Project Management Planning

Development of a Project Schedule

Initial Release	**1.0**
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Overview of Project Scheduling

Following the definition of project activities, the activities are associated with time to create a project schedule. The project schedule provides a graphical representation of predicted tasks, milestones, dependencies, resource requirements, task duration, and deadlines. The project's master schedule interrelates all tasks on a common time scale. The project schedule should be detailed enough to show each WBS task to be performed, the name of the person responsible for completing the task, the start and end date of each task, and the expected duration of the task.

Like the development of each of the project plan components, developing a schedule is an iterative process. Milestones may suggest additional tasks, tasks may require additional resources, and task completion may be measured by additional milestones. For large, complex projects, detailed sub-schedules may be required to show an adequate level of detail for each task.

During the life of the project, actual progress is frequently compared with the original schedule. This allows for evaluation of development activities. The accuracy of the planning process can also be assessed.

Basic efforts associated with developing a project schedule include the following:

- **Define the type of schedule**
- **Define precise and measurable milestones**
- **Estimate task duration**
- **Define priorities**
- **Define the critical path**
- **Document assumptions**
- **Identify risks**
- **Review results**

Define the Type of Schedule

The type of schedule associated with a project relates to the complexity of the implementation. For large, complex projects with a multitude of interrelated tasks, a PERT chart (or activity network) may be used. PERT charts depict interdependencies and associations and allow planning to include these relationships. A key feature of the PERT method is the ability both to determine and to show the critical path of the project (see below for a discussion of critical path). A sample PERT chart is shown below.

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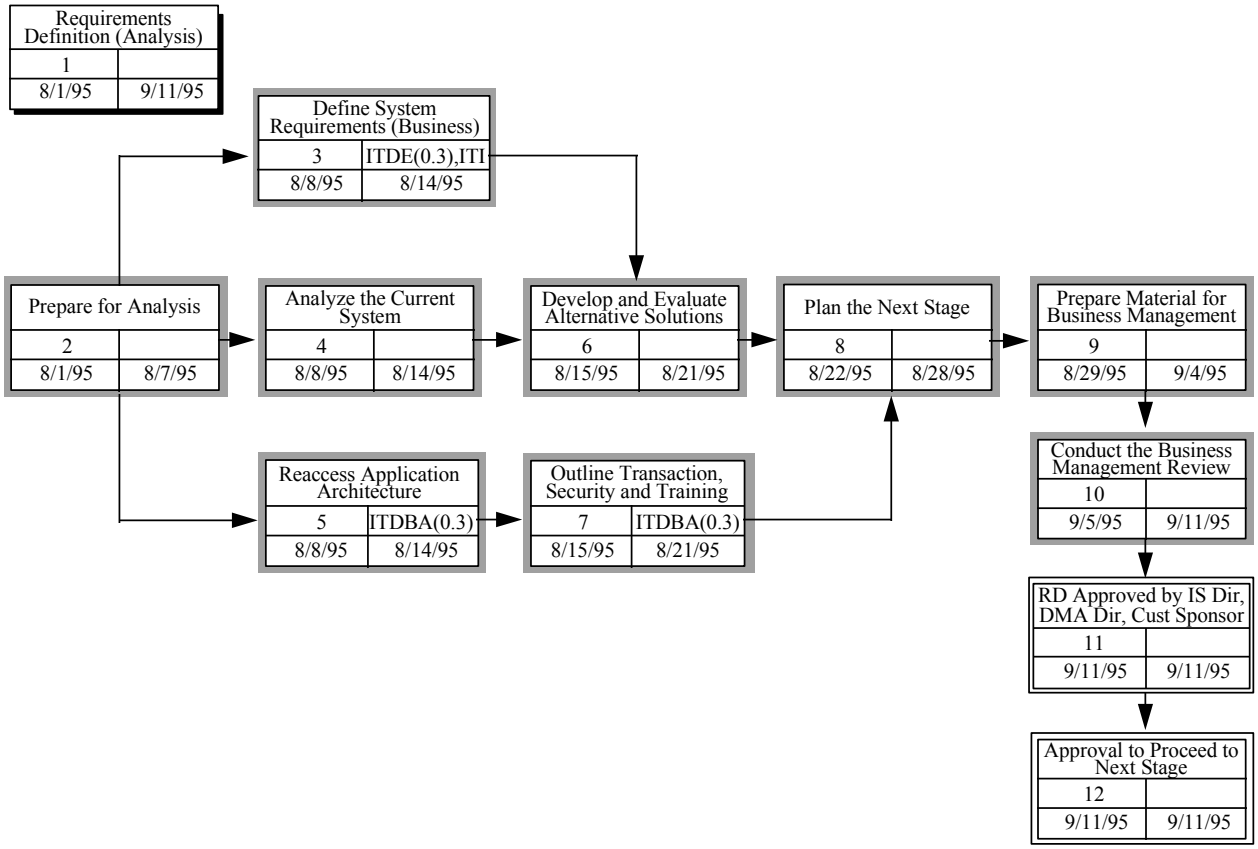
Sample PERT Chart



