

# Unit 3

- Pert Cost Control
- Cost reduction by crashing of activity
- Resource Scheduling
- Resource Levelling

# PERT/Cost

- assists in planning and controlling program cost expenditures by employing several cost-estimating techniques as monitors to determine variances, i.e., where actual costs are different from planned costs.
- Developed by DoD and NASA
- a) assist project managers by assigning costs to the working levels of projects in the detail needed for planning schedules and costs,
- b) evaluate schedule and cost performance, and
- c) predict and control costs during the project's operational phases

# PERT/Cost

## PERT Cost Activity Cost Estimates

- 1) a single cost estimate of expected actual cost,
- 2) three cost estimates combined by formula into an expected cost (similar to determining expected time in PERT Time),
- 3) optimum time-cost curves (used in conjunction with the Resource Allocation Procedure supplement), and
- 4) three separate cost estimates (used in conjunction with the Time-Cost Option Procedure supplement).

# PERT/Cost

- **Single Cost Estimate:** A single cost estimate of activity is based upon the sum of cost elements within each activity.
- These estimates are made by determining manpower, material, and other resources required to complete each activity.
- Direct and indirect cost

# PERT/Cost

Direct Costs	Indirect Costs
Direct costs affect the product's price and are thus calculated per project or per item.	Indirect costs affect the whole business and are thus calculated monthly or annually.
The volume of products affects final product costs.	Changes in production volumes do not significantly affect indirect costs.
Highly variable mainly due to market factors.	Relatively stable.
Includes raw material, manufacturing, direct labor, and direct fuel costs.	Includes rents, leases, utilities, insurance, legal, financial fees, office expenses, maintenance, and telecommunications.
Included in the costs of goods sold section in the income statement.	Included in the operational expenses segment in the income statement.

# PERT/Cost

Direct Costs		Indirect Costs	
Direct Labor	Highly variable	Rent	Fixed
Raw materials	Highly variable	Lease	Fixed
Production supplies	Highly variable	Utilities	Fixed
Fuel costs	Variable due to different fuel taxes per jurisdiction	Administration costs	Variable

# PERT/Cost

- **Three Cost Estimate:** The three cost estimate approach has as its goal determining an “expected activity cost.”
- subject to probability analysis.
- $C_e = (C_a + 4C_m + C_b)/6$
- if the cost estimates are realistic, the probabilities of achieving the expected cost can be used for project contract negotiations.

