

THE PROJECT MANAGEMENT KNOWLEDGE AREAS



- 4. Project Integration Management**
- 5. Project Scope Management**
- 6. Project Time Management**
- 7. Project Cost Management**
- 8. Project Quality Management**
- 9. Project Human Resource Management**
- 10. Project Communications Management**
- 11. Project Risk Management**
- 12. Project Procurement Management**

NOTES

PROJECT INTEGRATION MANAGEMENT

4

Project Integration Management includes the processes required to ensure that the various elements of the project are properly coordinated. It involves making trade-offs among competing objectives and alternatives in order to meet or exceed stakeholder needs and expectations. While all project management processes are integrative to some extent, the processes described in this chapter are *primarily* integrative. **Figure 4–1** provides an overview of the following major processes:

- 4.1 Project Plan Development**—taking the results of other planning processes and putting them into a consistent, coherent document.
- 4.2 Project Plan Execution**—carrying out the project plan by performing the activities included therein.
- 4.3 Overall Change Control**—coordinating changes across the entire project.

**4.1
Project Plan
Development**

**4.2
Project Plan Execution**

**4.3
Overall Change Control**

These processes interact with each other and with the processes in the other knowledge areas as well. Each process may involve effort from one or more individuals or groups of individuals based on the needs of the project. Each process generally occurs at least once in every project phase.

Although the processes are presented here as discrete elements with well-defined interfaces, in practice they may overlap and interact in ways not detailed here. Process interactions are discussed in detail in Chapter 3.

The processes, tools, and techniques used to integrate *project management* processes are the focus of this chapter. For example, project integration management comes into play when a cost estimate is needed for a contingency plan or when risks associated with various staffing alternatives must be identified. However, for a project to be completed successfully, integration must also occur in a number of other areas as well. For example:

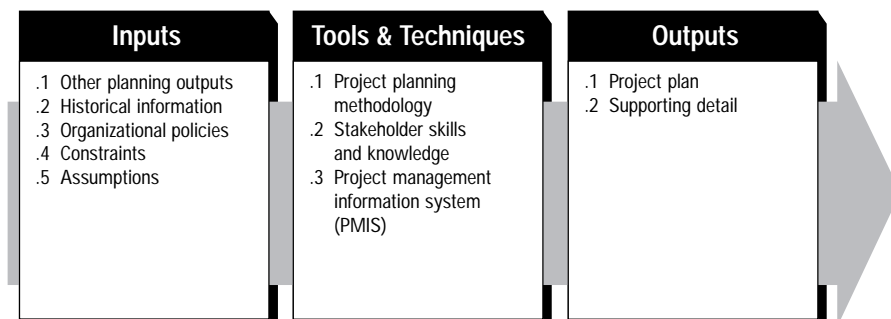
- The work of the project must be integrated with the ongoing operations of the performing organization.
- Product scope and project scope must be integrated (the difference between product and project scope is discussed in the introduction to Chapter 5).
- Deliverables from different functional specialties (such as civil, electrical, and mechanical drawings for an engineering design project) must be integrated.

4.1 PROJECT PLAN DEVELOPMENT

Project plan development uses the outputs of the other planning processes to create a consistent, coherent document that can be used to guide both project execution and project control. This process is almost always iterated several times. For example, the initial draft may include generic resources and undated durations while the final plan reflects specific resources and explicit dates. The project plan is used to:

- Guide project execution.
- Document project planning assumptions.

