select projects, but they may not provide needed information. If the **project objective** is unclear, or the **project charter** is incomplete or missing, you must fill the gaps. Find out the *purpose* for the project from the sponsor.

Work with the sponsor on **stakeholder identification**, listing those who depend upon its successful completion. Verify that **project infrastructure** decisions for reporting and **communications planning** satisfy sponsor and stakeholder expectations.

Verify the initial *resource commitments* for the project, for staffing, funding, equipment, travel, training, and any other identified expenses.

Get approval from the sponsor to hold a project **start-up workshop** to get the project off to a *fast, effective start*. Involve the sponsor in the workshop if possible, either at the start or at the end.

Following initial analysis of the project data and **scope planning**, *check your understanding* of the project with the sponsor by validating the **scope statement** and **project priorities**.

Project sponsorship can be time-consuming. Sponsors who begin more than six projects, even if they are small, will probably fail to support at least one of them adequately. Discuss responsibilities throughout the project and *get commitment for ongoing support* from your sponsor.

Support Planning

Throughout **project plan development**, *keep the sponsor informed* of (but not necessarily *involved* with) your progress.

As planning continues, *consult* with the sponsor as necessary to get guidance for **decision-making** and for managing trade-offs during **constraint management and plan optimization**.

Establish procedures during the planning process for **problem escalation**, **scope change management**, and other practices for project control. Verify support for *control processes* with the sponsor and document them.

At the close of planning, assemble your planning documents. If your *best* plan falls short of the sponsor's desired objective, also document two or more realistic alternatives and use this data to **negotiate project changes** with your sponsor. *Validate* an acceptable plan, freeze the scope specifications, and complete **project baseline setting**. Communicate your baseline and use it to ensure **stakeholder-expectation management**.

Guide Execution

Communicate *summary-level project information* to the sponsor frequently. Provide **performance reporting** promptly and factually, even if it contains bad news. Meet with the sponsor regularly to discuss the overall progress of the work and to keep the project visible.

When any aspect of **integrated change control** represents *impact to the project objective*, involve the sponsor in evaluating options and making decisions.

Whenever project progress stalls waiting for a sponsor response to a **problem escalation** or a necessary approval or decision, use **issue management** to *set due dates and communicate consequences* of any continued delays. If necessary, delegate ownership upward and track the status in your project-status reports.

Whenever a sponsor will be *unavailable* for more than a few days, locate a named individual who has decision and signature authority to ensure continuity.

Promptly Replace Lost Sponsors

If you lose your sponsor (through job change, health problem, resignation, or retirement), *find a new sponsor*. Document the value of your project and the consequences of failure to convince an appropriate high-level individual to support your project. Possible candidates include people who will suffer consequences if your project fails and managers who could (and might) cancel your project.

91

Stakeholder-Expectation Management (PMBOK® 10.4, Manage Stakeholders' Expectations)

What: Establishing and maintaining realistic understanding of your project.
When: Throughout a project.
Results: Continuing good relationships with key individuals connected to your project, and straightforward closure at project end.

Set Expectations

Use inputs from all the people listed during **stakeholder identification** in your project **requirements collection**, as appropriate. Validate your decisions regarding specifications throughout **scope definition** and **project plan development** with key stakeholders, especially your project sponsor. *Involve stakeholders* responsible for **scope validation** in your **project baseline setting**, obtaining explicit approval for your detailed scoping, timing, and other commitments.

Actively Manage Expectations

Keep stakeholders *informed* about the project through frequent **information distribution** and **performance reporting**, as outlined in your **communications planning**.

Use effective and prompt **issue management** whenever *problems* arise, increasing your communication and involving stakeholders in resolution when necessary.

When making project changes, follow your defined processes for **integrated change control**. For all major changes, involve stakeholders in **nego-**

tiating project changes as needed, and inform all stakeholders of any shifts in your project baseline.

On lengthy projects, also involve your stakeholders in **project reviews**, at least providing a summary presentation or report outlining your results and any recommendations.