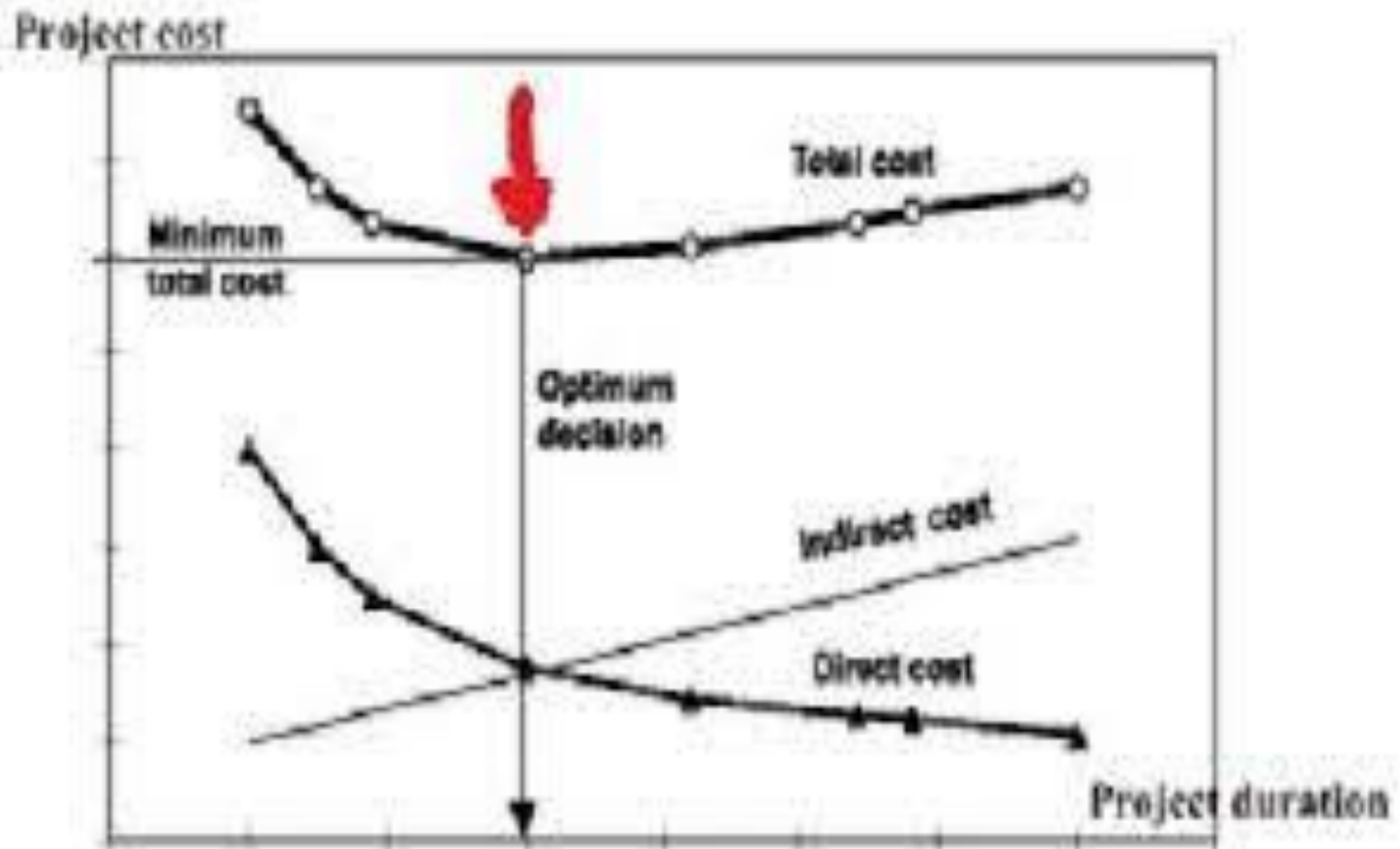


# PERT/Cost

## **Optimum Time-Cost Curve Estimate:**

- this concept is differential costing with time
- The intention of this approach is to optimize project time and costs by using optimum estimated activity costs
- It assumes the existence of a direct relationship between time and costs for each network activity.

# PERT/Cost



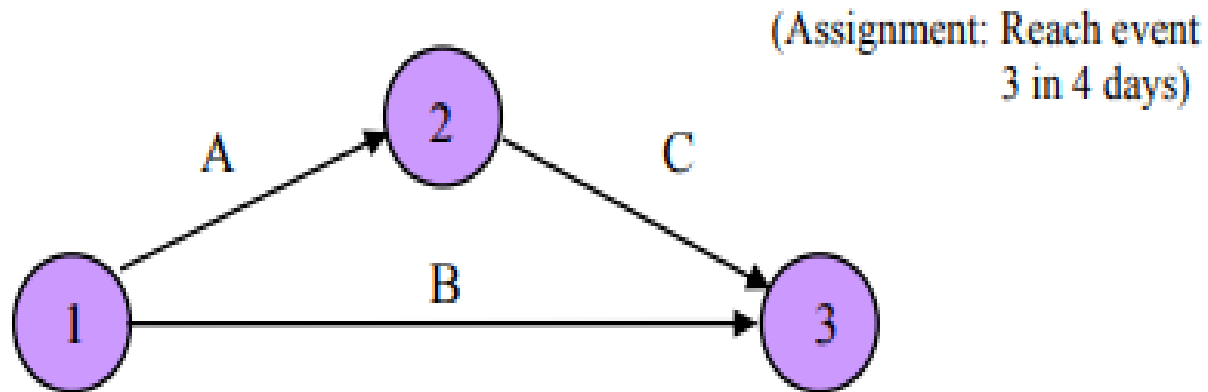
# PERT/Cost

## **Resource Allocation Supplement:**

This supplement is composed of a variation of continuous time-cost curves which can be used to plan and control a group of important activities representing only a minor portion of a project network.

