4.2 Critical Path Method

The Critical Path Method (CPM) is now the primary scheduling technique used by most computerized project management packages. The CPM focuses on two important aspects:
- highlighting the inter-relationships and dependencies between individual tasks, and
- identifying tasks or activities that are critical to completing the project on time.

The five basic steps involved in setting up a CPM-driven work plan are
1. developing the task outline, component parts, and work breakdown and structure;
2. adding task durations;
3. establishing the relationships between tasks;
4. completing the network diagram and CPM schedule (using the selected software program); and
5. determining the critical path.

The following table describes the steps in the CPM.

Step 1	**Task Outline**. The outline forms the foundation of the work plan and must reflect accurately the scope of work in the project. All tasks must be clearly identified, with well-defined work assignments and project deliverables or outcomes. The component parts should be specific, measurable, achievable, realistic, and time-defined ("SMART") units. The project manager needs these details so that slippages can be predicted and prompt remedial action taken. If the steps necessary to complete an activity are not scheduled separately, delays may be discovered when it is too late for remedial action to be taken or when remedial measures would be costly or no longer effective.
Step 2	**Task Durations**. The duration of each task should be estimated, based on a review of the scope of work within the task and the resources available to implement it. The durations can be stated in working days, calendar days, weeks, or months. The start date of the project should be added to the first task. Normally the program will calculate the start and finish dates based on the durations; however, any specific dates that could constrain key activities should also be defined (e.g., "task F456 cannot start before 01 April because of availability of funds").
Step 3	**Task Relationships**. The task interface diagram (or network precedence diagram) graphically identifies the relationships between tasks using any one of four specific relationships: • **Finish-start**: Task A must be completed before task B can begin (this is the most common link). • **Finish-finish**: Task B must be completed before task C can be completed. • **Start-finish**: Task B must be started before task D can be completed. • **Start-start**: Task D must be started before task C can be started. The relationships may include a lag period - the time that must elapse before the dependent task can commence.
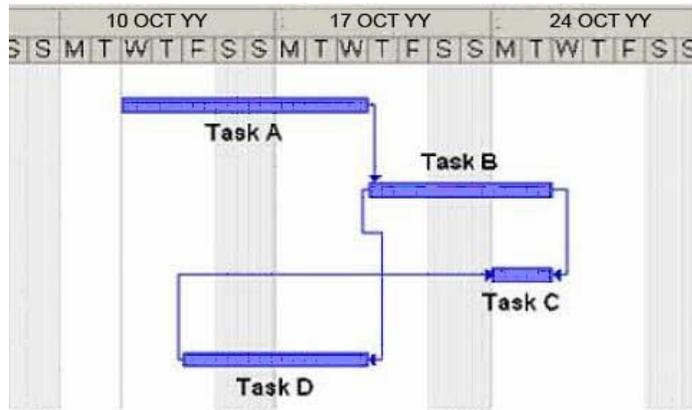
Step 4	**Network Diagram**: The software program will then display all the tasks in a single network diagram once all the task relationships and durations have been defined. This task interface diagram (or network precedence diagram) will show graphically the sequence of tasks and their dependency on all other tasks, as shown in the following example.
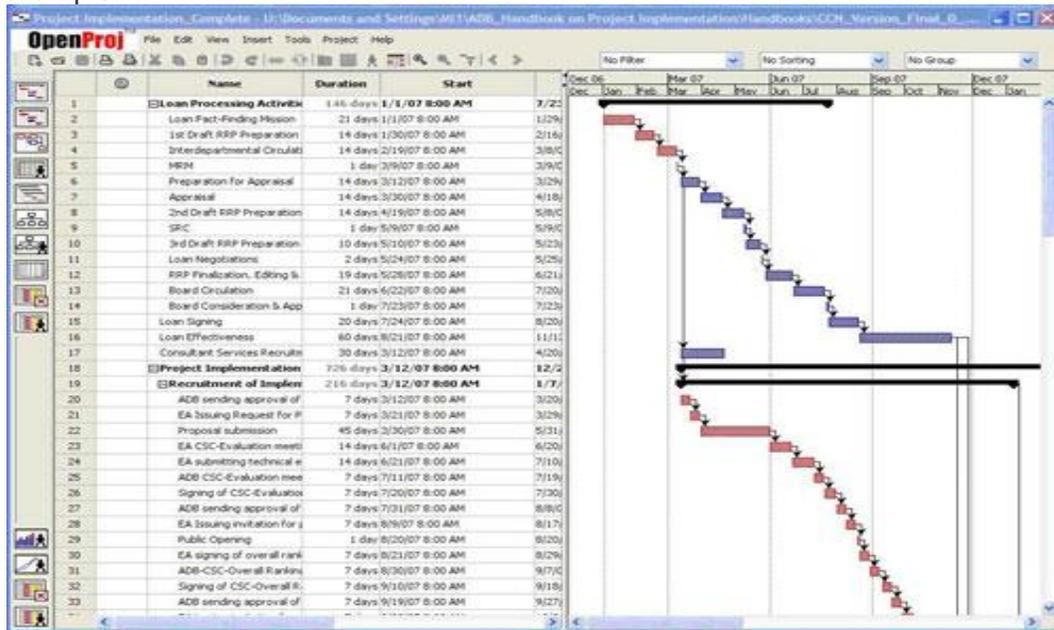
Step 5	**Critical Path**. When the network diagram has been checked and validated as practical and feasible, then the critical tasks can be identified. The critical path is the sequence or path through the critical tasks that allows the project to be completed within the shortest possible time. Any delay (or advance) in time will directly impact the completion date. Tasks not on the critical path will have "float time"—the amount of time that a noncritical task can slip before it becomes critical and subsequently impacts the overall project completion

On complex projects with many tasks, the critical path can be identified from the tabular reports. Standard CPM terms used in the tabulated results include the following:

- **Duration**: Length of time required to complete an activity.
- **Early start**: Earliest date that a task can commence.
- **Early finish**: Earliest date that a task can be completed (this equals the early start date plus the duration).
- **Free float**: Length of time that a task can be delayed without affecting the start or finish of other tasks.
- **Late start**: Latest date that a task can commence without impacting the overall project completion date (this equals the early start date plus the free float).
- **Late finish**: Latest date that a task can be completed without impacting the overall project completion date (this equals the late start date plus the duration; it also equals the early finish plus the free float).
- **Total float**: Length of time that a task can be delayed without affecting the overall project completion date.

The date of the loan agreement is the reference date from which all activity periods in the project work plan are normally based. Finalization of the implementation schedule can begin after ADB has approved the project, but at the latest when the loan agreement is signed.

The best project work plans have the following attributes:
- **Flexible**: Changes in tasks, scope, durations, etc., are a fact of project life; a flexible work plan should readily accommodate such changes.
- **Understandable**: The work plan must be easily comprehensible to the project team.
- **Clear**: The relationships between tasks must be clear and not overly complex; adopt the "kiss" concept ("keep it short and simple").
- **Practical**: The work plan must be practical and realistic in terms of available resources and methodology.

The work plan should allow for slippage. Tasks may slip for a variety of reasons (such as missed deadlines, human error, quality issues, equipment failure, weather, and staff issues), often beyond the project manager's control. A good work plan includes allowance for slippage time.

The work plan should allow for review, checking, and approval stages at regular milestone intervals.

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*Problems can be remedied
more easily if they are
anticipated.*

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