92

Stakeholder Identification (PMBOK® 10.1, Identify Stakeholders)

What: Discovering the key individuals who are, or could be, connected to your project.
When: Project initiation, and ongoing.
Results: A comprehensive list of all who can affect, or are affected by, your project.

Find Your Stakeholders

Some stakeholders are individuals who can affect your project, either positively or negatively. Primary among these are the people responsible for **sponsorship** of the work—those who get the project going and then fund and oversee the effort. Other stakeholders who can potentially affect your project include those who supply resources and staffing, managers of related projects and programs, organizational decision-makers, regulators, and others with influence over your work. For publically funded projects, the potential list of stakeholders may be huge.

In addition, your project may affect other people. These stakeholders include customers and users, project team members, and potentially many others both inside and outside your organization.

Document Stakeholders

As part of **project initiation**, list the known project stakeholders. Drawing a "mind map"–style diagram similar to the one shown in Figure 92.1 is an effective technique for uncovering related individuals and functions.

Uncover stakeholders during **project initiation** and while defining your **project infrastructure**.

Whenever possible, identify your stakeholders by name. For stakeholder categories where you lack specific names, add activities to find the individ-

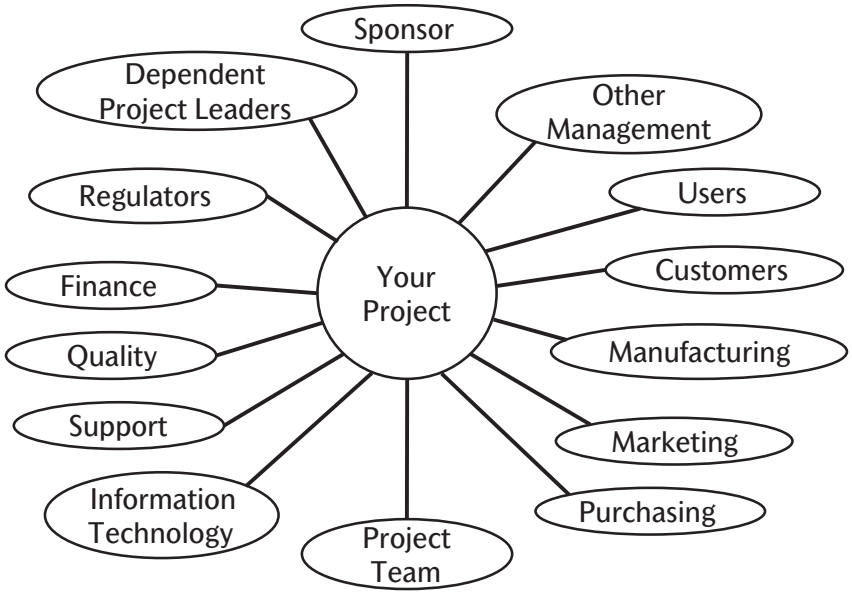

Figure 92.1. Sample stakeholder map.

uals to your **work breakdown structure**. Incorporate the needs of all stakeholders into your **communications planning**. Discuss the project with the identified stakeholders, and use the opportunity to probe for additional stakeholders.

Include stakeholder information in your **project charter** and in other relevant project documentation. Document contact data, roles and responsibilities, and other information you will need for stakeholder management and ongoing communications.

Analyze the likely impact each stakeholder could have on your project, and summarize your plans for interaction and **stakeholder-expectation management**. Explore possibilities for improving your relationships with stakeholders who can help your project, particularly with your sponsor and others with organizational power and influence. For stakeholders who can impede or otherwise negatively affect your project, use **influence without authority** to minimize potential harm. In extreme situations, work with your sponsor to identify options that will avoid involving stakeholders who are likely to be adversaries or project opponents.

93

Start-Up Workshop

What: A meeting to initiate project efforts and to build teamwork.
When: Project planning or project execution (or both).
Results: Consistent understanding of project goals and plans, a quick start on the work, and a cohesive project team.

Project start-up workshops go by *other names*, including project kickoffs, project initiation meetings, project planning workshops, and project launches.