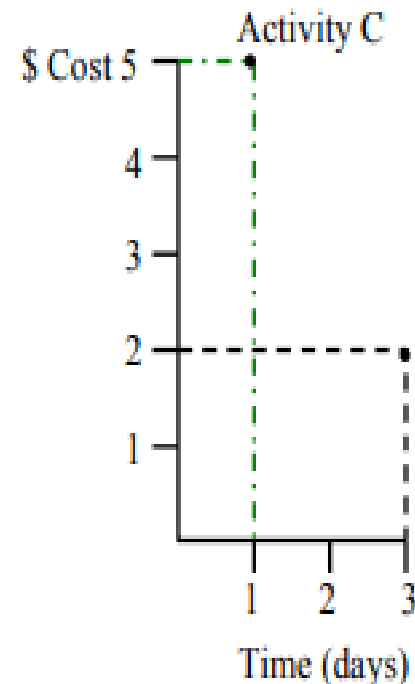
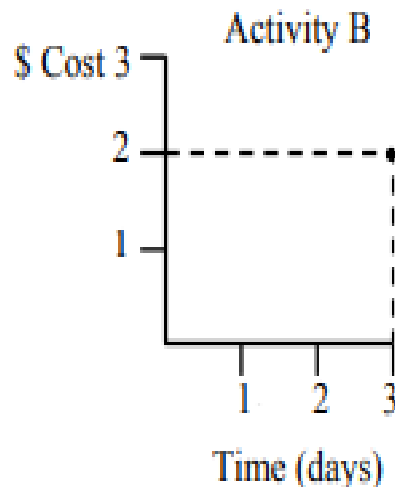
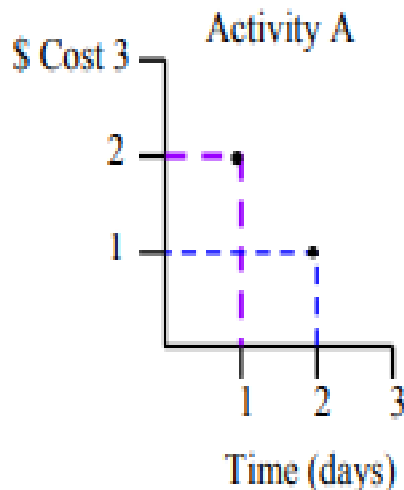
# PERT/Cost

- Procedure of RAS :
- Step 1: Construct network of activities in which you are interested.



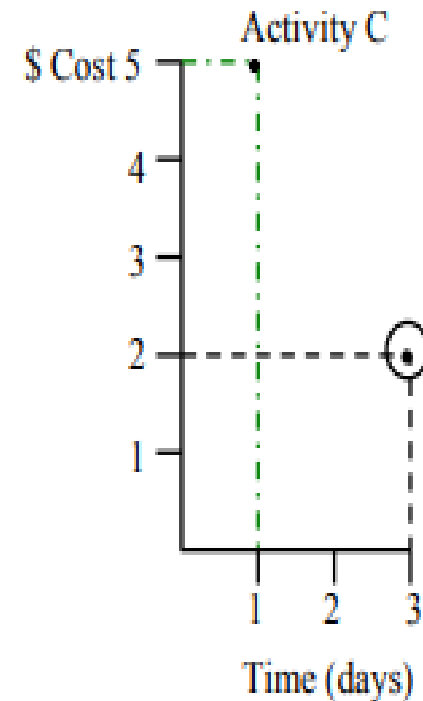
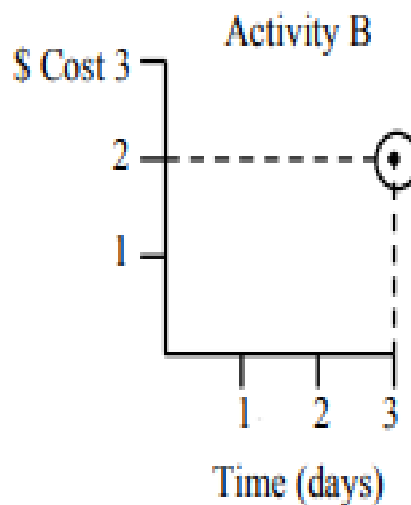
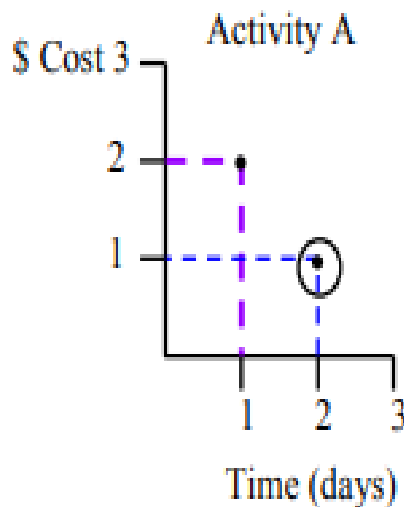
# PERT/Cost

