CPA is a project analysis and planning method that allows a project to completed in the shortest possible time

The need to plan complex projects

- Many larger businesses get involved in projects that are complex and involve significant **investment** and **risk**
- As the complexity and risk increases it becomes even more necessary to identify the **relationships between the activities** involved and to work out the most efficient way of completing the project

Information needed for CPA

- A list of all activities required to complete the project
- The time (duration) that each activity will take to completion
- The dependencies between the activities (e.g. activity D cannot be completed until activity B&C done)

Simple project example – revising for exams

Task	Activity	Dependent on	Duration (hours)
A	Gather lesson notes and read through	Starting activity	10
B	Identify gaps in knowledge	Completion of task A	3
C	Research online sources	Completion of task B	5
D	Procrastinate and browse Facebook	Completion of task B	30
E	Write revision plan & revision notes	Completion of task B & C	12
F	Practice past exam papers	Begin when E complete	8
G	Complete last minute cramming		15

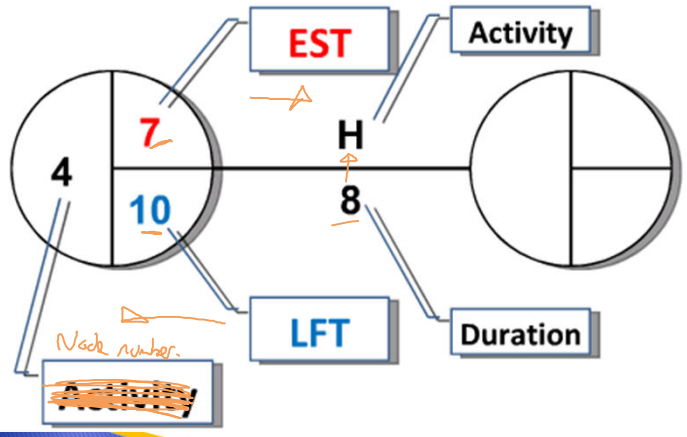
CPA calculates…

- The longest path of planned activities to the end of the project
- The **earliest start time (EST)** and **latest finish (LFT)** time that each activity can start and finish without making the project longer
- Which activities are "critical" (i.e. on the longest path) and which have "total float" (i.e. can be delayed without making the project longer)

Drawing the network

Component	Description
Node	A **circle** that represents a point in time where an activity is started or finished. The node (circle) is split into three sections:
	The left half of the circle is the **unique node (activity) number** – the network diagram draws these in order The top right section shows the **earliest start time (EST)** that an activity can commence based on the completion of the previous activity The bottom right section shows the **latest finish time (LFT)** by which the previous activity must be completed
Activities	An activity is something that takes time. An activity is shown on the network as a **line**, linking the nodes (circles). A description of the activity, or a letter representing the activity, is usually shown above the relevant line
Duration	The length of time it takes to complete an activity – shown as a number of the relevant units (e.g. hours, days) **under the activity line**

The network diagram - layout



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Calculating ESTs

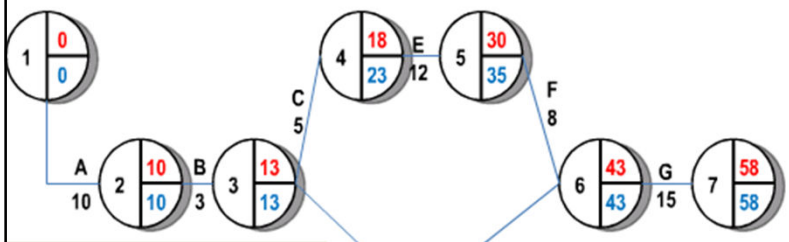
- The first node will always have an EST of zero!
- ESTs are calculated from left to right
- Add the **duration** of an activity to the EST of a previous node
- If more than one activity leads to a node, the highest figure becomes the new EST

Calculating LFTs

- Give the last node of the project an LFT = to the EST
- Work backwards from right to left
- Subtract the duration of the activity from the LFT

When there are two or more activities ending at the same node (working backwards), always take the activity with the LOWEST of the values.

What is the critical path?

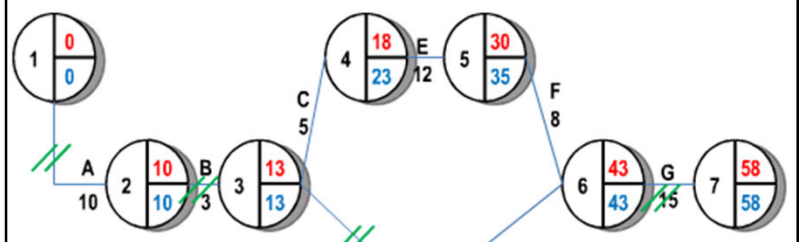


Why is the critical path so important?

Any delay of an activity on the critical path directly impacts the planned project completion date (i.e. there is no float on the critical path)

The sequence of project activities which add up to the longest overall duration The critical path determines the shortest time possible to complete the project

Identifying the critical path



// Represents the Critical Path for this Project

Calculating the float

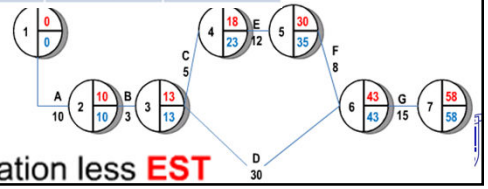
The **float** is the duration an activity can be extended or postponed so that the project still finishes within the minimum time

Calculated as:

LFT less Activity Duration less **EST**

Calculated float – Exam Project

Activity	LFT	Duration	EST	Total Float
A	10	10	0	0
B	13	3	10	0
C	23	5	13	5
D	43	30	13	0
E	35	12	18	5
F	43	8	30	5
G	58	15	43	0



LFT less Activity Duration less **EST**

Identifying the critical path

- Activities with a float of 0 (zero) cannot be delayed without delaying the entire project
- Such activities represent the "critical path"
- On the critical path, activities have an **equal** **EST** and **LFT**

Uses of critical path analysis

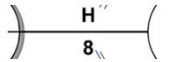
- Estimate and minimise project time
- Support project costing and evaluation
- Plan and organise resources
- Prioritise tasks
- Help provide direction (more motivating?

Benefits and drawbacks of CPA

Advantages	Disadvantages
Most importantly – helps reduce the risk and costs of complex projects	Reliability of CPA largely based on accurate estimates and assumptions made
Encourages careful assessment of the requirements of each activity in a project	CPA does not guarantee the success of a project
Help spot which activities have some slack ("float") and could therefore transfer some resources = better allocation of resources	Resources may not actually be as flexible as management hope when they come to address the network float
A decision-making tool and a planning tool – all in one!	Too many activities may the network diagram too complicated. Activities might themselves have to be broken down into mini-projects
Provides managers with a useful overview of a complex project	
Links well with other aspects of business planning, including cash flow forecasting and budgeting	

Essential points

- All diagrams start with
- Project name on top, duration below



- EST's first, left to right = previous EST + next activity duration.
- LFT's, right to left = previous LFT – duration. The first and last nodes' EST and LFT are equal.
- If more than one activity leads to a node (left or right), the EST of that node will be the highest option, the LFT will be the lowest.
- The critical path follows the nodes that have identical ESTs and LFTs.