Plan the Workshop

Justify the project start-up workshop by outlining the benefits you expect to achieve. One primary benefit of a face-to-face meeting is a solid foundation for **team management** based on relationships and trust on the project team. For global teams and other virtual teams, it is often the difference between project success and disaster. Additional benefits include unambiguous understanding of the project, a fast and efficient project beginning, collaborative initial **project plan development**, and team **motivation**. With these benefits come costs—for travel, time, and other investments. Build the business case for a workshop and get approval to conduct one.

Prior to the workshop, assemble the *project documents* you will use, including the **project objective**, **project charter**, data from **requirements collection**, your **project infrastructure** decisions, and any other project and **scope definition** documents available.

Develop an *agenda* to support your workshop objectives. The length and content of the agenda will vary depending on the type and size of the project, but allow a minimum of a half day, even for short projects. Significant programs may require a series of multiday workshops. Begin the agenda with introductions and a review of project expectations. Allow sufficient time for each major analysis, planning, or other result you need from the workshop. Include time for team-building activities to allow the staff to get to know one another.

Determine who in addition to the core project team should participate, and *schedule* the workshop when they can attend. In advance, obtain commitment from all participants to attend the entire meeting.

Plan the logistics for your **meeting**. You will accomplish more if you get away from workplace interruptions, so reserve a suitable off-site location. Arrange the room for a productive workshop, and bring any supplies you will need such as pens, tape, flip-charts, and yellow sticky notes. Although it is possible to facilitate your own workshop, getting another person to lead the meeting will allow you to contribute and participate more fully.

Hold the Workshop

Begin with *introductions* and let people interact with one another. Clarify each person's contribution to the team. Spend some time reviewing the agenda and objectives for the workshop, and discuss the project (with the sponsor if possible) to ensure that everyone understands the goals.

During the workshop, use a flip-chart to *capture data*: issues, relevant assumptions, decisions, plans, and action items. Use the workshop to build on the foundation of information available. Work to understand the **project priorities** and to improve the deliverable documentation using "Is/Is not" analysis on the project deliverables. If the planning process has begun, review the **work breakdown structure** and focus on **activity duration estimates**, **activity resource estimates**, **schedule development**, **resource analysis**, and **risk identification**.

Include activities where people work together in pairs or small groups for *team-building*, and use collaborative processes such as **brainstorming** and **creative problem-solving**. Have some fun during the workshop.

Wrap up the workshop by reviewing what you have accomplished and identifying the next steps. Assign an owner and a due date for all action items and tasks. End by renewing team commitments and thanking all participants.

Follow Up After the Workshop

Document the results of the workshop, and distribute the information to the team and appropriate stakeholders. Discuss workshop results with your sponsor.

Follow up on all action items and unfinished business of the workshop.

If you are using a **software tool for project management**, enter the results of the workshop into the database. Continue the *planning process* to develop the remaining data needed for **project baseline setting**.

94

Status Collection

What: Periodic collection of project activity information.
When: Project execution and control.
Results: Timely, accurate progress data and early detection of problems.

Select Effective Methods

Determining project status is primarily the responsibility of the *project leader*. The process for status collection is a key part of **communications planning**, and it is central to **project plan execution** and **procurement administration**. Status collection begins the project-tracking cycle.

Decisions regarding status collection are part of **project infrastructure** planning. There are many ways to *collect the data*, although most people prefer to do it in writing to minimize confusion and to retain a tangible account. Typical methods include:

- E-mail
- Paper or online forms
- Using the services of a **project office**
- One-on-one meetings
- Telephone conversations
- Project team meetings

Use a method that works for you, and make collection as *simple* as practical. On most projects people are very busy, so if the process is complicated or time-consuming, you will not get the information you need.

The *frequency* of data collection also varies, but most status collection is done weekly. Collecting information too infrequently reduces **schedule control**.

Collect Status

Project-status information is of two types: *hard data* (facts and figures) and *soft data* (anecdotal information, rumors, and less specific information). Both

types of status are useful. **Project variance analysis**, project control, and **performance reporting** all depend on hard data. Soft data reveal root causes of current problems and can provide early warning of potential project risks.