Step 2: Obtain alternative time-cost estimates for each activity.



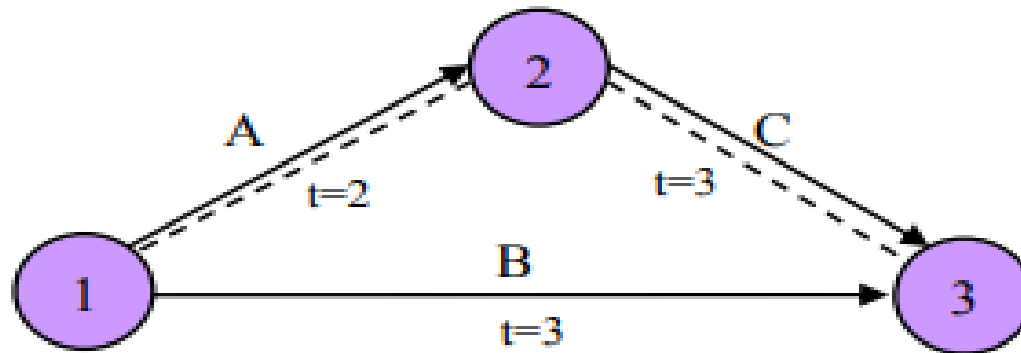
# PERT/Cost

Step 3: Select the lowest cost activity for each activity.



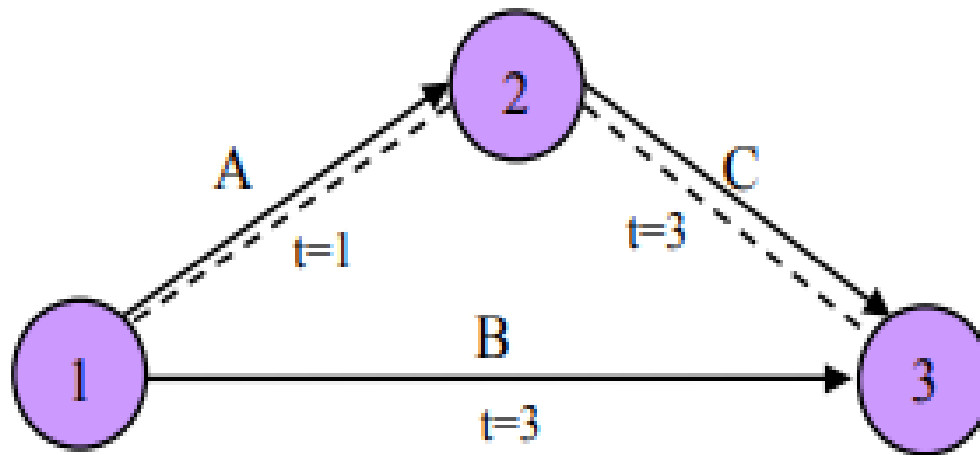
# PERT/Cost

- Step 4: Calculate critical path and compare with directed completion date.