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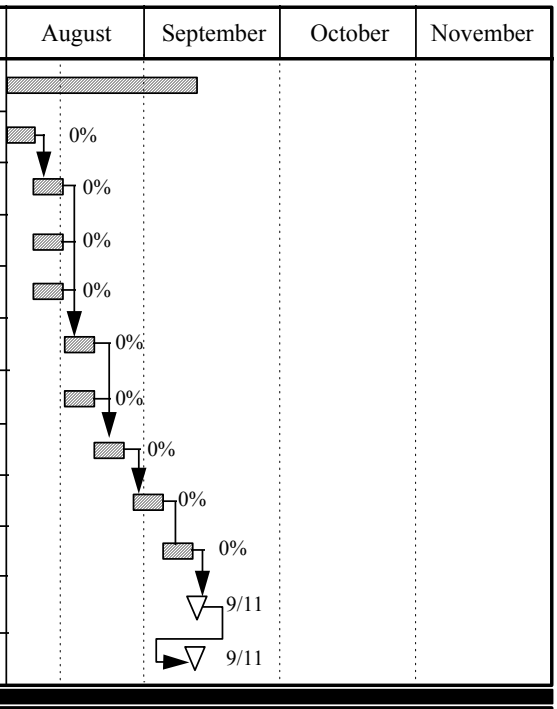
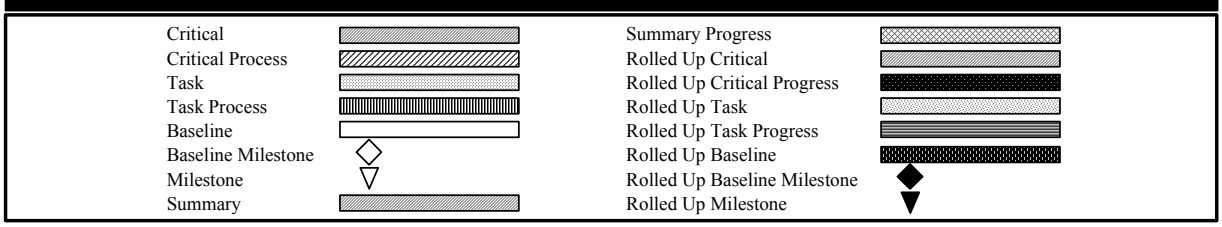
For small projects, a GANTT chart (or bar graph) is adequate. These schedules are two-dimensional representations that show the tasks and the timeframe for completion. Since task interrelationships are not easily shown on a GANTT chart, it is considered a weak planning tool for complex information technology projects. However, the GANTT chart is common in reporting status and in defining the schedule for small, simple projects with few interrelationships. A sample GANTT follows.

Sample GANTT Chart

ID	Task Name	Project	Stage
1	REQUIREMENTS DEFINITION (Analysis Stage)		RD
2	Prepare for Analysis		RD
3	Define System Requirements (Business Mode)		RD
4	Analyze the Current System		RD
5	Reassess Application Architecture Requirements		RD
6	Develop and Evaluate Alternative Solutions		RD
7	Outline Transition, Security, and Training Plan		RD
8	Plan the Next Stage		RD
9	Prepare Material for Business Management Review		RD
10	Conduct the Business Management Review		RD
11	RD Approved by IS Dir, DMA Dir, Cust Sponsor, and Process Team		RD
12	Approval to Proceed to Next Stage		RD





Define Precise and Measurable Milestones

The completion of key actions is important in all projects. These completions are denoted by milestones. These events have no duration. For example, deliverables often are represented as milestones, while the effort to produce the deliverable is referred to as a task.

While milestones are unique to each project, some example project milestones are shown below:

- **Requirements Approval**
- **Phase Review Approval**
- **Prototype Approval**
- **Design Reviews Complete**
- **Code Reviews Complete**
- **Unit Test Complete**
- **Integration Test Complete**
- **Acceptance Test Complete**
- **System Acceptance by User**
- **Customer Shipment**
- **Documentation Delivery**

Milestones can occur at the end of each work package in the WBS and serve as a measurable item upon which to base success of a task. Major project milestones should be summarized and included in the summary project plan.

For contracted work, milestones are often used as a point in the project where interim payments might be made. If this approach is used, mutual agreement is necessary on the content of each milestone and the cost associated with that milestone.

Estimate Task Duration

Estimating task duration is one of the most challenging aspects of project planning. It is also a key to later cost estimation. This is a refined process that occurs throughout the planning process, as it is directly affected by results of the staffing and costing activities.

