Information Management Master

Project Management Module 3

Fall/Spring

Rosemary Obi

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Attendance

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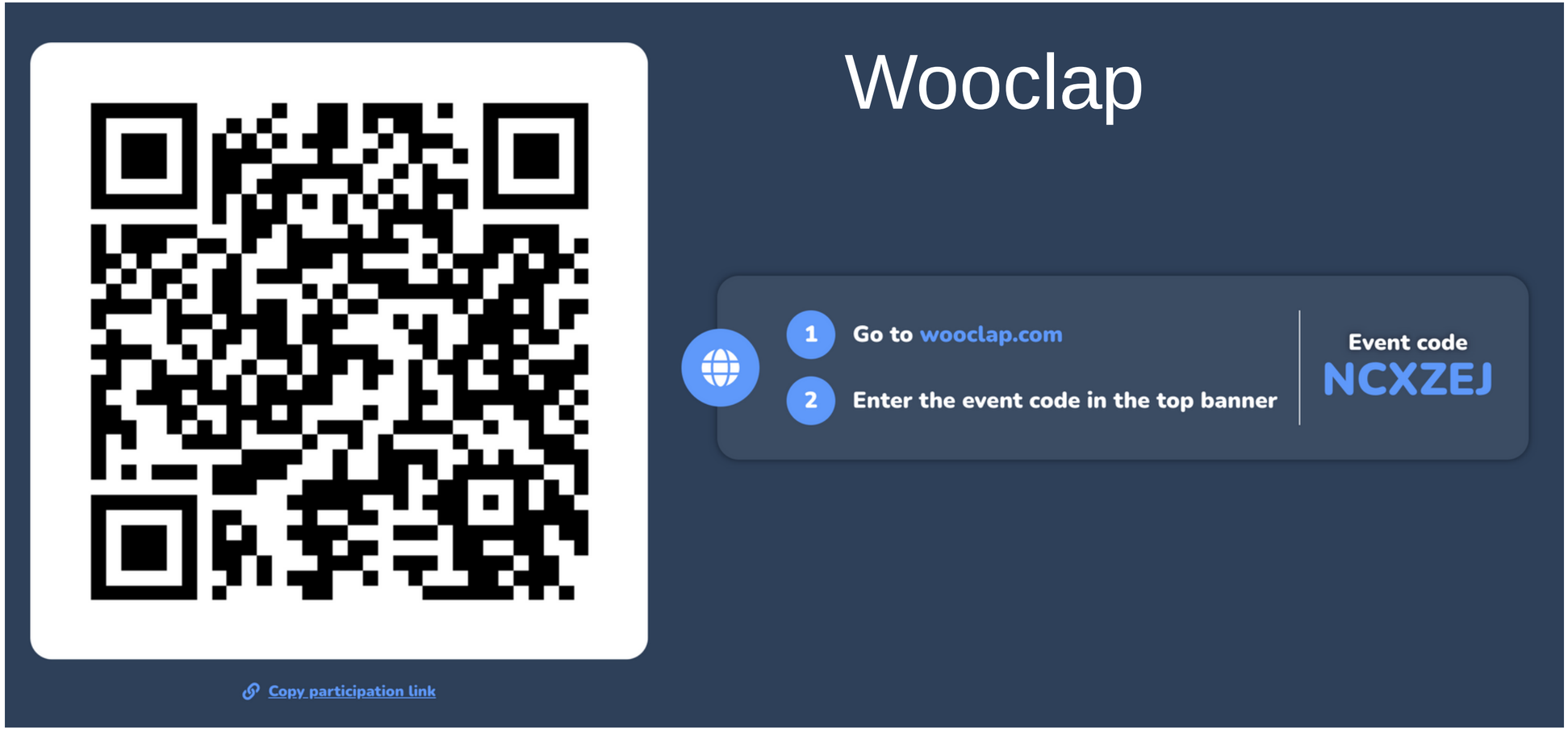
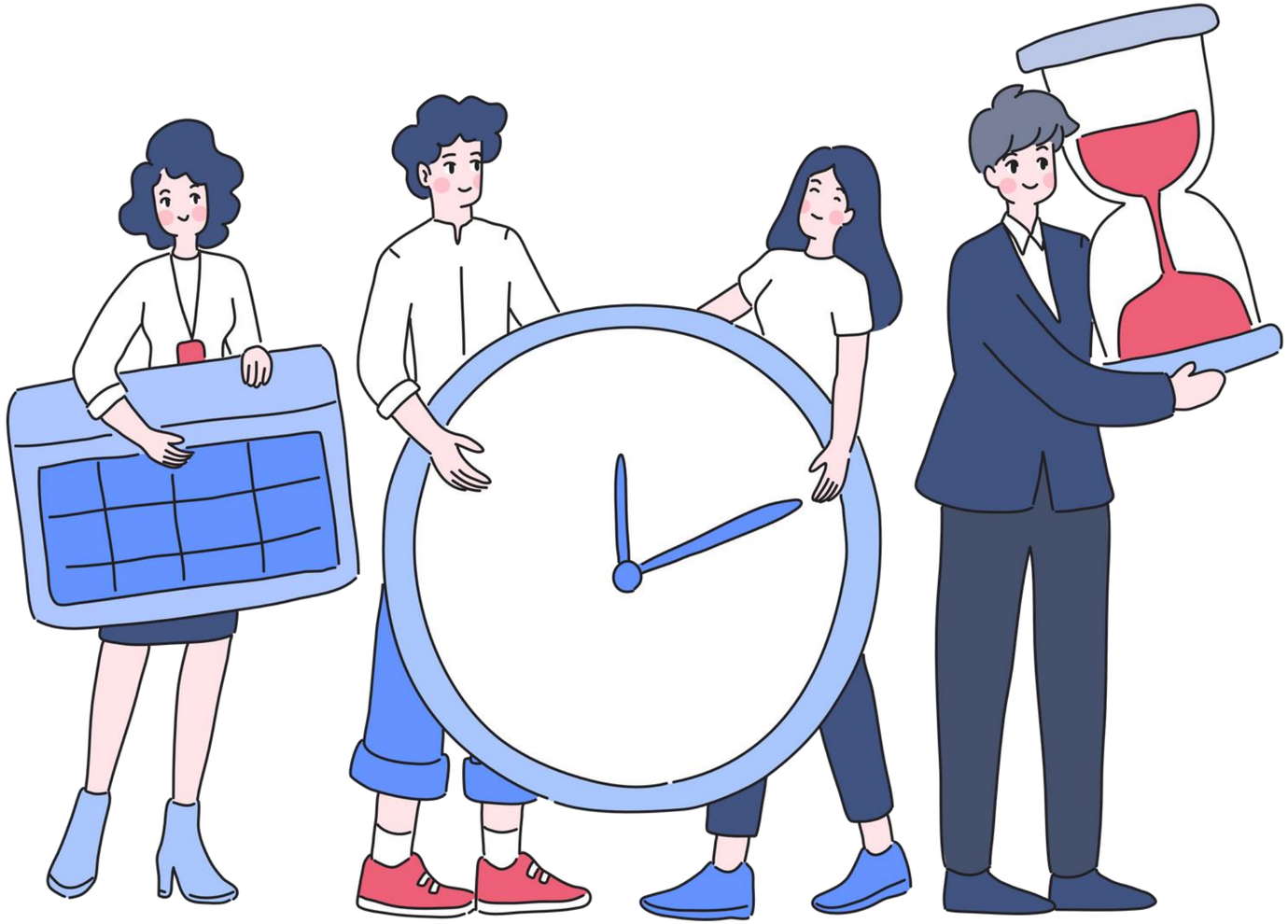
Project Management



