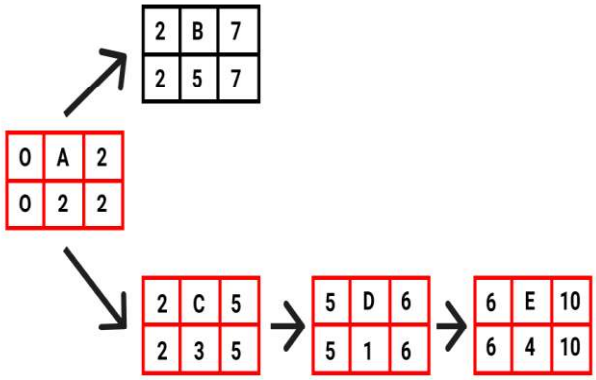
Just look for the longest string of project activities where the early finish and late finish dates (the two right squares of the grid) are the same.



Now you know that, if you hit a snag or delay along that critical path, it'll extend your entire project's duration.

This is a very simple example, and your values might not be the same across the board. But hopefully it illustrates how these calculations can help you understand where you have wiggle room in your project timeline and where you need to stick to the schedule.

Identifying Critical Path:

Introduction

If you have been into project management, I'm sure you have already heard the term 'critical path method.'

If you are new to the subject, it is best to start with understanding the 'critical path' and then move on to the 'critical path method.'

Critical path is the sequential activities from start to the end of a project. Although many projects have only one critical path, some projects may have more than one critical paths depending on the flow logic used in the project.

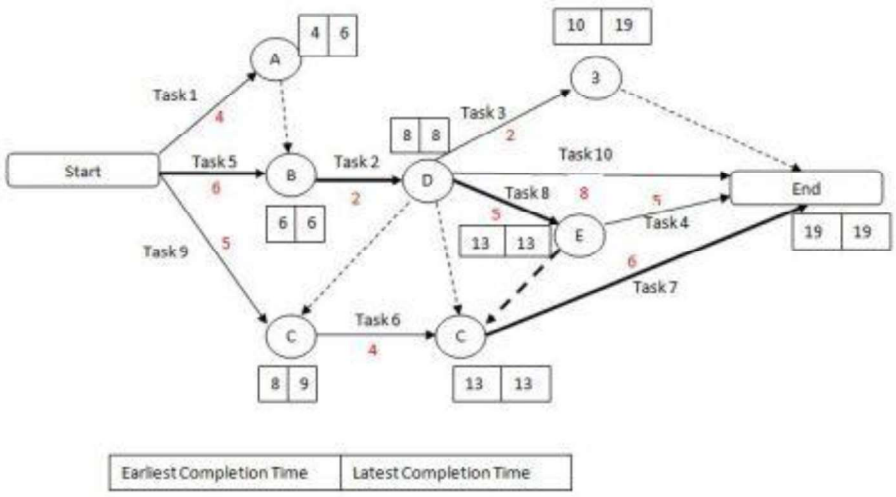
If there is a delay in any of the activities under the critical path, there will be a delay of the project deliverables.

Most of the times, if such delay is occurred, project acceleration or re-sequencing is done in order to achieve the deadlines.

Critical path method is based on mathematical calculations and it is used for scheduling project activities. This method was first introduced in 1950s as a joint venture between Remington Rand Corporation and DuPont Corporation.

The initial critical path method was used for managing plant maintenance projects. Although the original method was developed for construction work, this method can be used for any project where there are interdependent activities.

In the critical path method, the critical activities of a program or a project are identified. These are the activities that have a direct impact on the completion date of the project.



Key Steps in Critical Path Method

Let's have a look at how critical path method is used in practice. The process of using critical path method in project planning phase has six steps.

Step 1: Activity specification

You can use the Work Breakdown Structure (WBS) to identify the activities involved in the project. This is the main input for the critical path method.

In activity specification, only the higher-level activities are selected for critical path method.

When detailed activities are used, the critical path method may become too complex to manage and maintain.

Step 2: Activity sequence establishment

In this step, the correct activity sequence is established. For that, you need to ask three questions for each task of your list.

- Which tasks should take place before this task happens.
- Which tasks should be completed at the same time as this task.
- Which tasks should happen immediately after this task.

Step 3: Network diagram

Once the activity sequence is correctly identified, the network diagram can be drawn (refer to the sample diagram above).