# PERT/Cost

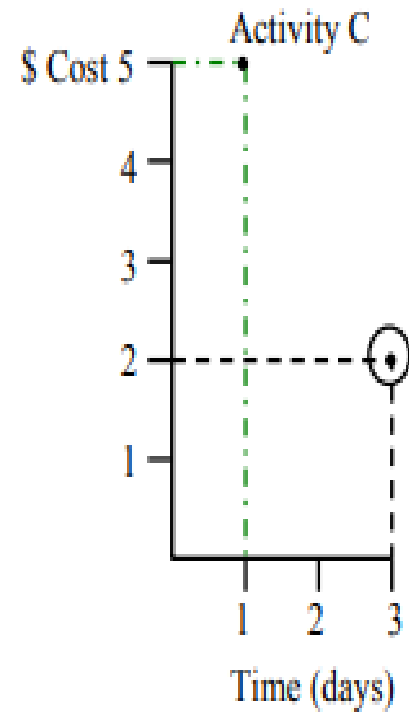
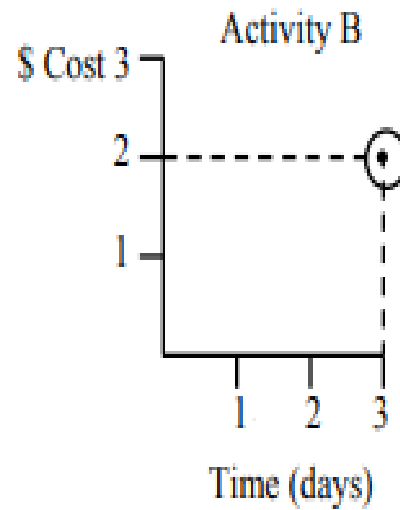
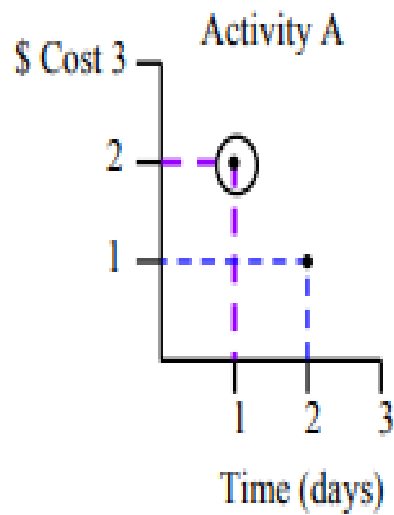
- Step 5: Adjust critical path to meet directed completion date at lowest possible costs.



(===== critical path takes 4 days, directed completion date is 4 days, scheduling change resulted in an increase in cost from \$5 to \$6.



# PERT/Cost



# PERT/Cost

- In the Resource Allocation supplement procedure, one can determine how to accomplish a project by a specified date at minimum cost. The critical path is from event 1 to event 2 and from event 2 to event 3 since it requires 5 days at absolute minimum costs. However, our assigned completion date is 4 days from the beginning. From our activity time-cost charts, one finds that cutting activity A one day doubles its cost. However, since shortening the activity time for activity C would result in an even greater cost increase, we choose to shorten activity A's time.

# Crashing of activity

- Cost reduction by crashing of activity
- Project crashing involves shortening the expected time taken for a project.
- This is primarily done by adding more resources to it.
- **Crashing in a project is an activity that will shorten the completion time of a project within the optimum cost increase.**