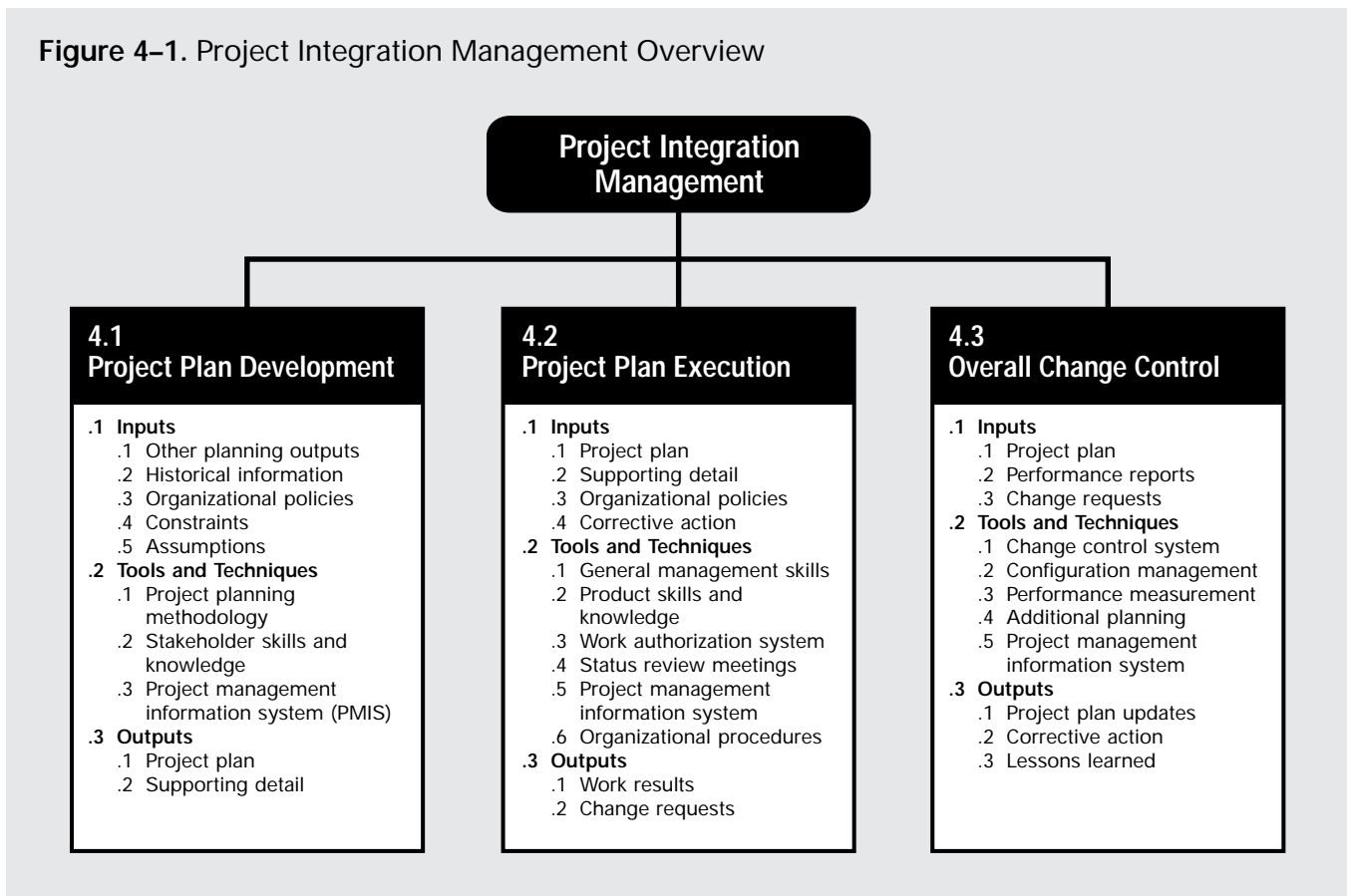
- Document project planning decisions regarding alternatives chosen.
- Facilitate communication among stakeholders.
- Define key management reviews as to content, extent, and timing.
- Provide a baseline for progress measurement and project control.



4.1.1 Inputs to Project Plan Development

- .1 **Other planning outputs.** All of the outputs of the planning processes in the other knowledge areas (Section 3.3 provides a summary of these project planning processes) are inputs to developing the project plan. Other planning outputs include both base documents such as the work breakdown structure as well as the supporting detail. Many projects will also require application area-specific inputs (e.g., most construction projects will require a cash flow forecast).
- .2 **Historical information.** The available historical information (e.g., estimating databases, records of past project performance) should have been consulted during the other project planning processes. This information should also be available during project plan development to assist with verifying assumptions and assessing alternatives that are identified as part of this process.
- .3 **Organizational policies.** Any and all of the organizations involved in the project may have formal and informal policies whose effects must be considered. Organizational policies which typically must be considered include, but are not limited to:
 - Quality management—process audits, continuous improvement targets.
 - Personnel administration—hiring and firing guidelines, employee performance reviews.
 - Financial controls—time reporting, required expenditure and disbursement reviews, accounting codes, standard contract provisions.
- .4 **Constraints.** Constraints are factors that will limit the project management team's options. For example, a predefined budget is a constraint that is highly likely to limit the team's options regarding scope, staffing, and schedule.
 When a project is performed under contract, contractual provisions will generally be constraints.
- .5 **Assumptions.** Assumptions are factors that, for planning purposes, will be considered to be true, real, or certain. For example, if the date that a key person will become available is uncertain, the team may assume a specific start date. Assumptions generally involve a degree of risk.

