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idea to accomplishment. It is a complicated process to manage a project, and plans act as a map of this process. The map must have sufficient detail to determine what must be done next but be simple enough that workers are not lost in a welter of minutiae.

In the pages that follow we discuss a somewhat formal method for the development of a project charter (similar to a proposal, or preliminary plan) and final project plan. Almost all project planning techniques differ only in the ways they approach the process of planning. Most organizations, irrespective of the industry, use essentially the same processes for planning and managing projects, but they often call these processes by different names. What some call "setting objectives," others call "defining the scope" of the project, or "identifying requirements." What some call "evaluation," others call "test and validation." No matter whether the project is carried out for an inside or outside client, the project's "deliverables" must be "integrated" into the client's processes.

We have adopted an approach that we think makes the planning process straightforward and fairly systematic, but it is never as systematic and straightforward as planning theorists would like. At its best, planning is tortuous. It is an iterative process yielding better plans from not-so-good plans, and the iterative process of improvement seems to take place in fits and starts. The process may be described formally, but it does not occur formally. Bits and pieces of plans are developed by individuals, by informal group meetings, or by formalized planning teams, and then improved by other individuals, groups, or teams, and improved again, and again. Both the plans themselves and the process of planning should start simple with the *project charter* which is then further elaborated and eventually becomes the *project plan*. In this chapter we focus on designing the physical aspects of the project, defining what the project is supposed to accomplish, and who will have to do what for the project's desired output to be achieved. Here we describe the actual process of project planning. Organizing the work of the project, acquiring a project manager, and forming a project team are parts of project initiation. The project's budget and schedule are major parts of the project plan, but we delay discussion of them until [Chapters 7](#) and [8](#). Indeed, what must be done to test and approve project outputs at both interim and final stages, and what records must be kept are both parts of the project plan and these are covered in later chapters, as is the part of the plan that covers terminating the project. There is nothing sacrosanct about this sequence. It is simply in the order that these parts of the project plan tend to develop naturally.

## 6.1 Initial Project Coordination and the Project Charter

It is crucial that the project's objectives be clearly tied to the overall mission, goals, and strategy of the organization, such as might be reflected in the project portfolio process. In the project charter, senior management should delineate the firm's intent in undertaking the project, outline the scope of the project, and describe how the project's desired results reinforce the organization's goals. Without a clear beginning, project planning (and later progress) can easily go astray. It is also vital that a senior manager call and be present at the *project chartering workshop or "launch" meeting*, an initial coordinating meeting, as a visible symbol of top management's commitment to the project. As Brox (2012a) points out, the sponsor and other key stakeholders should participate in this meeting for the purpose of establishing the project, agreeing on the top deliverables, discussing resourcing, establishing schedule and budget tolerances (so the PM knows when to check in with the sponsor), and defining the high-level risks. Having these key stakeholders involved early on creates buy-in and fosters early communication on potential issues and risks.

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The individual leading the launch meeting is first to define the scope of the project as detailed in the charter. The success of the project launch meeting is absolutely dependent on the existence of a well-defined set of objectives. Unless all parties to the planning process have a clear understanding of precisely what it is the project is expected to deliver, planning is sure to be inadequate or misguided. At the launch meeting, the project is discussed in sufficient detail that potential contributors develop a general understanding of what is needed. If the project is one of many similar

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projects, the meeting will be short and routine, a sort of “touching base” with other interested units. If the project is unique in most of its aspects, extensive discussion may be required.

It is useful to also review the major risks facing the project during the launch meeting. The known risks will be those identified during the project selection process. These are apt to focus largely on the market reaction to a new process/product, the technical feasibility of an innovation, and like matters. The risk management plan for the project must be started at the launch meeting so that later risk identification can be extended to include the technology of the process/product, the project's schedule, resource base, and a myriad of other risks facing the project but not really identifiable until the final project plan has begun to take form. In addition to the matters discussed below, one of the outcomes of the project planning process will be the formulation of the project's risk management group and the initial risk management plan that the group develops during the process of planning the project.