Although the early diagrams were drawn on paper, there are a number of computer softwares, such as Primavera, for this purpose nowadays.

Step 4: Estimates for each activity

This could be a direct input from the WBS based estimation sheet. Most of the companies use 3-point estimation method or COCOMO based (function points based) estimation methods for tasks estimation.

You can use such estimation information for this step of the process.

Step 5: Identification of the critical path

For this, you need to determine four parameters of each activity of the network.

- Earliest start time (ES) - The earliest time an activity can start once the previous dependent activities are over.
- Earliest finish time (EF) - ES + activity duration.
- Latest finish time (LF) - The latest time an activity can finish without delaying the project.
- Latest start time (LS) - LF - activity duration.

The float time for an activity is the time between the earliest (ES) and the latest (LS) start time or between the earliest (EF) and latest (LF) finish times.

During the float time, an activity can be delayed without delaying the project finish date.

The critical path is the longest path of the network diagram. The activities in the critical path have an effect on the deadline of the project. If an activity of this path is delayed, the project will be delayed.

In case if the project management needs to accelerate the project, the times for critical path activities should be reduced.

Step 6: Critical path diagram to show project progresses

Critical path diagram is a live artefact. Therefore, this diagram should be updated with actual values once the task is completed.

This gives more realistic figure for the deadline and the project management can know whether they are on track regarding the deliverables.

Advantages of Critical Path Method

Following are advantages of critical path methods:

- Offers a visual representation of the project activities.
- Presents the time to complete the tasks and the overall project.
- Tracking of critical activities.

Conclusion

Critical path identification is required for any project-planning phase. This gives the project management the correct completion date of the overall project and the flexibility to float activities.

A critical path diagram should be constantly updated with actual information when the project progresses in order to refine the activity length/project duration predictions.

Activity Throat:

Software Project Management consists of many activities, that includes planning of the project, deciding the scope of product, estimation of cost in different terms, scheduling of tasks, etc.

The list of activities are as follows:

1. Project planning and Tracking
2. Project Resource Management
3. Scope Management
4. Estimation Management
5. Project Risk Management
6. Scheduling Management
7. Project Communication Management
8. Configuration Management

Now we will discuss all these activities -

1. Project Planning: It is a set of multiple processes, or we can say that it a task that performed before the construction of the product starts.

2. Scope Management: It describes the scope of the project. Scope management is important because it clearly defines what would do and what would not. Scope Management create the project to contain restricted and quantitative tasks, which may merely be documented and successively avoids price and time overrun.

3. Estimation management: This is not only about cost estimation because whenever we start to develop software, but we also figure out their size(line of code), efforts, time as well as cost.

If we talk about the size, then Line of code depends upon user or software requirement.

If we talk about effort, we should know about the size of the software, because based on the size we can quickly estimate how big team required to produce the software.

If we talk about time, when size and efforts are estimated, the time required to develop the software can easily determine.

And if we talk about cost, it includes all the elements such as:

- Size of software
- Quality
- Hardware
- Communication

- Training
- Additional Software and tools
- Skilled manpower

4. Scheduling Management: Scheduling Management in software refers to all the activities to complete in the specified order and within time slotted to each activity. Project managers define multiple tasks and arrange them keeping various factors in mind.

For scheduling, it is compulsory -

- Find out multiple tasks and correlate them.
- Divide time into units.
- Assign the respective number of work-units for every job.
- Calculate the total time from start to finish.
- Break down the project into modules.

5. Project Resource Management: In software Development, all the elements are referred to as resources for the project. It can be a human resource, productive tools, and libraries.

Resource management includes:

- Create a project team and assign responsibilities to every team member
- Developing a resource plan is derived from the project plan.
- Adjustment of resources.

6. Project Risk Management: Risk management consists of all the activities like identification, analyzing and preparing the plan for predictable and unpredictable risk in the project.

Several points show the risks in the project:

- The Experienced team leaves the project, and the new team joins it.
- Changes in requirement.
- Change in technologies and the environment.
- Market competition.

7. Project Communication Management: Communication is an essential factor in the success of the project. It is a bridge between client, organization, team members and as well as other stakeholders of the project such as hardware suppliers.

From the planning to closure, communication plays a vital role. In all the phases, communication must be clear and understood. Miscommunication can create a big blunder in the project.

8. Project Configuration Management: Configuration management is about to control the changes in software like requirements, design, and development of the product.

The Primary goal is to increase productivity with fewer errors.