Hard data include all the diagnostic **project metrics** that you are tracking. This encompasses all of the *metrics* used for **earned-value management**. Schedule, cost, and resource metrics are collected routinely every status cycle, with scope and other metrics collected as necessary. Typical hard data examples are:

- Activities completed or delayed
- Actual activity start and finish dates
- Duration adjustments for incomplete activities
- Milestones completed or missed
- Actual activity-effort and cost data
- Effort adjustments for incomplete activities
- Data regarding specification changes
- Results of deliverable tests

You will also uncover less tangible information, both during status collection and during informal communications. These *soft data* include information such as:

- Priority conflicts arising from expected new projects or other work
- Productivity problems of team members
- Potential changes to the project environment
- Rumored delay of required project inputs
- Problem situations that have a common root cause
- Conflicts requiring more authority to resolve than you have
- Delayed resolution of **problem escalations**

Avoid Pitfalls

There are many *common problems* that can result in inadequate status information. Here are some good practices for avoiding them.

- *Do not "shoot the messenger" who brings bad news.* When team members are criticized or punished for negative news, they stop providing any useful information.
- *Always collect the status data, every cycle.* Good, timely information is even more important during times of high stress and significant problems.

- *Acknowledge and use the information you collect.* If it looks like you do not care about the information received, your team members will stop providing it. Make use of status data from all contributors in your **information distribution**.
- *Work hard to get status data from distant team members on* ***global teams*** and from external contributors. Be persistent, make multiple requests when necessary, contact them when they are at work (regardless of the time where you are), and verify the data.
- *Listen actively.* Paraphrase what you are told to ensure that you understood what was said. Ask open questions that require more than a yes or no answer, and probe for the root causes that underlie the status.

Team Acquisition (PMBOK® 9.2, Acquire Project Team)

What: Obtaining project staff required to complete project work.
When: Project planning.
Results: A roster of project team members, including relevant information and credible commitments.

Existing Staff

As part of **project initiation**, most (or perhaps all) of the project team may be assigned and committed. **Human resource planning** may identify needs for additional staff. Document your *known staffing needs*.

Identify Any Staffing Gaps

During **activity resource estimating**, identify the project's *unmet needs*:

- Missing skills identified through **required skills analysis**
- Required unstaffed roles based on **responsibility analysis**
- Portions of the project with resource overcommitments

Document the needs, with supporting data on project timing, costs, and other consequences of not resolving the staffing shortfall.

Resolve Gaps

Use existing organizational procedures and resources to fill out your project team through reassignment of *internal resources* whenever possible.

If staffing issues remain, develop a *staffing plan* to resolve them through:

- Negotiating increased commitments from part-time team members
- **Team development** of existing staff to build new skills

- **Procurement planning** and **procurement initiation** to outsource work
- Recruiting and hiring additional staff
- Other methods for obtaining additional staff

If you *cannot add needed staff* in a timely manner, begin **negotiating project changes** to scope or timing that are consistent with the resources you have. Rely on planned overtime only as a last resort, and if you must do it, add it as a significant resource risk during **risk identification**.

Document

Update the *project roster* to add all new project team members, along with their roles and responsibilities, telephone numbers, e-mail addresses, and other information.

96

Team Development (PMBOK® 9.3, Develop Project Team)

What: Ensuring that the project staff builds required skills and functions well as a team.
When: Throughout a project.
Results: A cooperative, effective team capable of completing the project.

Identify the Skills the Project Requires

As a project leader, be constantly on the alert for opportunities on the team to build new skills. Encouraging team members to *develop skills* increases **motivation** and can provide the project with staffing options not available when a team is dependent on a single individual with unique talents.

Based on the project's **resource planning** and **required skills analysis**, identify any *needed skills* that no one on the team possesses. For skills that you are unable to add through **team acquisition**, look for team members who may be willing and able candidates for learning new skills.