While various authors have somewhat different expectations for the project launch meeting (e.g., see Knutson, 1995; Martin et al., 1998), we feel it is important not to allow plans, schedules, and budgets to go beyond the most aggregated level, especially if the project deliverables are fairly simple and do not require much interdepartmental coordination. To fix plans in more detail at this initial meeting tends to prevent team members from integrating the new project into their ongoing activities and from developing creative ways of coordinating activities that involve two or more organizational units. Worse still, departmental representatives will later be asked to make “a ballpark estimate of the budget and time required” to carry out this first-blush plan. Everyone who has ever worked on a project is aware of the extraordinary propensity of preliminary estimates to metamorphose instantaneously into firm budgets and schedules. Remember that this is only one of a series of meetings that will be required to plan projects of more than minimal complexity.

It is critical to the future success of the project to take the time required to do a technically and politically careful job of planning. This may mean many meetings and participatory decision making, but it is well worth the effort. In confirmation of this view, a survey of 236 project managers across a wide variety of projects (White et al., 2002) found that there were five criteria used to judge project success: on time, on budget, to scope, fit between the project and the organization, and the impact of the project on the performance of the organization. But the four top-ranking factors critical to project success were: a realistic schedule, adequate resources, clear scope, and support from senior management, all products of careful planning with a solid charter.

Whatever the process, the outcome must be that: (1) technical scope is established (though perhaps not “cast in concrete”); (2) basic areas of performance responsibility are accepted by the participants; (3) any tentative delivery dates or budgets and their tolerances set by the parent organization are clearly noted; and (4) a risk management group is created. Each individual/unit accepting responsibility for a portion of the project should agree to deliver, by the next project meeting, a preliminary but detailed plan about how that responsibility will be accomplished. Such plans should contain descriptions of the required tasks, and estimates of the budgets (labor and resources) and schedules.



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Simultaneous with these planning activities, the risk management group develops a risk management plan that includes proposed methodologies for managing risk, the group's budget, schedule, criteria for dealing with risk, and required reports. Further, necessary inputs to the risk data base are described and various roles and responsibilities for group members are spelled

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out, as noted in PMBOK (Project Management Institute, 2013). It must be emphasized that the process of managing risk is not a static process. Rather, it is ongoing, with constant updating as more risks are identified, as some risks vanish, as others are mitigated—in other words as reality replaces conjecture—and new conjecture replaces old conjecture.

The various parts of the project charter, including the risk management plan, are then scrutinized by the group and combined into a composite project plan. The composite plan, still not completely firm, is approved by each participating group, by the project manager, and then by

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senior organizational management. Each subsequent approval hardens the plan somewhat, and when senior management has endorsed it, any further changes in the project's scope must be made by processing a formal *change order*. If the project is not large or complex, informal written memoranda can substitute for the change order. The main point is that no *significant* changes in the project are made, without written notice, following top management's approval. The definition of "significant" depends on the specific situation and the people involved. A useful tool for facilitating the management of changes to a project's scope is the Requirements Traceability Matrix. With this matrix, a table is created that links the source of each project requirement to the project objectives, WBS deliverables, etc. intended to satisfy it. A variety of fields (columns) can be incorporated in the Requirements Traceability Matrix depending on the intended use of the matrix. A quick search of the Web will yield a variety of templates that are application-ready for use. An example is shown in PMBOK, p. 119.



### PMBOK Guide 5.2.3.2

The PM generally takes responsibility for gathering the necessary approvals and *assuring* that any changes incorporated into the plan at higher levels are communicated to, and approved by, the units that have already signed off on the plan. Nothing is as sure to enrage functional unit managers as to find that they have been committed by someone else to alterations in their carefully considered plans without being informed. Violation of this procedure is considered a betrayal of trust. Several incidents of this kind occurred in a firm during a project to design a line of children's clothing. The anger at this *change without communication* was so great that two chief designers resigned and took jobs with a competitor.

Because senior managers are almost certain to exercise their prerogative to change the plan, the PM should always return to the contributing units for consideration and reapproval of the plan as modified. The final, approved result of this procedure is the project plan. When the planning phase of the project is completed, it is valuable to hold one additional meeting, a postplanning review. This meeting should be chaired by an experienced project manager who is not connected with the project (Antonioni, 1997). The major purpose of the postplanning review is to make sure that all necessary elements of the project plan have been properly developed and communicated.