Figure 4–1. Project Integration Management Overview



4.1.2 Tools and Techniques for Project Plan Development

- .1 Project planning methodology.** A project planning methodology is any structured approach used to guide the project team during development of the project plan. It may be as simple as standard forms and templates (whether paper or electronic, formal or informal) or as complex as a series of required simulations (e.g., Monte Carlo analysis of schedule risk). Most project planning methodologies make use of a combination of “hard” tools such as project management software and “soft” tools such as facilitated start-up meetings.
- .2 Stakeholder skills and knowledge.** Every stakeholder has skills and knowledge which may be useful in developing the project plan. The project management team must create an environment in which the stakeholders can contribute appropriately (see also Section 9.3, Team Development). Who contributes, what they contribute, and when will vary. For example:
 - On a construction project being done under a lump sum contract, the professional cost engineer will make a major contribution to the profitability objective during proposal preparation when the contract amount is being determined.
 - On a project where staffing is defined in advance, the individual contributors may contribute significantly to meeting cost and schedule objectives by reviewing duration and effort estimates for reasonableness.

- .3 Project management information system (PMIS).** A project management information system consists of the tools and techniques used to gather, integrate, and disseminate the outputs of the other project management processes. It is used to support all aspects of the project from initiating through closing and generally includes both manual and automated systems.

4.1.3 Outputs from Project Plan Development

- .1 Project plan.** The project plan is a formal, approved document used to manage and control project execution. It should be distributed as defined in the communications management plan (e.g., management of the performing organization may require broad coverage with little detail, while a contractor may require complete details on a single subject). In some application areas, the term *integrated project plan* is used to refer to this document.

A clear distinction should be made between the project plan and the project performance measurement baselines. The project plan is a document or collection of documents that should be expected to change over time as more information becomes available about the project. The performance measurement baselines represent a *management control* that will generally change only intermittently and then generally only in response to an approved scope change.

There are many ways to organize and present the project plan, but it commonly includes all of the following (these items are described in more detail elsewhere):

- Project charter.
- A description of the project management approach or strategy (a summary of the individual management plans from the other knowledge areas).
- Scope statement, which includes the project deliverables and the project objectives.
- Work breakdown structure (WBS) to the level at which control will be exercised.
- Cost estimates, scheduled start dates, and responsibility assignments to the level of the WBS at which control will be exercised.
- Performance measurement baselines for schedule and cost.
- Major milestones and target dates for each.
- Key or required staff.
- Key risks, including constraints and assumptions, and planned responses for each.
- Subsidiary management plans, including scope management plan, schedule management plan, etc.
- Open issues and pending decisions.

Other project planning outputs should be included in the formal plan based upon the needs of the individual project. For example, the project plan for a large project will generally include a project organization chart.

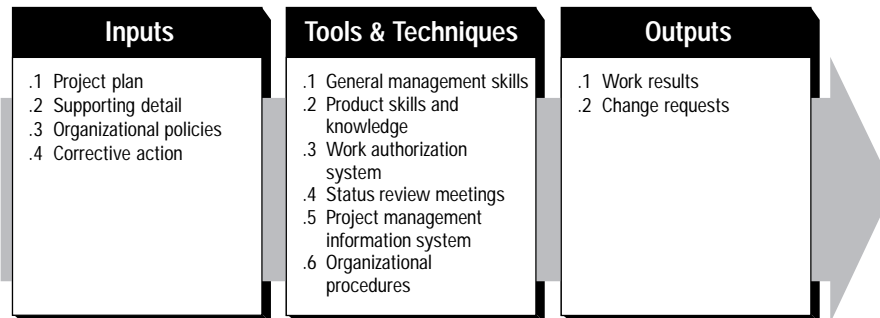
- .2 Supporting detail.** Supporting detail for the project plan includes:
- Outputs from other planning processes that are not included in the project plan.
 - Additional information or documentation generated during development of the project plan (e.g., constraints and assumptions that were not previously known).
 - Technical documentation such as requirements, specifications, and designs.
 - Documentation of relevant standards.