Another place where skill gaps can surface is **performance problem resolution**. Some *missed commitments* are a consequence of team members who lack necessary skills.

Be aware that **scope change control** and other *project shifts* may also generate new project activities that no one currently on the team knows how to do.

Build New Skills

Acquiring *new skills* on the team can be done through:

- Training
- **Coaching and mentoring**

- Networking with others
- Self-development

Build an Effective Project Team

Begin team-building through a project **start-up workshop**. Develop trust and interpersonal relationships through team-building activities, and make connections within the team using pair and group interactions.

Align the objectives of the project with individual goals. Build **motivation** by identifying "What's in it for me?" for each person on the team, and respect individual preferences when **delegating responsibility**. Employ **influence without authority** to get reliable commitments, especially with team members who report to others.

Especially on cross-functional or **matrix teams**, encourage good team *working relationships*. Foster one-on-one and small-group interactions. Get to know new team members quickly, and identify common interests, experiences, education, or background. Co-location, even for short periods, helps in avoiding trouble and in **conflict resolution**. Periodic face-to-face meetings are essential for building relationships and trust that a team depends upon in times of project difficulty.

Establish honest, *open communication*. In **global team** communication, be sensitive to different preferences and time zones. Choose **virtual team technical tools** that are acceptable to all, and shift conference call schedules periodically to share time zone inconveniences. Global team work styles also vary, so adjust project plans to minimize potential project impact.

Use *positive feedback* to build team cohesion, whether through personal thanks, specific mentions of project contributions in performance reporting, or other **rewards and recognition**.

97

Team Management (PMBOK® 9.4, Manage Project Team)

What: Establishing and maintaining team productivity, cooperation, engagement, and trust.
When: Throughout a project.
Results: Less conflict and chaos, and faster, less expensive projects.

Create a Good Foundation

Define the *objectives* for the team in very specific terms. Involve everyone in **user-needs assessment** for the project, and verify that the team understands the **project objective** and **project vision**. Involve team members in **project plan development** and build buy-in and commitment by **delegating responsibility** and ownership for project work.

Staff the team with capable people with the talents identified in your **required skills analysis**. Clearly identify the *roles and responsibilities* for each team member, and focus **staff acquisition** efforts on finding individuals with good interpersonal skills, general knowledge, and no conflicting priorities.

Work to understand the team members, and determine the best *leadership style* for the group. Use your experience and knowledge of the people to strike an appropriate **leadership** balance between consensus management and autocratic control.

Establish a team identity or name that brings the team together. *Structure* the team to work effectively. Determine a **project infrastructure** that facilitates team productivity, and ensure effective information flow through **communications planning**. Identify and work to minimize unnecessary overhead.

Teamwork emerges most easily through proximity, so if it is possible, *co-locate* the team where members can work together permanently throughout the project. If co-location is not possible, schedule face-to-face meetings periodically, at least for portions of the team, and enhance communications by using the best available **virtual team technical tools**.

Maintain Team Relationships

Meet face-to-face regularly, weekly if possible. Meet as a team at least twice a year, even for global teams, to renew and reinforce interpersonal relationships.

Be disciplined in your *project communications*. Monitor project progress through frequent **status collection**, **project variance analysis**, and **performance reporting**. Organize and conduct effective **meetings**. In addition to formal communication, **communicate informally** with the team regularly, and encourage informal interaction among the team members.

When *conflicts* arise, deal with differences promptly in a constructive, nonjudgmental environment. Use **conflict resolution** as an opportunity to learn, to improve the project, and to build mutual respect within the team.

Encourage *fun and humor*. Periodically schedule events, chosen by the team, to get the team together outside the project. Find opportunities as a team to eat together; food is something everyone has in common and is very effective in connecting people.

Manage Team Performance

Track individual performance through diligent **status collection**. If project variance analysis reveals problems, work with the contributors involved on **issue management**. Confront and resolve problems quickly. When team members fail to meet commitments, work on **performance problem resolution** with them individually. For situations that are beyond your authority, seek rapid resolution through **problem escalation**. Seek team members' participation in all **decision-making** that involves them. Use team analysis and **creative problem-solving** to resolve difficulties within the team whenever possible.