Time Management



Objectives of the module

- Define the core activities required for the project time management process
- Understand how to use network diagrams and their dependencies in time management of a project
- Use a Gantt and PERT chart in planning and tracking the project schedule.

Importance of project management

The biggest challenge for a project manager: meeting the deadline and the cost.

- **Most projects miss their delivery times**
- **Time management is one of the main causes of conflict, especially during the second half of the projects**

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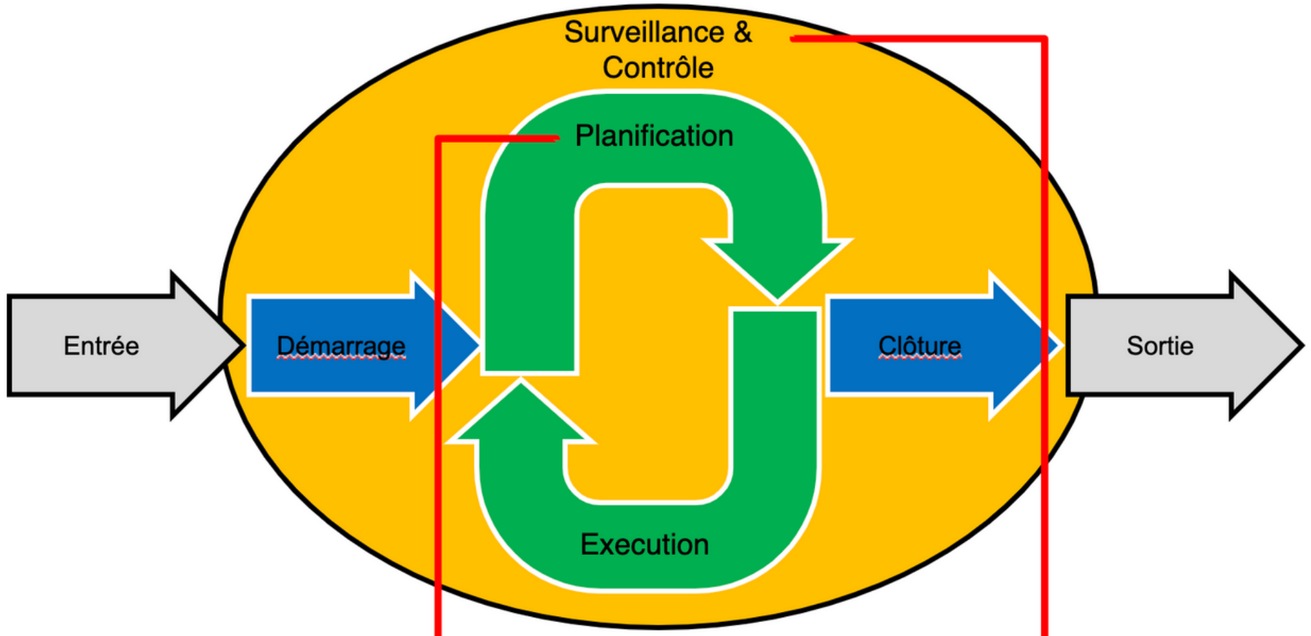


Knowledge Area	Process				
	Initiating	Planning	Executing	Monitoring & Contol	Closing
Time		Definition of activities Scheduling activities Resource estimate Estimated duration Preparation of the plan		Control of the plan	

Project Time Management Process

5.1 Definition of activities

- List of activities and their attributes

5.2 Scheduling activities

- Identification and documentation of dependencies between activities

5.3 Resource Estimate

- Estimated resources needed to carry out each activity

5.4 Estimated duration

- Approximation process of duration to carry out individual activities

5.5 Preparation of the plan

- Creation of the project calendar from sequences, durations, resource requirements

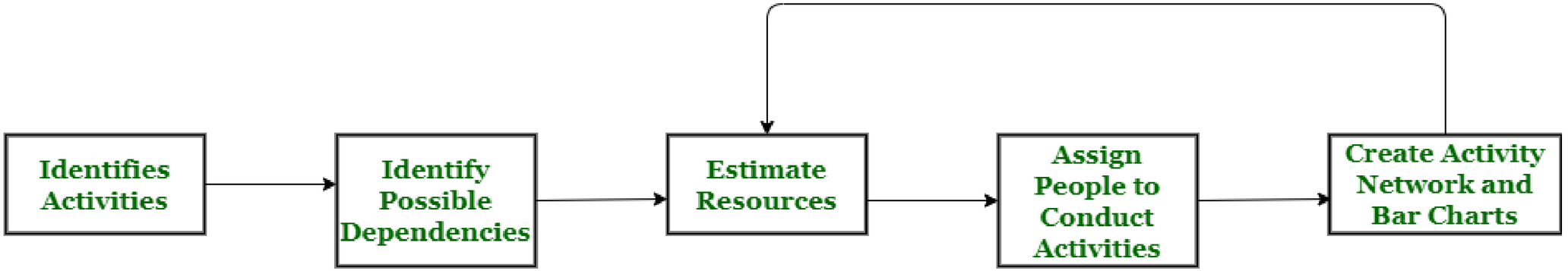
5.6 Control of the plan

6.1 Define the activities

- **Creating a list of activities and their attributes using the WBS (Structure de Découpage du Projet (SDP) in French)**
  - **Predecessors and successors**
  - **Logical relationships**
  - **Resource requirements**
  - **Constraints**
  - **Non-negotiable dates**
- **Milestone**
  - **Very important event that has no duration and is used to monitor the progress of the project**

6.2 Scheduling of activities

Identify and document logical links or dependency relationships between project activities