This material should be organized as needed to facilitate its use during project plan execution.

4.2 PROJECT PLAN EXECUTION

Project plan execution is the primary process for carrying out the project plan—the vast majority of the project's budget will be expended in performing this process. In this process, the project manager and the project management team must coordinate

and direct the various technical and organizational interfaces that exist in the project. It is the project process that is most directly affected by the project application area in that the product of the project is actually created here.



4.2.1 Inputs to Project Plan Execution

- .1 **Project plan.** The project plan is described in Section 4.1.3.1. The subsidiary management plans (scope management plan, risk management plan, procurement management plan, etc.) and the performance measurement baselines are key inputs to project plan execution.
- .2 **Supporting detail.** Supporting detail is described in Section 4.1.3.2.
- .3 **Organizational policies.** Organizational policies are described in Section 4.1.1.3. Any and all of the organizations involved in the project may have formal and informal policies which may affect project plan execution.
- .4 **Corrective action.** Corrective action is anything done to bring expected future project performance into line with the project plan. Corrective action is an output of the various control processes—as an input here it completes the feedback loop needed to ensure effective project management.

4.2.2 Tools and Techniques for Project Plan Execution

- .1 **General management skills.** General management skills such as leadership, communicating, and negotiating are essential to effective project plan execution. General management skills are described in Section 2.4.
- .2 **Product skills and knowledge.** The project team must have access to an appropriate set of skills and knowledge about the project product. The necessary skills are defined as part of planning (especially in resource planning, Section 7.1) and are provided through the staff acquisition process (described in Section 9.2).
- .3 **Work authorization system.** A work authorization system is a formal procedure for sanctioning project work to ensure that work is done at the right time and in the proper sequence. The primary mechanism is typically a written authorization to begin work on a specific activity or work package.
 The design of a work authorization system should balance the value of the control provided with the cost of that control. For example, on many smaller projects, verbal authorizations will be adequate.
- .4 **Status review meetings.** Status review meetings are regularly scheduled meetings held to exchange information about the project. On most projects, status review meetings will be held at various frequencies and on different levels (e.g., the project management team may meet weekly by itself and monthly with the customer).
- .5 **Project management information system.** The project management information system is described in Section 4.1.2.3.

- .6 Organizational procedures.** Any and all of the organizations involved in the project may have formal and informal procedures useful during project execution.

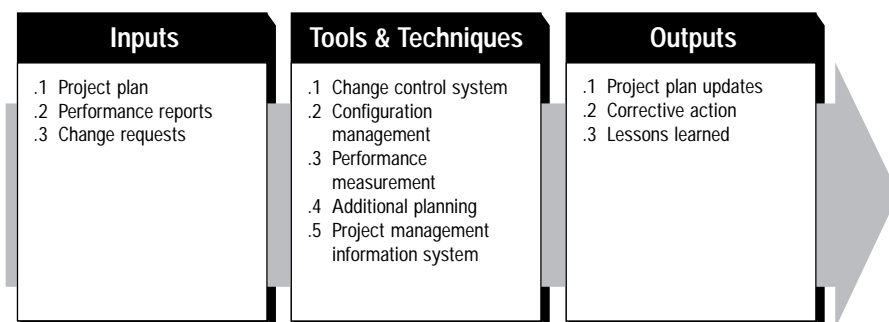
4.2.3 Outputs from Project Plan Execution

- .1 Work results.** Work results are the outcomes of the activities performed to accomplish the project. Information on work results—which deliverables have been completed and which have not, to what extent quality standards are being met, what costs have been incurred or committed, etc.—is collected as part of project plan execution and fed into the performance reporting process (see Section 10.3 for a more detailed discussion of performance reporting).
- .2 Change requests.** Change requests (e.g., to expand or contract project scope, to modify cost or schedule estimates, etc.) are often identified while the work of the project is being done.