# Crashing of activity

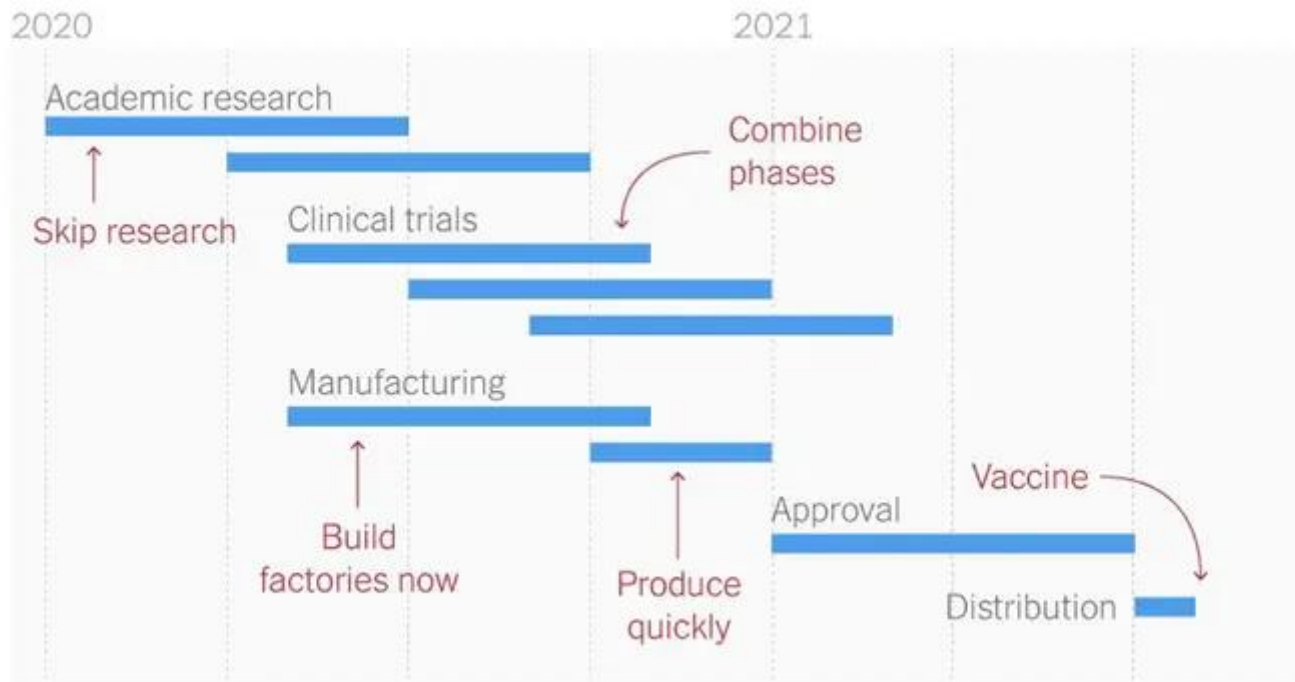
- **What are the problems a project may face?**
- A delay
- Lack of quality
- A problem with coordination
- Mismatch of expectations
- A poor plan
- Unforeseen circumstances
- External factors
- Change of scope

# Crashing of activity

- **What Prompts Crashing in Project Management?**
- If there is a **heavy penalty** for failing to meet a project completion deadline, then the increased cost of crashing could be justified to an extent.
- If there is an external change where a competitor is working on a similar project, the cost of not speeding up the project would lead to the loss of a **competitive edge**.
- In case there is an activity that **delays a host of other activities**, crashing that activity could bring benefits across the project.

