Critical Path in Project Management

Every project is a set of activities that must happen in the right order. Some activities can run at the same time, while others must wait. The Critical Path Method, or CPM, shows which activities really decide the end date. It was developed in the late 1950s by Morgan Walker of DuPont and James Kelley of Remington Rand. Today, it is used for building projects, office moves, events and much more.

1. List the Activities

The first step is to break the project into clear activities. For each one, we estimate its duration in days. Then we ask a key question: what must be finished before this activity can start? These links are called dependencies. Activities, durations and dependencies form the foundation of the method.

Example: when we cook dinner, the rice and the sauce cook at the same time, but the meal is served only when both are ready.

At work: Rami, an office manager, is moving his company to a new office. First, the layout takes five days; then the furniture takes ten days and the IT network five days; finally, the move takes five days.

2. Find the Critical Path

Next, we draw the activities as a simple network of boxes and arrows. Each route from start to finish is a path, and we add up the durations along it. The longest path is the critical path. Its length is the shortest possible project duration, because its activities happen one after the other. These are called critical activities.

Example: a family leaves for a trip only when the last person is ready.

At work: Rami finds two paths. Layout, furniture and move take twenty days, while layout, network and move take fifteen days. So the whole project needs at least twenty days.

3. Float, or Slack

Activities outside the critical path have some spare time, called float or slack. Float is how long an activity can be delayed without delaying the project. Critical activities have zero float. Knowing the float gives flexibility in planning people and resources. But float can be used up, and then an activity can become critical too.

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Example: a cake needs one hour in the oven, and the cream only twenty minutes, so the cream can start later without delaying dessert.

At work: the IT network has five days of float. The IT team could start up to five days later without delaying the move.

4. When the Critical Path Slips

A delay on the critical path delays the whole project by the same amount, unless we act. A delay on another activity usually only uses up its float. That is why project managers watch critical activities closely. When a problem appears, the first question is: is this activity on the critical path? The answer shows how urgent it is.

Example: if the chef arrives late, the restaurant opens late, but a late delivery of napkins may go unnoticed.

At work: the furniture arrives three days late, so the move would end on day twenty-three, not twenty. A three-day delay in the network, however, changes nothing, thanks to its float.

5. Managing with the Critical Path

The critical path shows managers where to focus their time and their best people. To shorten a project, we can use crashing: adding people or overtime to critical activities, usually at extra cost. Another option is fast-tracking: doing in parallel some activities that were planned one after the other, which adds risk. Shortening activities outside the critical path does not help. After every change, we check again, because the critical path can move.

Example: a family preparing for guests asks a friend to help with the cooking, the longest job, so everything is ready sooner.

At work: Rami pays for faster furniture delivery, which is crashing. His team also starts moving boxes while the last desks are installed, which is fast-tracking; the move is back on day twenty.

Conclusion

In summary, the Critical Path Method turns a long to-do list into a clear picture of time. We list the activities, durations and dependencies, draw the network and find the longest path. That path gives the shortest possible duration and shows which activities cannot slip. Float shows where we have flexibility, while crashing and fast-tracking help when time is short. When we know the critical path, we know where every day counts.

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