4.3 OVERALL CHANGE CONTROL

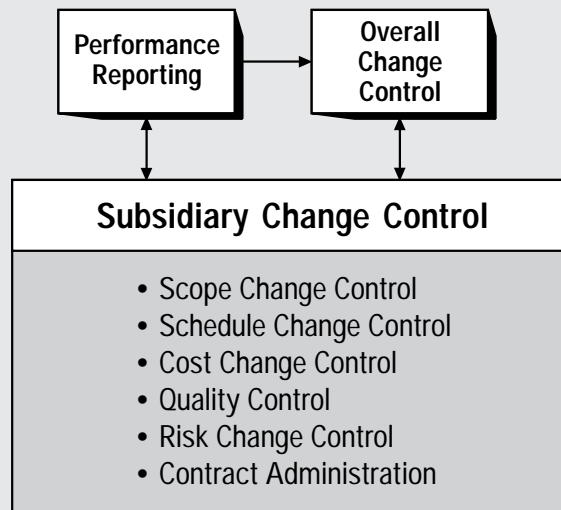
Overall change control is concerned with (a) influencing the factors which create changes to ensure that changes are beneficial, (b) determining that a change has occurred, and (c) managing the actual changes when and as they occur. Overall change control requires:

- Maintaining the integrity of the performance measurement baselines—all approved changes should be reflected in the project plan, but only project scope changes will affect the performance measurement baselines.
- Ensuring that changes to the product scope are reflected in the definition of the project scope (the difference between product and project scope is discussed in the introduction to Chapter 5).
- Coordinating changes across knowledge areas as illustrated in Figure 4-2. For example, a proposed schedule change will often affect cost, risk, quality, and staffing.



4.3.1 Inputs to Overall Change Control

- .1 Project plan.** The project plan provides the baseline against which changes will be controlled (see Section 4.1.3.1).
- .2 Performance reports.** Performance reports (described in Section 10.3) provide information on project performance. Performance reports may also alert the project team to issues which may cause problems in the future.
- .3 Change requests.** Change requests may occur in many forms—oral or written, direct or indirect, externally or internally initiated, and legally mandated or optional.

Figure 4–2. Coordinating Changes Across the Entire Project

4.3.2 Tools and Techniques for Overall Change Control

- .1 Change control system.** A change control system is a collection of formal, documented procedures that defines the steps by which official project documents may be changed. It includes the paperwork, tracking systems, and approval levels necessary for authorizing changes.

In many cases, the performing organization will have a change control system that can be adopted “as is” for use by the project. However, if an appropriate system is not available, the project management team will need to develop one as part of the project.

Many change control systems include a change control board (CCB) responsible for approving or rejecting change requests. The powers and responsibilities of a CCB should be well-defined and agreed upon by key stakeholders. On large, complex projects, there may be multiple CCBs with different responsibilities.

The change control system must also include procedures to handle changes which may be approved without prior review; for example, as the result of emergencies. Typically, a change control system will allow for “automatic” approval of defined categories of changes. These changes must still be documented and captured so that they do not cause problems later in the project.

- .2 Configuration management.** Configuration management is any documented procedure used to apply technical and administrative direction and surveillance to:
- Identify and document the functional and physical characteristics of an item or system.
 - Control any changes to such characteristics.
 - Record and report the change and its implementation status.
 - Audit the items and system to verify conformance to requirements [1].

In many application areas, configuration management is a subset of the change control system and is used to ensure that the description of the project product is correct and complete. However, in some application areas, the term *configuration management* is used to describe any rigorous change control system.

- .3 **Performance measurement.** Performance measurement techniques such as earned value (described in Section 10.3.2.4) help to assess whether variances from the plan require corrective action.
- .4 **Additional planning.** Projects seldom run exactly according to plan. Prospective changes may require new or revised cost estimates, modified activity sequences, analysis of risk response alternatives, or other adjustments to the project plan.
- .5 **Project management information system.** Project management information systems are described in Section 4.1.2.3.

4.3.3 Outputs from Overall Change Control

- .1 **Project plan updates.** Project plan updates are any modification to the contents of the project plan or the supporting detail (described in Sections 4.1.3.1 and 4.1.3.2, respectively). Appropriate stakeholders must be notified as needed.
- .2 **Corrective action.** Corrective action is described in Section 4.2.1.4.
- .3 **Lessons learned.** The causes of variances, the reasoning behind the corrective action chosen, and other types of lessons learned should be documented so that they become part of the historical database for both this project and other projects of the performing organization.