Project Scheduling Process

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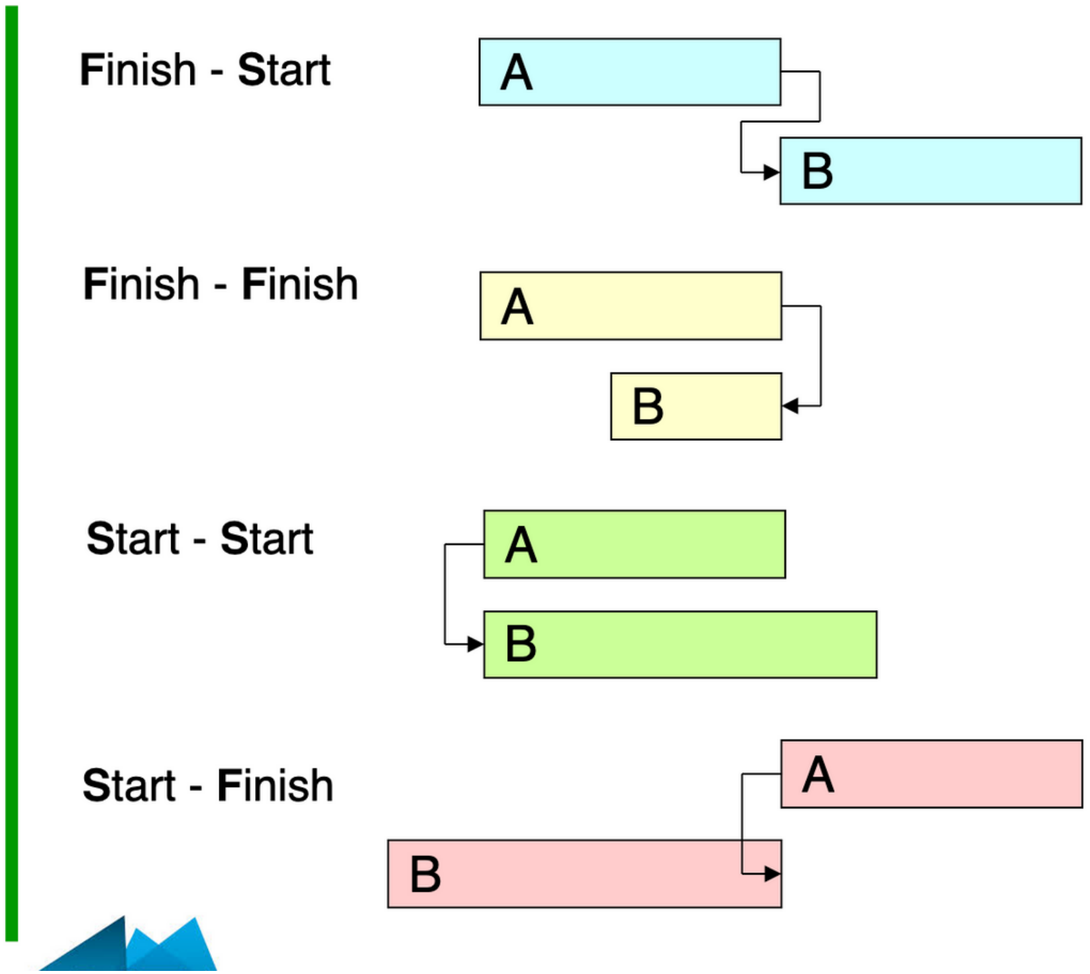
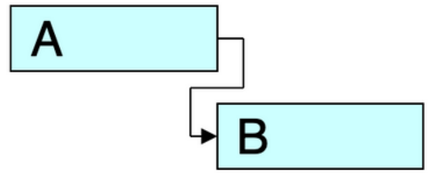
The sequencing

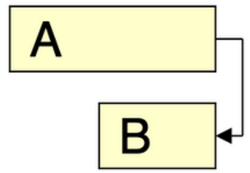
- Sequencing is the establishment of a logical sequence between network activities, the most appropriate form for the project
- Sequencing uses the notion of antecedence between activities
- Ensures that all the necessary steps happen correctly and helps you optimize resources efficiently.

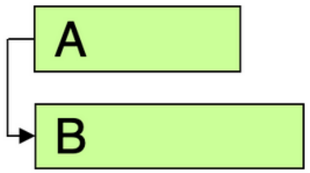


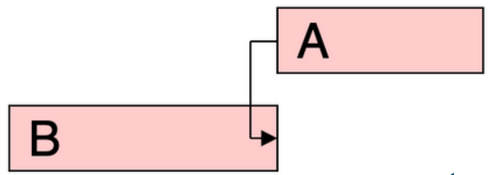
Examples of sequencing

- **Finish to Start**
  - **Wait for anesthesia to take effect (Task A) before operating (Task B)**
- **Finish to Finish**
  - You finish writing the first draft (Task A), but you can't finish editing (Task B) until the draft is finished.
- **Start to Start**
  - **Paste posters and advertise on the radio**
- **Start to Finish**
  - You can't finish deploying the app to the app store (Task B) until the beta testing phase starts (Task A). The start of the testing process is what triggers the end of the deployment.



