

Paper E2

Enterprise Management

Critical path analysis is one of the most important techniques for shortening projects and preventing cost overruns at the outset – which is when they are most often caused

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My first Study notes article on managing projects (November 2010) described some of the main reasons why they go over budget. To recap, the key causes typically concern scope, timing, complexity, dependencies, quality, planning, systems, resources, organisational culture and environmental factors.

Cost overruns, which can in exceptional circumstances lead companies into significant financial difficulty and even failure, are usually caused at the start of a project. Some people may be surprised to learn this, because overruns are not necessarily evident in the early stages. While unplanned changes that increase costs can happen at any point, and although any changes should be subject to tight control, getting it right first time at the outset should limit the project's exposure to cost escalation later. "Proper planning and preparation prevents poor performance," a quote attributed to the Duke of Wellington at the battle of Waterloo, is well worth remembering here. Critical path analysis (CPA) is one of a number of

PROJECT COST REDUCTION TIPS

- Where possible, negotiate a reduction in the project's scope that won't have an impact on the benefits it will deliver.
- Focus on the activities on the critical path in order to reduce the time they take.
- "Managing by due dates" does not encourage people to finish tasks ahead of schedule, so try to avoid this approach.
- Alert the team to problems – and act on them – immediately.
- For IT systems projects, use joint workshops and cross-functional teams of users and developers to produce iterative solutions.
- Use project and resource management software that offers resource-availability and task-completion alerts; escalation filters and root-cause analysis; and exception reporting on tasks that aren't proceeding as planned.
- Continually consider alternative ways to meet deadlines.
- Enforce tight discipline and adherence to agreed approaches to change and risk management.
- Engender an open and honest "no surprises" culture.

'Reducing the duration of a project doesn't necessarily always make it less costly'

techniques that project managers can use to help achieve this.

CPA is a most effective method of identifying and organising those processes that will affect the total duration of the project. By focusing effort on critical tasks, managers can reduce the total time and cost of the project. Note that reducing the duration of a project doesn't necessarily always make it less costly – for example, using more resources may reduce lead times, but clearly it may increase costs.

CPA does the following things:

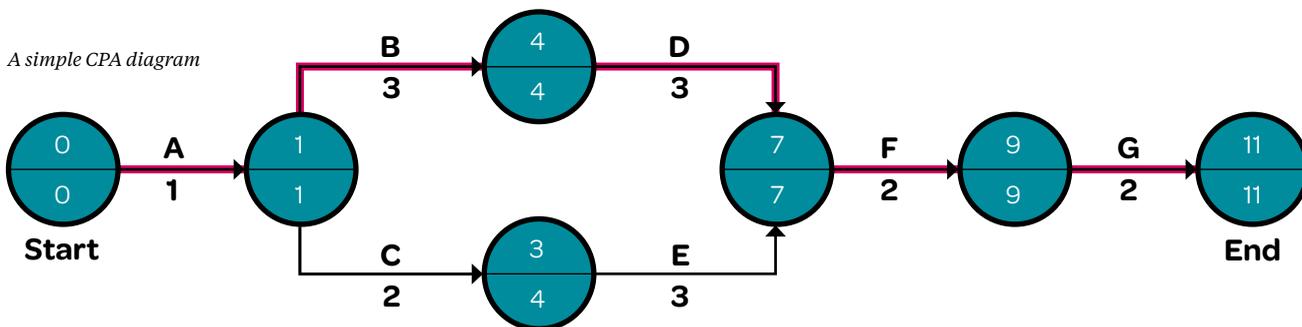
- Lists every activity in the project.
- States the sequence in which these activities should be undertaken.
- Highlights dependencies – ie, instances where certain activities can occur only once others have been completed.

'If there is any delay in completing any of the tasks on the critical path, the whole project will be held up'

- Shows which activities can be performed in parallel, thereby reducing the overall time taken to complete the project.
- Specifies when certain resources will be needed.

In order to construct a CPA it is necessary to estimate the time that each task will take from start to finish. Once you've done this, it's possible to see the critical path – the route through the project where there is no spare time (sometimes called float or slack) in any of the activities. If there is a delay in completing any of the tasks on the critical path, the whole project will be held up. The total time along this critical path is also the longest duration in which the whole project will be completed.

A simple example of a CPA is shown in the diagram at the top of the opposite page, where the letters represent tasks and the numbers beneath



them represent their duration. The tasks' earliest start times and latest completion times are shown in the top and bottom respectively of the circles. The critical path is shown in red, where the earliest start times and latest completion times are the same. Any increase in the time taken to complete any critical task will increase the overall duration of this project because there is no slack, whereas either of the tasks not on the critical path – C or E in this case – could take one unit of time longer to complete without holding up the project.

Businesses typically use software such as Microsoft Project to help them conduct CPA. The screen-grab shown below is an example of a Microsoft Project plan with a Gantt chart. This chart shows the tasks and their internal dependencies displayed in horizontal timelines. The activities on the critical path are highlighted in red. They are sequential and dependent on each other. The analysis suggests that the project is at risk of delay during its closing stages.

The activities on the critical path therefore offer the most potential for shortening the project's duration. Alternative methods of delivering the same outcome should be examined for each activity, including ways of reducing tasks; of improving processes and lead times; and of reallocating skills and resources to achieve results more efficiently. The CPA can also show the likely impact on the whole project if no action is taken to address any delay in one critical activity.

If there is slack elsewhere in the project, it may be possible to switch resources from those activities to help shorten the time being consumed by a critical and/or delayed task.

CPA is recognised as a useful technique for assessing the following:

- Which activities need to be performed.

'If there is slack elsewhere in the project, it may be possible to switch resources from those activities to help shorten the time being consumed by a critical task'

- The sequence of activities and their scheduling.
- Task priorities.
- Resourcing requirements.
- Where activities can be performed in parallel.
- The shortest time to complete the project.
- The most efficient methods of shortening the project's duration.

An effective CPA can make the difference between success and failure in complex projects and can be especially useful for assessing the importance of problems faced during the implementation stage. It can also help to reduce a project's duration and cost by focusing people's attention on the most important tasks.

Although there are also other complementary tools and techniques for reducing project costs, such as benchmarking and option appraisal, we should not forget that projects are managed and delivered by people, so stakeholder analysis, strong governance and effective communication are just as important as CPA.

A typical Gantt chart generated using Microsoft Project