Be consistently fair and honest in formal periodic appraisals for all team members who report to you. Provide input for and participate in performance evaluations for those on your team who report to others, and be specific about significant contributions and accomplishments. Throughout the project, conduct frequent one-on-one discussions of individual performance with all team members.

Maintain **motivation** by demonstrating *loyalty* to the team and praise team members who help one another or fill in when others are absent. Find frequent opportunities to thank people for their accomplishments and take full advantage of programs for **rewards and recognition**.

98

Transitioning to Project Leadership

What: Understanding the changes required when moving from a project contributor to leader.
When: As necessary.
Results: A quick and successful transition into a project leadership role.

Understand the Project Manager's Role

The daily work of a project leader *differs* in many ways from the work of other project team members, as shown in Figure 98.1.

Figure 98.1. Focus of team members and project leaders.

Project Team Members	*Project Leaders*
• Seek excellent solutions	• Seek workable solutions
• Work with "stuff"	• Work with staff
• Are subject matter experts	• Are generalists
• Are evaluated on personal efforts	• Are evaluated on team efforts
• Focus on individual goals	• Focus on project and overall goals

The transition from member to a project leadership role can be very difficult and frustrating because the jobs are so different, and new leaders are often reluctant to give up technical and execution responsibility. Because project leaders need to allocate about 10 percent of their time for each core project team member, any project leader with a sizable team who retains significant technical responsibilities will be responsible for *two full-time jobs*.

Focus on Communication

One of the most important responsibilities of the project leader is *information management*: **status collection**, **information distribution**, and **perfor-**

mance reporting. Project leaders need to be conduits for formal project communication, not barriers. Good leaders become adept at summarizing, filtering, and transferring clear data up (to management and sponsors), down (to contributors), and laterally (to leaders of related projects). In addition, effective project leaders devote substantial effort to **informal communication** throughout the project.

Most project leaders attend many *meetings*, so **meeting planning** and **meeting execution** skills are crucial for minimizing the time invested and maximizing meeting value. Good **presentation** skills are also essential.

Learn to Lead and Motivate

Project leaders need to be *people-oriented*. They need to understand their project teams to determine what **leadership** styles will work best. **Team management** involves **delegating responsibility** for project activities to team members, and it requires a facility for building teamwork and **motivation**. Getting people from other organizations to cooperate depends on exerting **influence without authority**. Project leaders also provide **coaching and mentoring** for team members, and they must take advantage of opportunities for **team development**.

Project leaders need to keep a *systems view* and focus on the overall objectives. They also need to develop their ability to multitask, working effectively through frequent interruptions.

Plan Thoroughly

Project plan development is a very visible responsibility of any project leader. The project leader is responsible for *creating the plans* and determining how to store the information. The project leader must become proficient at using **software tools for project management**. The leader is also responsible for **negotiating project changes** that are necessary to ensure a realistic foundation for **project baseline setting**.

Have a Business Focus

Project leaders need to understand the project user needs through **requirements collection**, the perspective of the sponsor, and **stakeholder-expectation management**. *Project finances* and **cost budgeting** are essential to the overall success of the project.

99

Virtual Team Technical Tools

What: Using technology to assist in managing distributed teams.
When: Throughout a project.
Results: Effective long-distance collaboration and sharing of project information.

Select Tools for Communications

In **communications planning**, *prepare in advance* for any technological tools you will use. Set expectations for timing, and establish standard formats for **performance reporting** and other written project communications. For **global team** communications, adopt tools and techniques that all of the team members can and will use effectively. With careful planning, technical tools can increase your **influence without authority**.

For **meetings**, *teleconferencing* is the most common tool. Telephones, videoconferencing, and computer networking methods can all be effective. Specialized media rooms set up for videoconferencing and Web-based meetings are particularly useful when participants need to share images, graphics, software applications, live video, or other complex visual information.