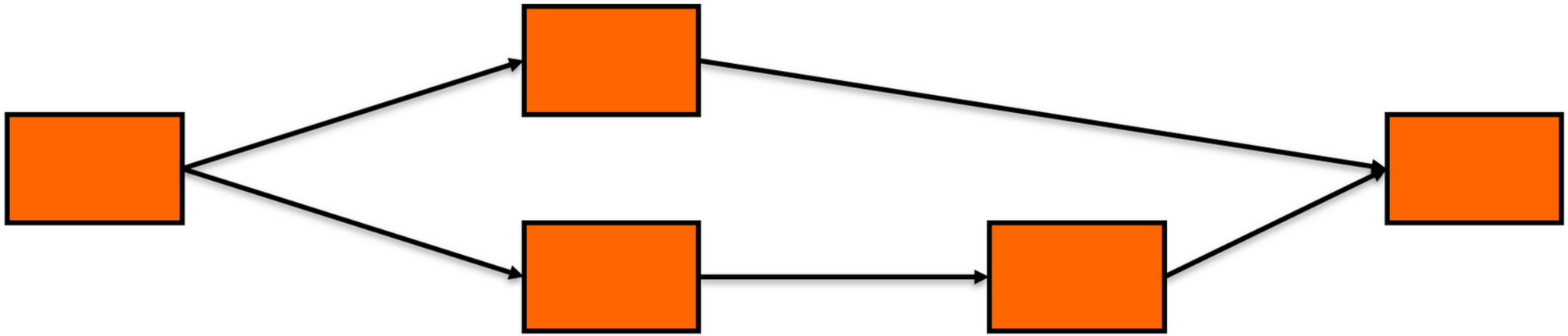




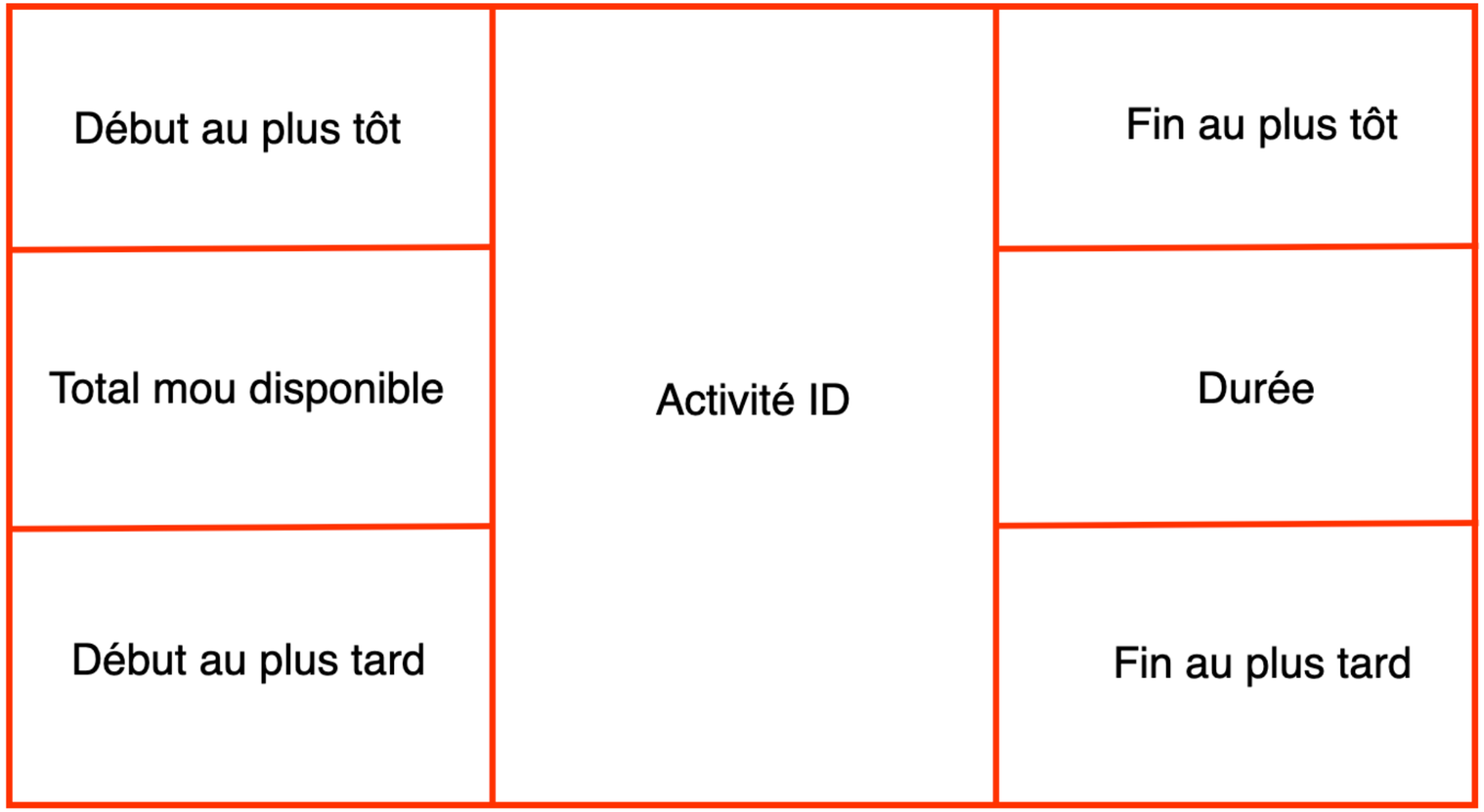


The PERT Network

- Program Evaluation and Review Technique
- Created in 1958 at the request of the US Navy
- Focuses on the notions of flow and dependencies
- Determines the critical path



Méthode du chemin critique



Total mou disponible = Début au plus tard – début au plus tôt
ou
Total mou disponible = Terminer au plus tard - Terminer au plus tôt

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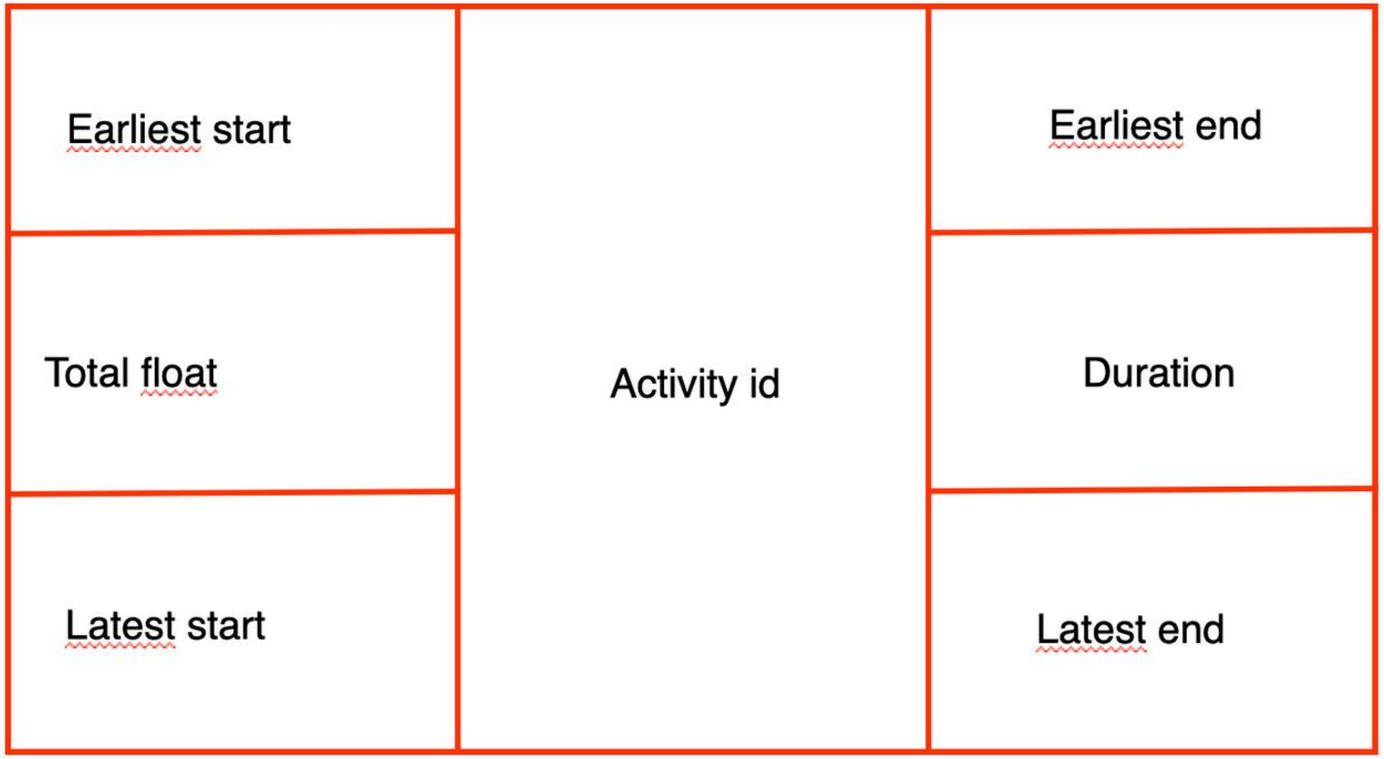
Critical path method

Float or slack time is the amount of time that an activity can be delayed without affecting the project's completion time.