Some reasons show the need for configuration management:

- Several people work on software that is continually update.
- Help to build coordination among suppliers.
- Changes in requirement, budget, schedule need to accommodate.
- Software should run on multiple systems.

Tasks perform in Configuration management:

- Identification
- Baseline
- Change Control
- Configuration Status Accounting
- Configuration Audits and Reviews

People involved in Configuration Management:

Shortening Project:

If we wish to shorten the overall duration of a project we would normally consider attempting to rcducc activity durations. In many cases this can he done by applying more resources to the task - working overtime or procuring additional staff, for example. The critical path indicates where we must look to save time -if we are trying to bring forward the end date of the project, there is clearly no point in attempting to shorten non-critical activities. Referring to Figure 6.20 it can be seen that w e could complete the project in week 12 by reducing the duration of activity F by one week (to 9 weeks).

Referring to Figure 6.20. suppose that the duration for activity F is shortened to 8 Exercise 6.5 weeks. Calculate the end date for the project.

What would the end date for the project be if activity F were shortened to 7 weeks? Why?

As we reduce activity times along the critical path we must continually check for any new critical path emerging and redirect our attention where necessary.

There will come a point when we can no longer safely, or cost-effectively, reduce critical activity durations in an attempt to bring forward the project end date. Further sav ings, if needed, must be sought in a consideration of our work methods and by questioning the logical sequencing of activities. Generally, time savings are to be found by increasing the amount of parallelism in the network and the removal of bottlenecks (subject always, of course, to resource and quality constraints).

Precedence Networks:

Precedence Diagram Method (PDM) is a visual representation technique that depicts the activities involved in a project. It is a method of constructing a project schedule network diagram that uses boxes/nodes to represent activities and connects them with arrows that show the dependencies.

Purpose of Precedence Diagram Method (PDM)

The Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM) techniques are essentially limited to “finish-start” relationships (i.e., activity B cannot start until activity A is completed). PDM was developed subsequent to the PERT/CPM techniques and its function is to permit a more accurate depiction of relationships among various activities.

How is the Precedence Diagram Method (PDM) Depicted

The Precedence Diagram is depicted by a chart with nodes and their relationships. An arrow connects two nodes to represent an active relationship. It's also called a nodal diagram or network diagram.
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Precedence Diagram Method (PDM)

Precedence Diagram Method (PDM) Benefits

There are a lot of benefits that can be obtained by using the PDM. These are:

- Highlights relationships and dependencies among activities to ensure planning efficiency.
- Identifies possible missing activities.
- Helps identify critical activities to ensure better planning.
- Helps develop the overall project schedule.
- Good communication tool for project team members.

The Four Precedence Diagram Methods (PDM)

The PDM has four ways of developing the diagram. These methods are:
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- Finish-Start: In this dependency, an activity cannot start before a previous activity has ended. This is the most commonly used dependency.
- Start-Start: In this dependency, there is a defined relationship between the start of activities.
- Finish-Finish: In this dependency, there is a defined relationship between the end dates of activities.
- Start-Finish: In this dependency, there is a defined relationship between the start of one activity and the end date of a successor activity. This dependency is rarely used.

Precedence Diagram Method Dependencies

Steps to Developing a Precedence Diagram

- Step 1: Break your Work Breakdown Structure (WBS) into activity levels.
- Step 2: List all activities and their sequences in a table.
- Step 3: Add relationships and dependencies to each activity in the table.
- Step 4: Draw the diagram.

Precedence Diagram Method (PDM) Dependency Levels

- Mandatory Dependency: known as hard logic is an integral part of the work. Example: Activity A must be completed before activity B can start.
- Discretionary Dependency: preferential or soft logic. Example: Dependency is controlled by the project team and can be changed.
- External Dependency: Comes from outside of the project. Example: Laws and Regulations or waiting for government funding to begin the project.
- Internal Dependency: involves a precedence relationship between project activities. Example: Can't start until the previous internal project is completed.

How a Precedence Diagram Method (PDM) Helps Program Managers

Network scheduling techniques provide Program Managers with a powerful tool for scheduling and controlling their programs/projects. In general, they permit the graphic portrayal of project activities and relationships among the activities. This provides the basis for determining the project's critical path, predicting shortages, and identifying possible reallocation of resources to solve problems.

Through the use of readily available software, network schedules are fairly easy to update and rework, thus providing managers with current program/project status information and control over activities and schedules. [1]