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technological research objectives is common. As noted in Chapter 3, SEMATECH is a consortium of semiconductor manufacturers for the purpose of conducting joint research projects in the field. The consortium was exempted from prosecution under the U.S. anti-trust laws when the National Cooperative Research Act of 1984 was passed expressly to allow such cooperation among competitors.

There are a great many such groups of competitors engaged in cooperative research and other cooperative activities (not, one hopes, in price-setting or other illegal activities). They exist worldwide and are often multinational in their membership; for example, Airbus Industry (originally British, French, Spanish, and German) and International Aero Engines (originally USA, Japan, Germany, Italy, and UK), as mentioned in Chapter 3.

Airbus Industry is not only a consortium of private firms from four different nations, but each of the four governments subsidized their respective private firms. This venture, apparently undertaken in order to foster a European competitor to USA's Boeing Aircraft, resulted in a successful competitor in the market for commercial aircraft.

Partnering, however, is not without its problems. There can be no doubt that those who have not had much experience with partnering underrate its difficulty. Partnering requires strong support from senior management of all participants, and it requires continuous support of project objectives and partnering agreements (Moore et al., 1995). Above all, and most difficult of all, it requires open and honest communication between the partners. With all of its problems, however, partnering yields benefits great enough to be worth the efforts required to make it work correctly (Baker, 1996; Larson et al., 1997).

Chartering

The agreements between groups partnering on large endeavors are often referred to as *charters*. A project (program, etc.) charter is a detailed written agreement between the stakeholders in the project; that is, the client or sponsor, the PM, senior management, the functional managers who are committing resources and/or people to a specific project (program, etc.), and even possibly others such as community groups or environmental entities. Bear in mind, the charter may take many different forms. Typically, it gives an overview of the project and details the expected deliverables, including schedules, personnel, resource commitments, risks, and evaluation methods (see Chapter 6). It attests to the fact that all the stakeholders are "on the same page," agreeing about what is to be done, when, and at what cost. Note that if there is such an agreement, there is also an implication that none of the parties will change the agreement unilaterally, or, at least, without prior consultation with the other parties. Many projects do not have charters, which is one reason that many projects do not meet their scope, are not completed on time, and/or are not completed on budget.

In Chapter 6, we also describe an iterative process for developing the *project plan*, a detailed listing of all the work and procedures involved in executing the project. We

note that it is not uncommon for the individuals or groups who make commitments during the process of developing the project plan to sign off on their commitments.

An informal project charter appears in Cowen et al. (1992, Figure 2, p. 8), in which the various members of the partnering team sign a commitment to:

- Meet design intent
- Complete contract without need for litigation
- Finish project on schedule:
    - —Timely resolution of issues
    - —Manage joint schedule
- Keep cost growth to less than 2 percent ... etc.

Of course, to meet the underlying purpose of a charter, even these less-specific terms assume an agreement on the "design intent," the schedule, and costs.

Scope Change

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The problem of changing the scope expected of a project is a major issue in project management and constitutes part of the second PMBOK knowledge area. No matter how carefully a project is planned, it is almost certain to be changed before completion. No matter how carefully defined at the start, the scope of most projects is subject to considerable uncertainty. There are three basic causes for change in projects. Some changes result because planners erred in their initial assessment about how to achieve a given end or erred in their choice of the proper goal for the project. Technological uncertainty is the fundamental causal factor for either error. The foundation for a building must be changed because a preliminary geological study did not reveal a weakness in the structure of the ground on which the building will stand. An R & D project must be altered because metallurgical test results indicate another approach should be adopted. The project team becomes aware of a recent innovation that allows a faster, cheaper solution to the conformation of a new computer.

Other changes result because the client/user or project team learns more about the nature of the project deliverable or about the setting in which it is to be used. An increase in user or team knowledge or sophistication is the primary factor leading to change. A computer program must be extended or rewritten because the user thinks of new uses for the software. Physicians request that intensive care units in a hospital be equipped with laminar air-flow control in order to accommodate patients highly subject to infection who might otherwise not be admissible in an ICU. The fledgling audio-addict upgrades the specifications for a system to include very high frequencies so that his dog can enjoy the music, too.

A third source of change is the mandate. This is a change in the environment in which the project is being conducted. As such, it cannot be controlled by the PM. A new law is passed. A government regulatory unit articulates a new policy. A trade association sets a new standard. The parent organization of the user applies a new criterion for its purchases. In other words, the rules of conduct for the project are altered. A state-approved pollution control system must be adopted for each chemical refinery project. The state government requires all new insurance policies to conform to a revised law specifying that certain information must be given to potential purchasers. At times, mandates affect only priorities. The mandate in question might move a very important customer to the "head of the line" for some scarce resource or service.

To some extent, risk management techniques can be applied to scope change. Technological uncertainty can be mitigated by careful analysis of the technologies