# Crashing of activity

- **An Example of Crashing in Project Management – Covid case**

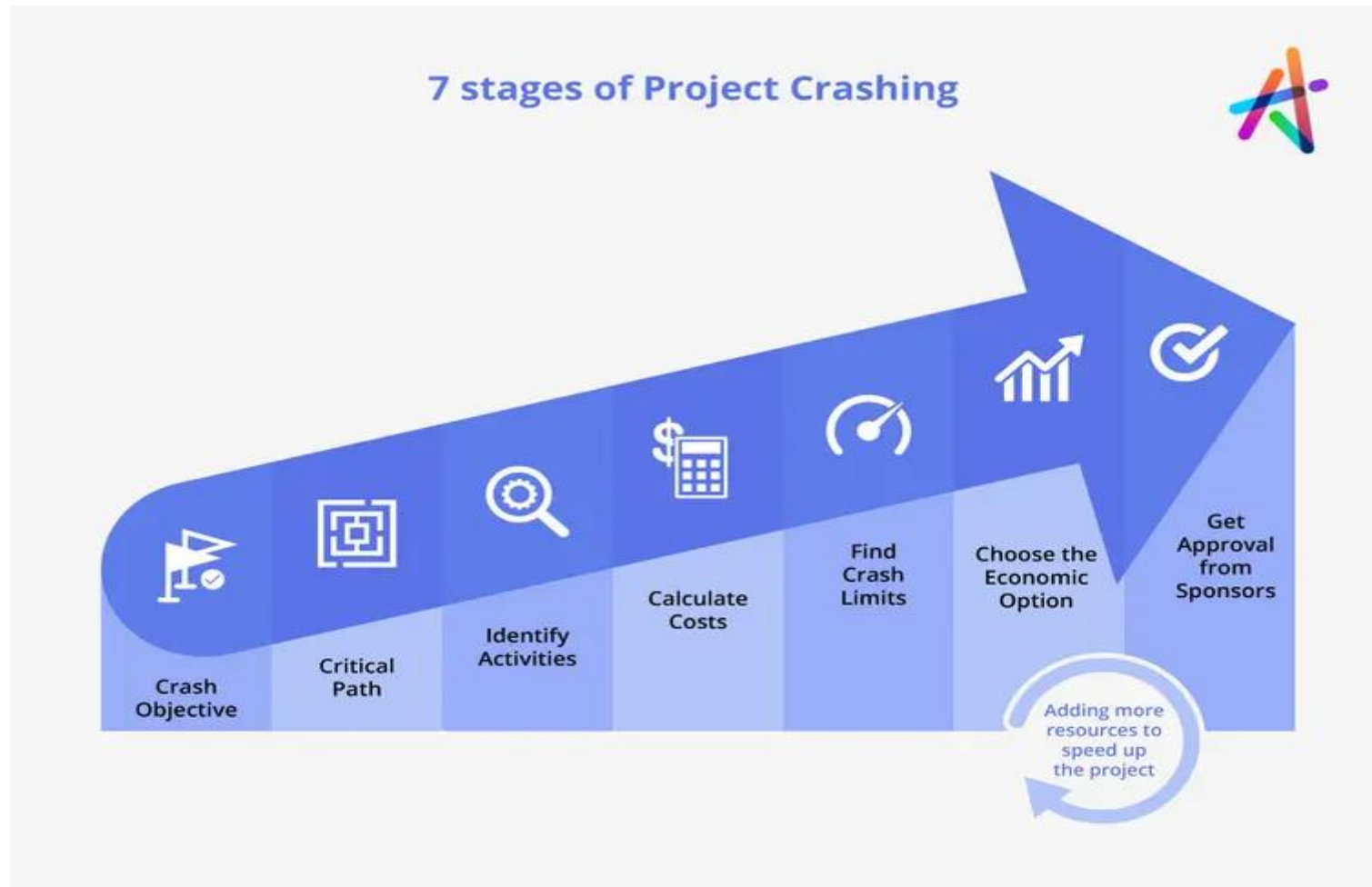


# Crashing of activity

- While crashing into an activity in your project consider :
- **Critical Path**
- **Cost and Benefit**
- **Resource Availability**
- **Training Needs**

# Crashing of activity

- **Project Crashing Management Stages**





# Crashing of activity

- **1. Crash Objective**
- The first stage of the project crashing is understanding the need for it and the objective in terms of what is to be accomplished. If the scope of the project has been reduced, then there may not be a need to add more resources to speed up the project.
- How to use the workforce or what amount of work can be outsourced etc. can be estimated at this stage.

# Crashing of activity

## 2. Critical Path

- Each project will have a critical path identified at the beginning. This chain of activities is what needs to be crashed to speed up the project. Crashing an activity outside the critical path does not help in reducing the project time.

# Crashing of activity

## **3. Identify Activities**

- Not every activity can be crashed. There may be activities that need very specific skills that are not easily transferable. Hence adding resources to that might prove to be counterproductive. The list of activities that can be crashed and are part of the critical path should be the ones in focus.

# Crashing of activity

## 4. Calculate Costs

- Crashing involves an increase in cost. This increase in cost will be different for each process. Comparing these costs with each other will help you arrive at a reasonable cost at which some activities can be crashed to sufficiently advance the project completion date.

# Crashing of activity

## 5. Find Crash Limits

- Each activity will have a crash limit. This is the point beyond which an action cannot be crashed. Understanding this information will give you an idea of how much the project can potentially be crashed.

# Crashing of activity

## **6. Choose the Economic Option**

- Once you have an idea of how much each activity can be crashed and the cost associated with it, it becomes easy to identify how many activities to target and to what extent they need to be crashed to meet the objective at the most reasonable cost.

# Crashing of activity

## **7. Get Approval from Sponsors**

- Once you have identified the most reasonable or most viable crashing plan, then you can convince the key stakeholders of the project and get their approval to implement it.

# Resource Scheduling

- Resource scheduling is a process used by teams to organize and structure their time, so tasks they need to complete are scheduled based on availability and capability.
- It determines the timeline and resources required to complete a project.
- Analyze how well resources are being utilized and reassign tasks to people who are not working to their full utilization rates.
- Track project estimations and outcomes to make future scheduling easier.