Total float = Latest start – Earliest start
or
Total float = Latest End – Earliest End

Calculating Slack Time in Critical Path Method

Simply put, float (slack) time is the amount of time an activity may delay without extending the entire duration of the project. To calculate slack time, we need the following:

ES (Earliest Start) Moving from start to finish in the project, the earliest start is the time taken up to the current activity in the process.

EE (Earliest End) Earliest End takes the time calculated in ES and adds the current activity's time to the total duration.

LS (Latest Start) Moving backward from finish to start, the Latest start calculates the time taken up to the current activity in the process. Opposite of ES

LE (Latest End) Earliest End takes the time calculated in LS and adds the current activity's time to the total duration. Opposite of EE

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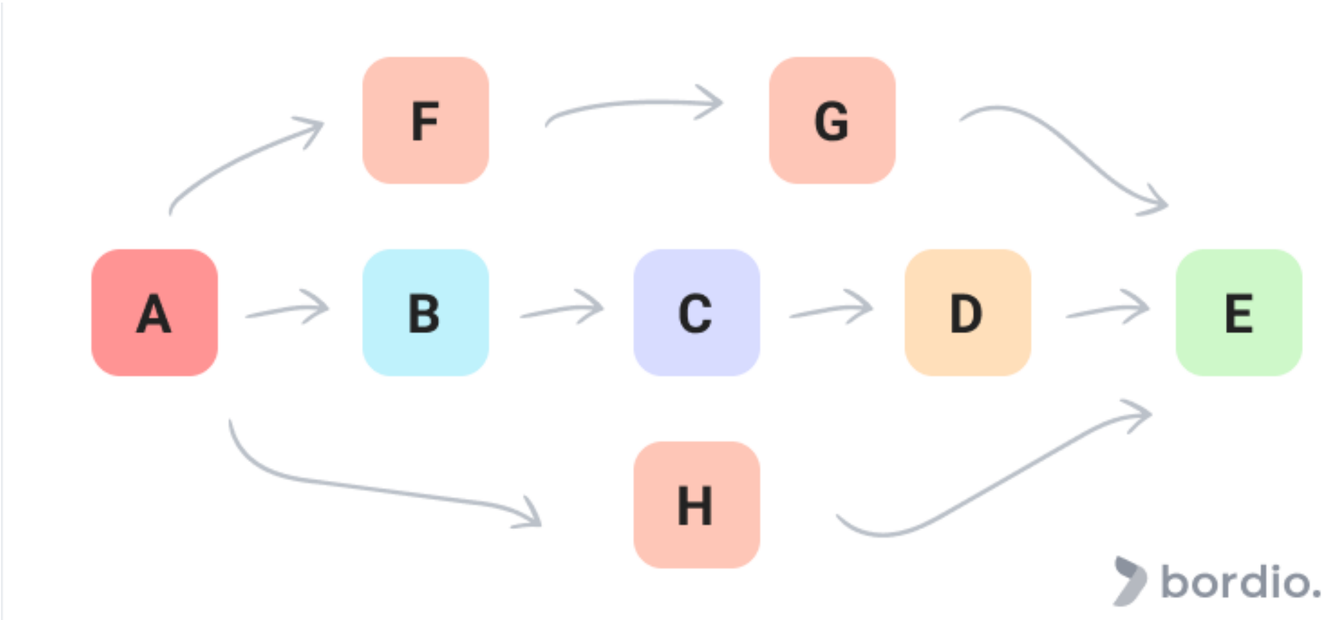
- **The critical path is also the path through the project network where all activities have zero float.**

i.e - Total float = 0



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Key Points

- **PERT (Program Evaluation and Review Technique)** determines the critical path by analyzing the estimated time and sequence of tasks in a project.

- The **Critical Path Method (CPM)** is a project management technique used to plan, schedule, and manage projects.

- CPM focuses on identifying the **Critical path** in a project network, which is the sequence of tasks that must be completed on time to ensure the project is completed as scheduled.

- It is the **longest path** through the network, representing the **shortest time**, **least flexible path** and cannot be delayed so that the project can be completed on time.

Project Management

Table of Predecessors

Activité	Prédécesseur
A	
B	A
C	A
D	B,C
E	C
F	D,E
G	E
H	F,G

An example for you to look at

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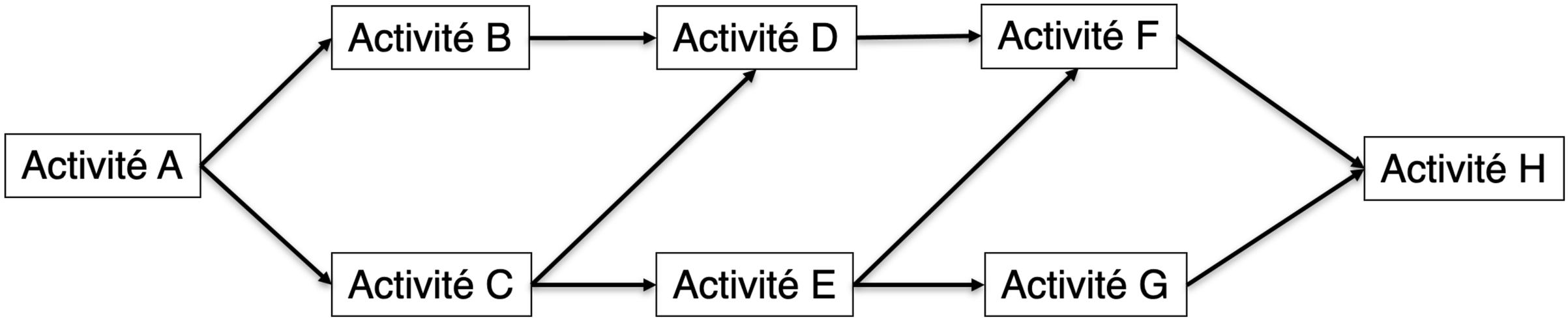

Network Diagram representation

A schematic display of the relationships between project activities, always drawn from left to right to reflect the order of the project.