## Outside Clients

When the project is to deliver a product/service to an outside client, the fundamental planning process described above is unchanged except for the fact that the project's scope cannot be altered without the *client's* permission. A common "planning" problem in these cases is that marketing has promised deliverables that engineering may not know how to produce on a schedule that manufacturing may be unable to meet. This sort of problem usually results when the various functional areas are not involved in the planning process at the time the original proposal is made to the potential client. We cannot overstate the importance of a carefully determined set of *deliverables*, accepted by both project team and client (Martin et al., 1998).

Two objections to such early participation by engineering and manufacturing are likely to be raised by marketing. First, the sales arm of the organization is trained to sell and is expected to be fully conversant with all technical aspects of the firm's products/services. Further, salespeople are expected to be knowledgeable about design and manufacturing lead times and schedules. On the other hand, it is widely assumed by marketing (with some justice on

occasion) that manufacturing and design engineers do not understand sales techniques, will be argumentative and/or pessimistic about client needs in the presence of the client, and are generally not “housebroken” when customers are nearby. Second, it is expensive to involve so much technical talent so early in the sales process—typically, prior to issuing a bid or proposal. It can easily cost a firm more than \$10,000 to send five technical specialists on a short trip to consider a potential client's needs, not including a charge for the time lost by the specialists. The willingness to accept higher sales costs puts even more emphasis on the selection process.

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The rejoinder to such objections is simple. It is almost always cheaper, faster, and easier to do things right the first time than to redo them. When the product/service is a complex system that must be installed in a larger, more complex system, it is appropriate to treat the sale like a project, which deserves the same kind of planning. A great many firms that consistently operate in an atmosphere typified by design and manufacturing crises have created their own panics. (Software producers and computer system salespeople take note!) In fairness, it is appropriate to urge that anyone meeting customers face to face should receive some training in the tactics of selling.

## Project Charter Elements

As noted earlier, the initial project planning task is the development of the project charter. The project charter is a high-level document that helps to define the scope of the project and is typically submitted to get project approval to move on to develop a project plan. Given a project charter, approvals really amount to a series of authorizations. The PM is authorized to direct activities, spend monies (usually within preset limits), request resources and personnel, and start the project on its way. Senior management's approval not only signals its willingness to fund and support the project, but also notifies subunits in the organization that they may commit resources to the project.

The process of developing the project charter varies from organization to organization, but should contain the following elements as described in PMBOK®:



### PMBOK Guide 4.1

- **Purpose** This is a short summary directed to top management and those unfamiliar with the project. It contains a statement of the general goals of the project and a brief explanation of their relationship to the firm's objectives (i.e., the "Business Case," where we see how profits are gained). The Business Case includes not only market opportunities and profit potentials but also the needs of the organization, any customer requests for proposals, technological advancement opportunities, and regulatory, environmental, and social considerations. A properly crafted Business case should succinctly provide the financial and strategic justification for the project.
- **Objectives** This contains a more detailed statement of the general goals of the project and their priorities, what constitutes success, and how the project will be terminated. The statement should include measurable objectives such as profit and competitive aims from the Business Case as well as technical goals based on the Statement of Work (generally abbreviated as SOW).
- **Overview** This section provides a high-level description of the project and its requirements. Both the managerial and the technical approaches to the work are also described. The technical discussion describes the relationship of the project to available technologies. For example, it might note that this project is an extension of work done by the company for an earlier project. The subsection on the managerial approach takes note of any deviation from routine procedure—for instance, the use of subcontractors for some parts of the work. Also included here is a description of the assumptions the project is based on and contingency plans if the assumptions don't prove to be correct, and the procedures for changes in the project, including scope, budget, and schedule.