Accurate task duration estimates are defined in order to stabilize customer relations and maintain team morale. With defined task durations, the team knows what to expect and what is expected of them. A task duration is rarely overestimated, but is frequently underestimated. Inaccurate estimates can result in an increase in the "frenzy level" of a project. The frenzy escalates as sponsors scramble for more money, and/or the technical staff scramble to

complete a project in an unrealistic timeframe. Often, the end result is cutting corners, excessive overtime, and a dissatisfied customer.

The estimation process is complex because activity duration is affected by numerous variables that must be dealt with concurrently in the planning phase. Some of these variables include staff availability, the skill level of the person assigned to the task, unexpected events, efficiency of work time, and mistakes and misunderstandings during the development of the project.

When estimating the duration of a task, reality is a major factor. The knowledgeable scheduler takes into account absenteeism, meetings, discussions, and interaction among the staff. No one is 100% productive every hour of the workday. If a scheduled task assumes 100% productivity, the schedule rapidly falls apart. A successful schedule builds these types of factors into the duration estimate.

There are several techniques that support task duration estimation. The most common technique is based on the historical experience of a similar scope of work performed by the estimator. Collected and archived historical project data are used successfully by many organizations to achieve quality performance on project deliveries.

Historical records greatly support both the duration and the cost estimations that are so important in this phase. Data based on staff skills are far more valuable than generalized "industry" estimates. If historical data does not exist, seek the advice of experts and others who have completed similar tasks.

When historical data or experts are not available, use a technique of getting estimates from multiple sources, comparing results and estimating the duration based on the multiple inputs. The nature of this method is predicated on finding good sources for providing the estimates.

Define Priorities

Clearly defining the task priorities helps to resolve any scheduling and/or resource conflicts. Understanding the priorities and relationships of the tasks assists in resolving difficult scheduling conflicts.

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Define the Critical Path

The critical path is the longest path through a project. It determines the earliest possible completion of the work. The critical path is carefully managed because if critical path tasks slip, the entire project is delayed. In order to manage the project, the project manager determines the critical path and remains aware of its importance throughout the implementation of the plan.

The successful scheduler considers availability of both labor and non-labor resources. Equipment availability on a long lead item often drives the critical path of a schedule. If installation equipment is required, for example, and the equipment cannot be delivered for six months, the installation phase is held up for that period of time.

Document Assumption

Documentation of the assumptions made in developing the project schedule are critical to the later success of the project. Without clear documentation of these assumptions, later changes to the schedule are very difficult and risky.

If, for example, a schedule was shortened because it was assumed that a highly skilled person would be performing the work, that assumption should be documented. Then, if a less skilled person is actually assigned to perform the task, the project manager can recognize the risk and make necessary changes and decisions. Without documentation of the assumption, the schedule could be later placed in serious risk without the project manager realizing it.

Identify Risks

Risks are inherently involved with scheduling limited resources. Good scheduling makes allowances for risks in one or more of the following ways:

- Where significant schedule risks are identified, add an additional WBS task for risk management/risk reduction, where financial reserves can be set aside to deal with potentially delayed schedules.
- Add additional time to those tasks where risks are inherent. There is no rule of thumb for this multiplier; it depends on the degree of risk and overall importance of the schedule to the project.
- Add a percentage time multiplier to the schedule for particular individuals, particularly if new technology is being used or if the person providing the estimate is extremely optimistic. Technical staff often underestimate the time required to do any particular task.

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Review the Results

The development of a schedule requires input from more than one person. No one possesses all the knowledge or understanding of all the factors that affect schedules in every aspect of a project. Schedule review also prompts buy-in to the schedule. Buy-in on the schedule by the people who will actually perform the work is critical to success. Participation in scheduling gives staff a stake in the outcome of the project. On the other hand, imposed schedules offer the opportunity for sabotage.

Once an initial cut at the schedule is ready, a team should perform a review. The work descriptions and the schedule should be reviewed by the people named to do the work (and who did not participate in the initial estimates). Interview the people and determine if the work descriptions are complete and accurate.

Determine if there is a common understanding of what has to be done. Get their independent estimates as to how long it will take to do the job. Where there are significant differences between the current schedule and new estimates, determine the reasons and either redefine the work packages or review and iterate the schedule estimates.

Scheduling Tools

There are numerous tools that support the development of project schedules. Many of these tools prepare either a GANTT or PERT chart. They require experience in setting up the projects and in defining task relationships and dependencies.

Each state organization should select tools that best meet their needs. A list of tools that support schedule development for a wide variety of platforms and with a highly varying degree of functionality is included in this documentation.

References:

The project schedule is included as an item in the Project Management template. Since output from many scheduling programs does not effectively integrate into word processing documents, it is assumed that the schedule will be created separately from the word processing template. The template should include a reference to the most current, baselined electronic version of the schedule.