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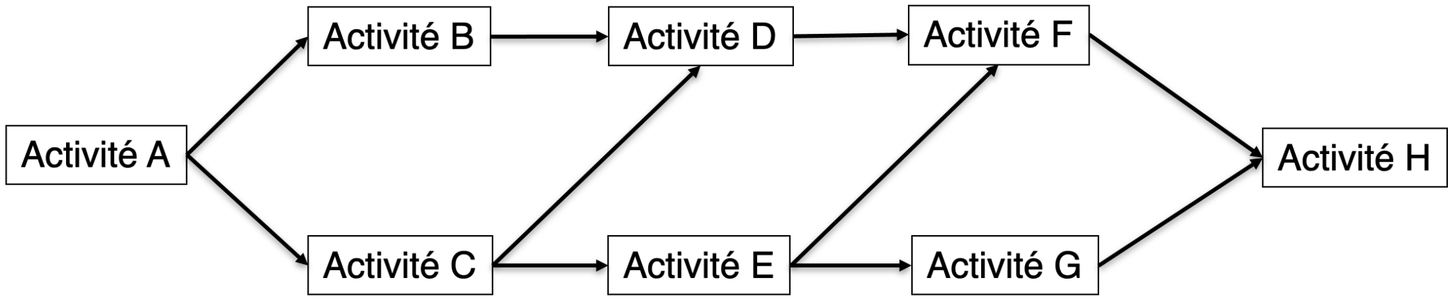
Activité	Prédécesseur
A	
B	A
C	A
D	B,C
E	C
F	D,E
G	E
H	F,G

Table of Predecessors



Critical path method

Activité	Durée	Prédécesseur
A	3	
B	5	A
C	4	A
D	2	B,C
E	6	C
F	5	D,E
G	4	E
H	7	F,G

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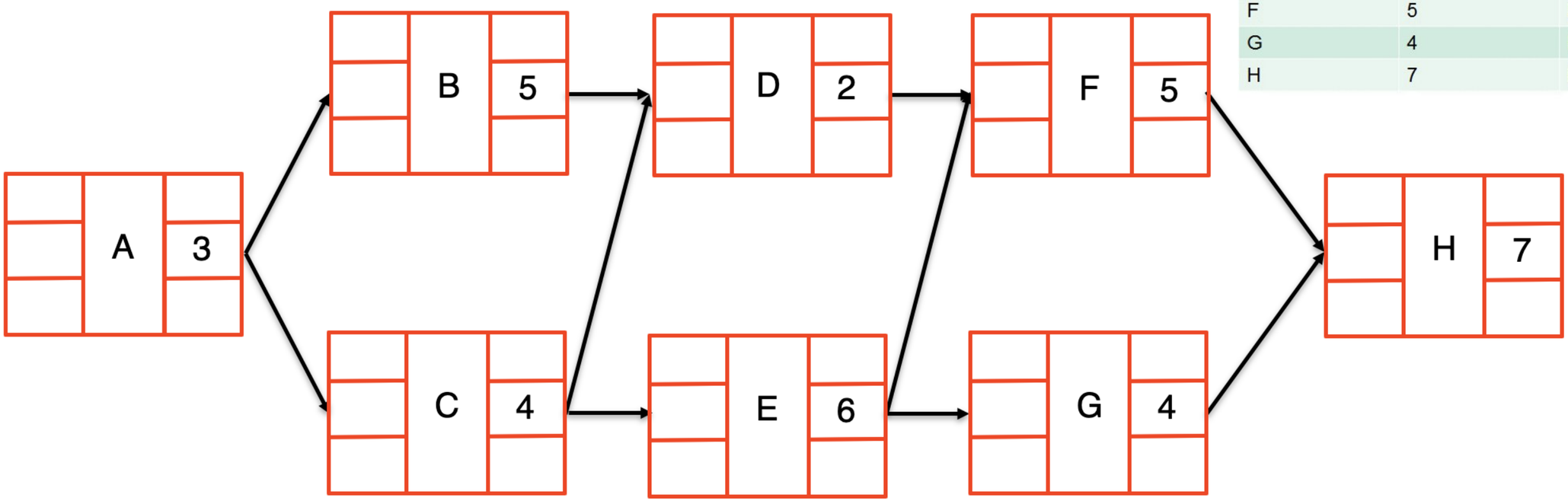
Critical path method

Activité	Durée	Prédécesseur
A	3	
B	5	A
C	4	A
D	2	B,C
E	6	C
F	5	D,E
G	4	E
H	7	F,G



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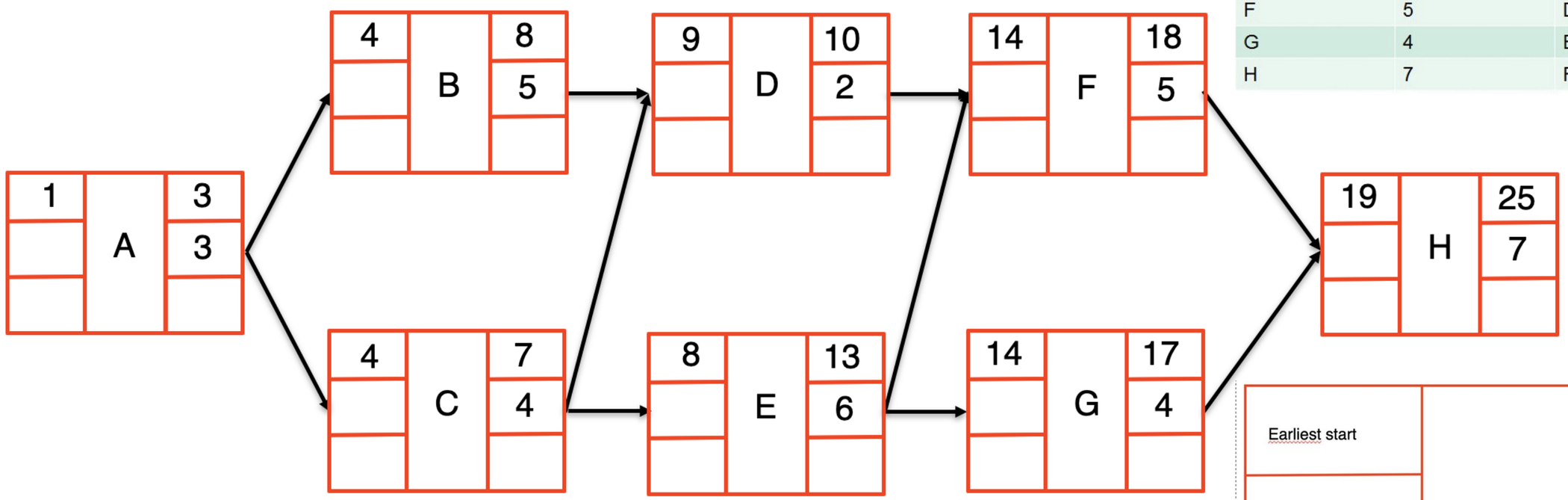
Critical path method

