Planning is the most important project management activity. It has two basic objectives—establish reasonable cost, schedule, and quality goals for the project, and to draw out a plan to deliver the project goals. A project succeeds if it meets its cost, schedule, and quality goals. Without the project goals being defined, it is not possible to even declare if a project has succeeded. And without detailed planning, no real monitoring or controlling of the project is possible. Often projects are rushed toward implementation with not enough effort spent on planning. No amount of technical effort later can compensate for lack of careful planning. Lack of proper planning is a sure ticket to failure for a large software project. For this reason, we treat project planning as an independent chapter. Note that we also cover the monitoring phase of the project management process as part of planning, as how the project is to be monitored is also a part of the planning phase.

The inputs to the planning activity are the requirements specification and maybe the architecture description. A very detailed requirements document is not essential for planning, but for a good plan all the important requirements must be known, and it is highly desirable that key architecture decisions have been taken.

There are generally two main outputs of the planning activity: the overall project management plan document that establishes the project goals on the cost, schedule, and quality fronts, and defines the plans for managing risk, monitoring the project, etc.; and the detailed plan, often referred to as the detailed project schedule, specifying the tasks that need to be performed to meet the goals, the resources who will perform them, and their schedule. The
overall plan guides the development of the detailed plan, which then becomes the main guiding document during project execution for project monitoring.

In this chapter, we will discuss

- How to estimate effort and schedule for the project to establish project goals and milestones and determine the team size needed for executing the project.
- How to establish quality goals for the project and prepare a quality plan.
- How to identify high-priority risks that can threaten the success of the project, and plan for their mitigation.
- How to plan for monitoring a project using measurements to check if a project is progressing as per the plan.
- How to develop a detailed task schedule from the overall estimates and other planning tasks done such that, if followed, the overall goals of the project will be met.

### 4.1 Effort Estimation

For a software development project, overall effort and schedule estimates are essential prerequisites for planning the project. These estimates are needed before development is initiated, as they establish the cost and schedule goals of the project. Without these, even simple questions like “is the project late?” “are there cost overruns?” and “when is the project likely to complete?” cannot be answered. A more practical use of these estimates is in bidding for software projects, where cost and schedule estimates must be given to a potential client for the development contract. (As the bulk of the cost of software development is due to the human effort, cost can easily be determined from effort by using a suitable person-month cost value.) Effort and schedule estimates are also required for determining the staffing level for a project during different phases, for the detailed plan, and for project monitoring.

The accuracy with which effort can be estimated clearly depends on the level of information available about the project. The more detailed the information, the more accurate the estimation can be. Of course, even with all the information available, the accuracy of the estimates will depend on the effectiveness and accuracy of the estimation procedures or models employed and the process. If from the requirements specifications, the estimation approach can produce estimates that are within 20% of the actual effort about two-thirds of the time, then the approach can be considered good. Here we discuss two commonly used approaches.