Good teleconferencing (like any meeting) requires *advance planning*. Set an agenda before the meeting with *topics*, *owners*, *timing*, and *expected outcomes* for each item the meeting will address. If there will not be easy access to images during the teleconference, send visual information in advance via e-mail, fax, or express mail, or place files on websites that all will be able to access. When dealing with significant time differences, schedule meetings at a time that is as mutually convenient as possible. Schedule meetings so that all participants will be able to meet during their normal working hours, at least once in a while.

For *technology-assisted meetings*, select technology that all the participants can competently use, and make it part of the **project infrastructure**. Obtain agreement from the entire project team (including any involved external consultants, partners, and outside service suppliers) to use the meeting technology, and test all hardware before use for compatibility. Begin technology-mediated

meetings with introductions, and throughout the meeting remind participants to state their names before speaking.

General communications via e-mail and other *computer messaging* technologies are also vital to virtual teams, especially when there are significant time differences. Resolve any issues of access, technical compatibility, and security in advance, so team members can communicate freely. If new software releases are scheduled, give everyone prior warning. Repeat your compatibility tests after any changes or upgrades. Check that attachments to e-mails and files stored on computer networks are accessible using software available to all team members. If some team members have limited or low-speed network access, avoid techniques that require very large files.

Always *reread all e-mails* and other written communications before sending them to check for clarity, tone, and terminology. As you review what you have written, think how you would react to it if you received it. Encourage frequent, short communications.

Whenever complex information needs to be shared across the team, communicate it in *several ways*. If information distribution is initially verbal, follow up with a written summary. Tailor your communication to the recipients, and offer to follow up and discuss any written communication that may be unclear.

Use Tools to Work Together

As with communication tools, check file sharing and *collaboration tools* that your project will need in advance for compatibility and performance. Using Web-based tools, E-rooms, instant messaging, file servers, **software tools for project management**, and other distance-collaboration tools can be very effective in technical projects if their use is carefully planned and aligned with project requirements.

Combine High-Tech with "High Touch"

Technology and other capabilities are essential throughout **project plan execution**, but use them *in addition to*, not instead of, other types of communication. High-tech communication works best when accompanied by other "high touch," more personal methods. Use all available tools, but avoid misuse. Voice mail can be extremely valuable for **communicating informally** when team members share a language and culture, but for team members who speak different languages, voice mail can be easily misinterpreted and may seem rude or impolite.

Never miss an opportunity for *one-on-one meetings* for **team management**

to build trust, even when it is not with the entire team. Get the whole team together as frequently as practical, at least semiannually, for events such as project **start-up workshops**, **project plan development**, and **project reviews**.

Exchanging photographs among distant locations, particularly informal pictures of team members outside of the workplace, is an effective way to build personal connections on a virtual team.

100

Work Breakdown Structure (PMBOK® 5.3, Create WBS)

What: Creating a hierarchical, comprehensive description of the project work.
When: Project planning, execution, and control.
Results: A project work breakdown structure (WBS) that serves as the foundation for realistic planning and meaningful tracking.

Prepare

Developing a WBS is a *team process*. Identifying project work completely requires the perspective of all contributors—from other functions, from support organizations, and from people who may only be involved later in the project. Involve the core project team and other stakeholders who can help in understanding the project.

Plan the *logistics*. For large projects, scope definition may take several days. Allocate at least two hours for even modest projects, and seek a quiet place away from your normal work area with ample room and open wall space. Provide necessary supplies, such as thick, dark pens; yellow sticky notes; and tape or pins to post large sheets of paper on the walls.

Assemble *project documentation* from **project initiation** and **scope definition**, such as the **project objective**, scope statement, **project priorities**, **project charter**, and **project vision**. Review the results of **requirements collection**, and define the project acceptance criteria. Also provide work breakdowns developed for earlier similar projects, as well as any relevant WBS templates.

Before beginning to decompose the work with your team, break *larger programs* into smaller projects that can be assigned to teams of at most 12 people.