Activité	Durée	Prédécesseur
A	3	
B	5	A
C	4	A
D	2	B,C
E	6	C
F	5	D,E
G	4	E
H	7	F,G



Earliest start	Activity id	Earliest end
Total float		Duration
Latest start		Latest end

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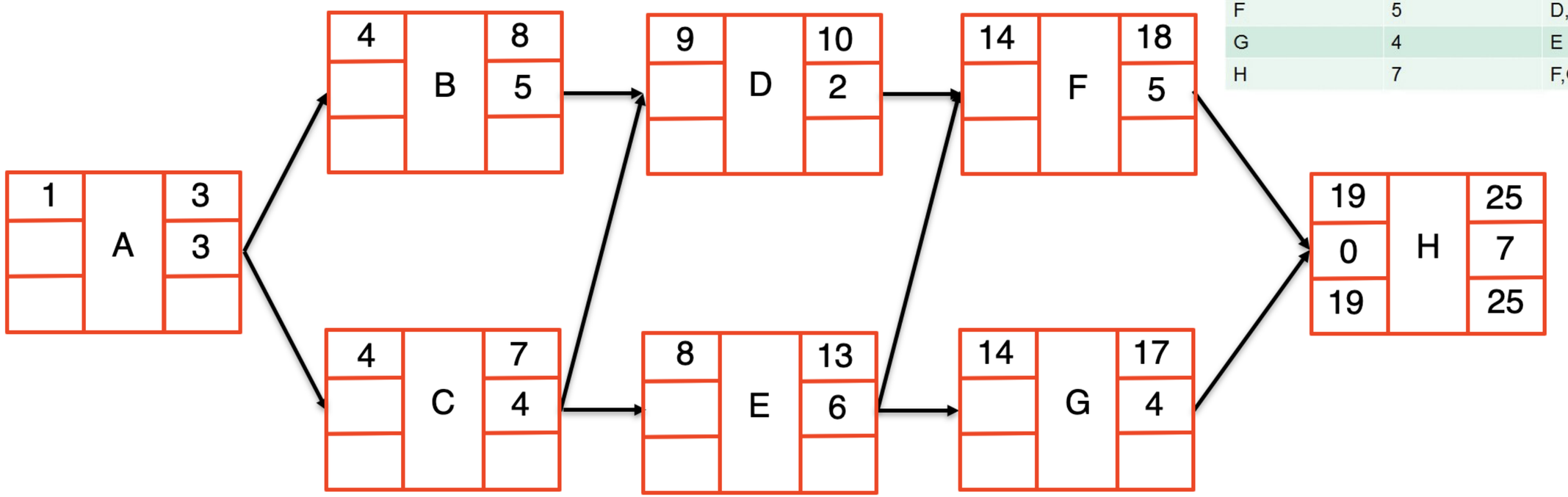
Activité	Durée	Prédécesseur
A	3	
B	5	A
C	4	A
D	2	B,C
E	6	C
F	5	D,E
G	4	E
H	7	F,G

Backtracking



Backtracking: The process to determine the late start or late finish times for activities in the critical path method.

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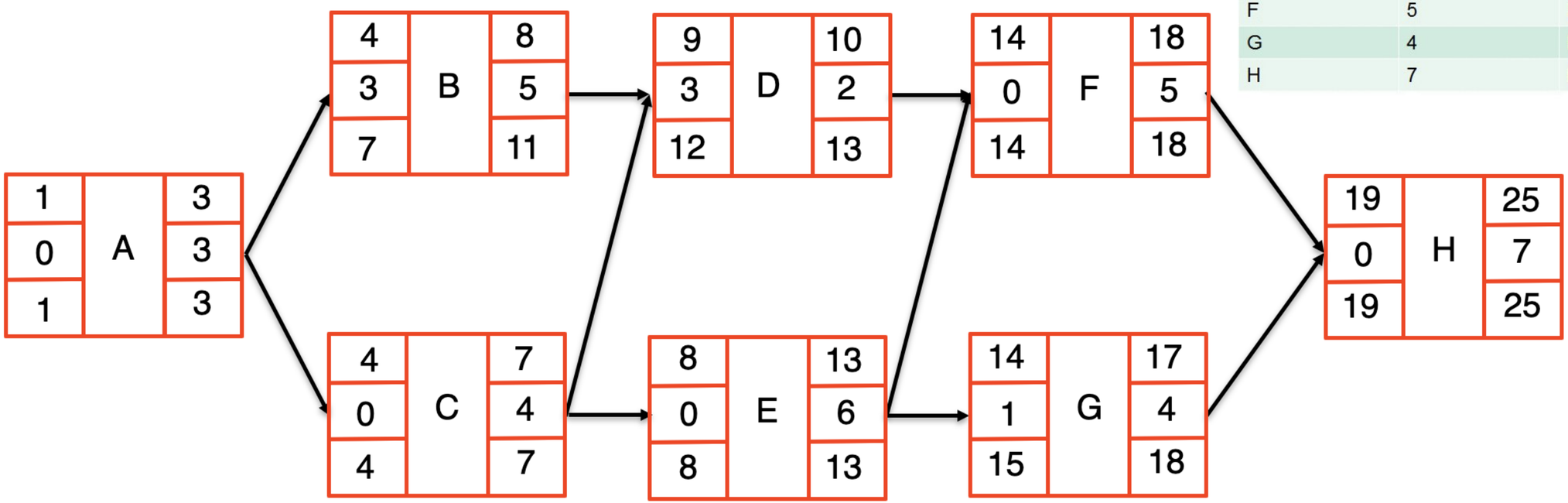
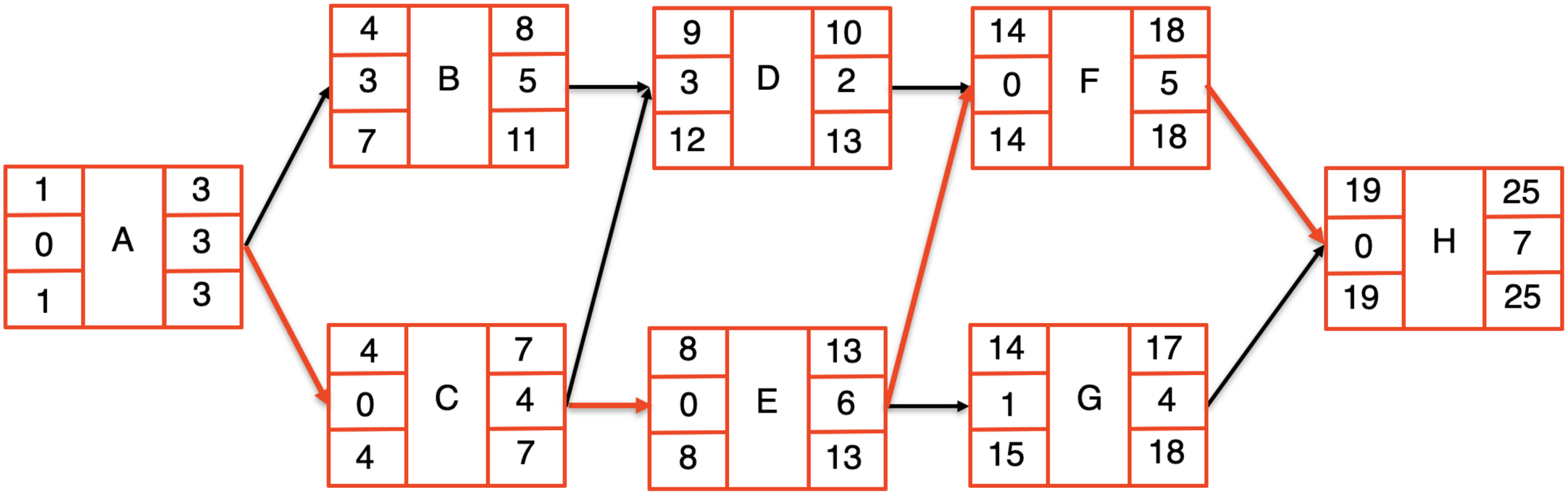
Activité	Durée	Prédécesseur
A	3	
B	5	A
C	4	A
D	2	B,C
E	6	C
F	5	D,E
G	4	E
H	7	F,G