# Need for Resource Scheduling

- **Reduces overallocation:** Team leaders can assign people tasks without over (or under) allocating their schedules. In return, team members are constantly working on an optimized schedule
- **Improves task allocation:** It makes it easy to identify who should be working on what and when and helps match people with tasks they're best suited for.
- **Provides accurate demand forecasts:** It gives team leaders a chance to fill gaps before they can derail a project. If you don't have a designer or engineer on your team to complete a specific task, you'll know ahead of time and can reallocate work or bring in extra help!

# Types of Resource Scheduling

## 1. **Resource Constraint Scheduling:**

- Resource-constrained scheduling is a method used to complete a project with limited resources. It involves adjusting projects to align with resource capabilities.
- Say you have a project that ideally requires three people to complete, but you only have one person available. This process helps you maximize the use of your available team members or find a way to get the job done without missing the project deadline

# Resource Scheduling

## 2. Time constrained scheduling

- Time-constrained scheduling is a method used to manage resources and schedule activities when there are strict deadlines to meet.
- For example, your team is working on a preorder website that has to be rolled out in two weeks. Halfway through the project, you realize that the team isn't moving fast enough to meet the deadline. So you hire a freelance developer to help speed things up.

# Resource Scheduling

- **Resource scheduling in 5 steps**
- **Step 1. Break down tasks within a project**
- The first step to resource scheduling is figuring out what jobs you need to tackle on a project.
- Start by looking at the project as a whole and then breaking down each part into individual tasks.

# Resource Scheduling

- **Step 2. Look at your resource capabilities**
- confirm who is available to take on tasks.
- This step goes beyond just looking at who has space on their calendar for a project.
- need to ensure people with space on their calendars also have the skills required to complete the work.

# Resource Scheduling

- **Step 3. Schedule tasks to team members based on their availability**
- assigning tasks to your team based on their availability.
- Review past projects like the one you are scheduling to get an idea of how long you should allow each task on your team's calendars.

# Resource Scheduling

- **Step 4. Manage and monitor resources as the project progresses**
- It's crucial to monitor individual tasks' progress so your project doesn't get knocked off course.
- If a team member calls in sick or takes some vacation time, you'll need a plan to reassign their tasks or move their deadlines backward.

# Resource Scheduling

- **Step 5. Track the actual time spent on tasks and activities**
- Finally, track everything, so you make the project run even smoother.
- By tracking how many resources you used on each task and the time it took to complete them, you'll be able to use that data to tighten up your future schedules.
- Adding time tracking to your resource scheduling software is the easiest and most effective way. See if a project task is taking your team longer than expected or your resources are being used inefficiently.



# Resource Levelling

- Resource leveling is a project management technique that involves resolving overallocation or scheduling conflicts to ensure a project can be completed with the available resources.
- Resources include the time, materials, or tools needed to complete a project.

# Resource Levelling

- The purpose of resource leveling is to get the most out of available resources while working within the project's time, cost, and scope constraints.
- Resource leveling can be challenging for project managers as it requires balancing the demand for the same resources across multiple projects.

# Resource Levelling

Depending on your team needs, here are possible outcomes:

- If the goal is to keep the current project deadline, more resources may need to be made available.
- If the goal is to run the project with currently available resources, the deadline of the project may be extended.

# Resource Levelling

- When to use resource leveling
- To optimize your resources
- To minimize deficits
- To prevent task overloading
- To ensure the quality of a project output

# Resource Levelling

- Example of Obtaining additional resources

The IT team has been responding to a large number of IT requests to deal with a virus that infected company computers. Since the company's current antivirus software isn't robust enough to handle the virus, the team decides to invest in new antivirus software so they're able to fix the computers.

# Resource Levelling

Example of Postponing a project end date :

- The marketing team is launching a new social media campaign and they're waiting for approval from the social media manager, who is currently out of the office due to illness. Since the campaign isn't time-sensitive, they decide to push the launch date back by a few days so the manager has time to review.
- Whether you lead a marketing, sales, or IT team, resource leveling can come in handy for resolving resource conflicts. Once you decide on a solution, let the rest of your team know your plan.