Identify Project Work

The goal of the WBS process is to describe the project in much smaller pieces, or *work packages*. A project WBS is a structured hierarchy, with work

packages at lower levels representing smaller portions of the overall project. The lowest-level work packages are often called "tasks" or "activities," but terminology varies widely.

A WBS is typically developed by breaking the overall project deliverable into major subsets of work, and then continuing the process of *decomposition* down through multiple levels. Identify work through **brainstorming** and using lists of activities from earlier projects.

Document each work package on a separate sticky note, giving each one a *verb-noun description*. The verb defines the effort, and the noun identifies the deliverable. Examples are "Test user interfaces" and "Interview customers."

Strive for as *complete* a set of activities as possible. Include key project management tasks and any training, integration, and testing activities. Identify missing tasks that must come before or after tasks already identified. Break large tasks into shorter tasks.

Continue the breakdown process until lowest-level activities are:

- *Small*. Guidelines vary, but strive for *durations* of between two and 20 workdays or *effort* of no more than 80 person-hours. Project work broken down to this level of detail provides a good foundation for **activity duration estimating**, **activity resource estimating**, **cost estimating**, **schedule development**, **risk identification**, and **performance reporting**.
- *Assignable*. Each activity can be unambiguously assigned to a single owner.
- *Measurable*. Completion criteria are specific and clear.

Organize the Work

Once activities are identified and documented, use the sticky notes to develop a hierarchy that shows the overall project in a *logical structure*. Major deliverables are commonly used for the first level below the project objective, but there are other possible organizing principles for project work:

- By organizational function (marketing, R&D, manufacturing)
- By discipline (carpentry, masonry, plumbing, electrical, painting)
- By skill set (programming, accounting, marketing)
- By geography (Stuttgart, Bangalore, Topeka, Taipei, Bogota)
- By life cycle phase (analyze, design, build, test, deploy)

When your WBS is organized in a tree structure, test each lower level for *aggregation*; ensure that each resulting decomposition is equivalent to the

work package it branches from. Work breakdowns are most easily understood and used when leaders break the work packages into seven or fewer parts. A simple WBS example is in Figure 100.1. WBS branches often vary widely in levels and complexity.

Document and Use

Format the WBS in a *graphical display* or indented outline. Assign codes to the work packages in your hierarchy using outlining conventions. WBS data may be organized into a WBS dictionary or documented using a scheduling tool, database, or **software tool for project management**.

Use the WBS as a basis for **project plan development** and as your scope baseline for **status collection** throughout the project. Update your WBS during **project reviews**.

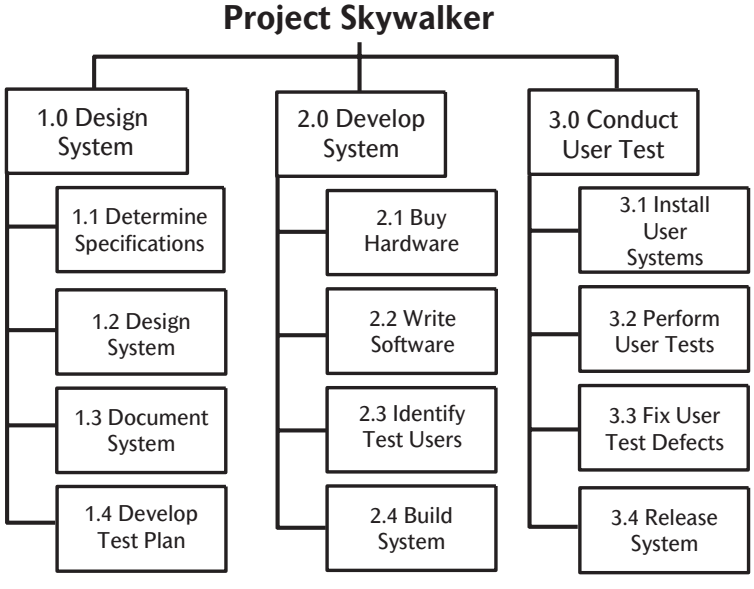

Figure 100.1. The WBS for Project Skywalker.

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