- **Schedules** This section outlines the various schedules and lists all *milestone* events and/or phase-gates. Each summary (major) task is listed, with the estimated time obtained from those who will do the work. The projected baseline schedule is constructed from these inputs. The responsible person or department head should sign off on the final, agreed-on schedule.
- **Resources** There are three primary aspects to this section. The first is the budget. Both capital and expense requirements are detailed by task, which makes this a *project budget*,

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with one-time costs separated from recurring project costs. Second, is a complete list and description of all contractual items such as customer-supplied resources, liaison arrangements, project review and cancellation procedures, proprietary requirements, purchasing/procurement contracts (knowledge area 9 in PMBOK), any specific management agreements (e.g., use of subcontractors), as well as the technical deliverables and their specifications, delivery schedules, and a specific procedure for changing any of the above. Third, is the set of cost monitoring and control procedures. In addition to the usual routine elements, the monitoring and control procedures must also include any special resource requirements for the project such as special machines, test equipment, laboratory usage or construction, logistics, field facilities, and special materials. Finally, any constraints on the above should also be noted here.



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- **Stakeholders** This section lists the key stakeholders. The topic of identifying and analysing stakeholders was discussed in [Chapter 4](#). Key insights from this analysis should be included here. Besides the client, community, and other external stakeholders, the section also lists the expected personnel requirements of the project, especially the project manager and the sponsor/approver of the project. In addition, any special skill requirements, training needed, possible recruiting problems, legal or policy restrictions on work force composition, and security clearances, should be noted here. It is helpful to time-phase personnel needs to the project schedule, if possible. This makes clear when the various types of contributors are needed and in what numbers. These projections are an important element of the budget, so the personnel, schedule, and resources sections can be cross-checked with one another to ensure consistency.
- **Risk Management Plans** At a high-level, this covers potential problems as well as potential lucky breaks that could affect the project. One or more issues such as subcontractor default, unexpected technical breakthroughs, strikes, hurricanes, new markets for the technology, and sudden moves by a competitor are certain to occur—the only uncertainties are which, when, and their impact. In fact, the timing of these disasters and benefits is not random since there are definite times in every project when progress depends on subcontractors, the weather, or timely technical successes. Plans to deal with favorable or unfavorable contingencies should be developed early in the project's life. No amount of planning can definitively solve a potential crisis, but preplanning may avert or mitigate some. As Zwikael et al. (2007) report, in high-risk projects better project planning improved success on four measures: schedule overrun, cost overrun, technical performance, and customer satisfaction. They conclude that improving the project plan is a more effective risk management approach than using the usual risk management tools.
- **Evaluation Methods** Every project should be evaluated against standards and by methods established at the project's inception, allowing for both the direct and ancillary goals of the project, as described in [Chapter 1](#). This section contains a brief description of the procedures to be followed in monitoring, collecting, storing, auditing, and evaluating the project, as well as in the post-project ("lessons learned") evaluation following project termination.

These are the elements that constitute the project charter and are the basis for more detailed planning of the budgets, schedules, work plan, and general management of the project. Once this project charter is fully developed and approved, it is disseminated to all interested parties. It is also important to point out that creating the project charter is not a onetime event where it is

completed and then filed away never again to see the light of day. Rather, the project charter should be a living document that is continuously updated as conditions change.

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Once the project charter is completed and the project approved, a more detailed project plan can be developed. According to PMBOK, a proper project plan addresses the following issues:



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### 4.2.3

- The process for managing change
- A plan for communicating with and managing stakeholders
- Specifying the process for setting key characteristics of the project deliverable (technically referred to as configuration management)
- Establishing the cost baseline for the project and developing a plan to manage project costs
- Developing a plan for managing the human resources assigned to the project
- Developing a plan for continuously monitoring and improving project work processes
- Developing guidelines for procuring project materials and resources
- Defining the project's scope and establishing practices to manage the project's scope
- Developing the Work Breakdown Structure
- Developing practices to manage the quality of the project deliverables
- Defining how project requirements will be managed
- Establishing practices for managing risk
- Establishing the schedule baseline and developing a plan to manage the project's schedule

Before proceeding, we should reiterate that this formal planning process just described is required for relatively large projects that cannot be classified as "routine" for the organization. The time, effort, and cost of the planning process is not justified for routine projects such as most plant maintenance projects. Admittedly, no two routine maintenance projects are identical, but they do tend to be quite similar. It is useful to have a generic plan for such projects, but it is meant to serve as a template that can easily be modified to fit the specific routine project at hand.