Backtracking



Where is the Critical path ?

Backtracking



Where is the Critical path ?

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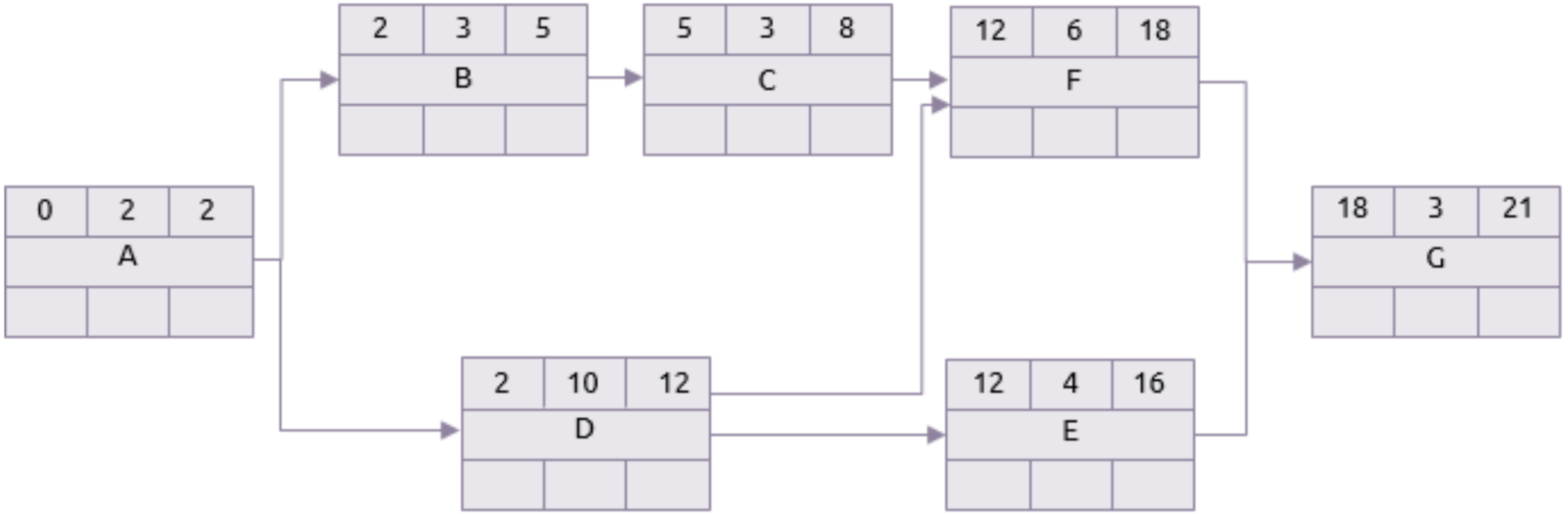

Another example

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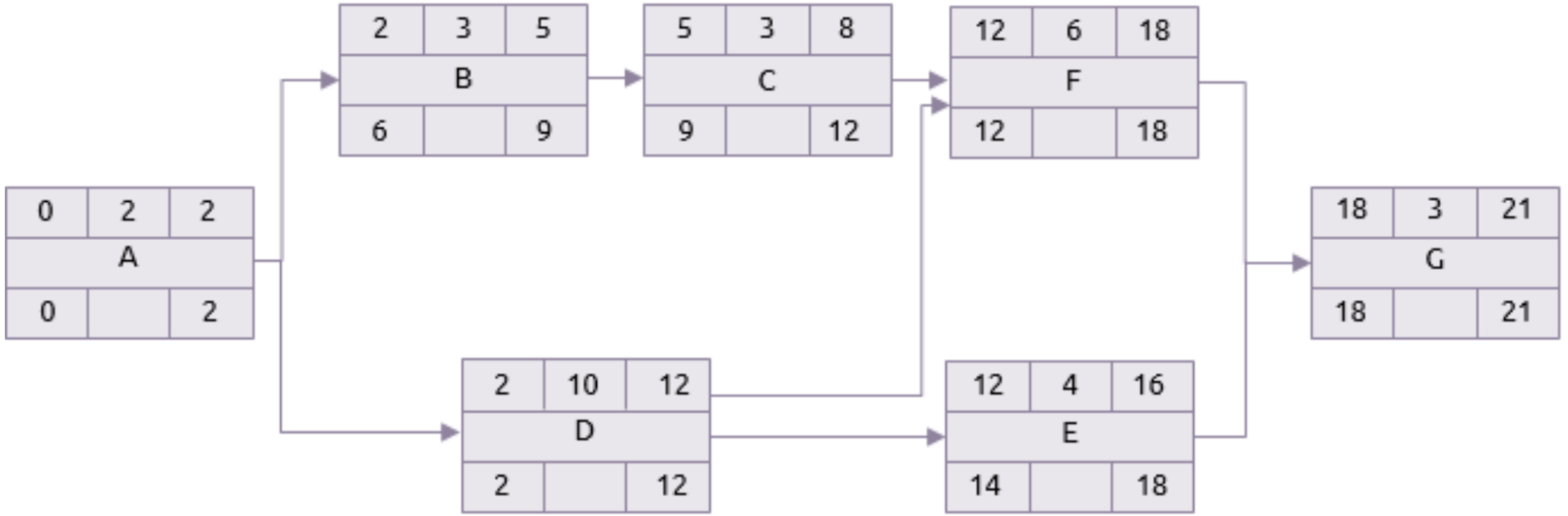
The backward pass:

The earliest finish for the project is assumed to also be its latest finish. The process is then repeated, but in reverse.



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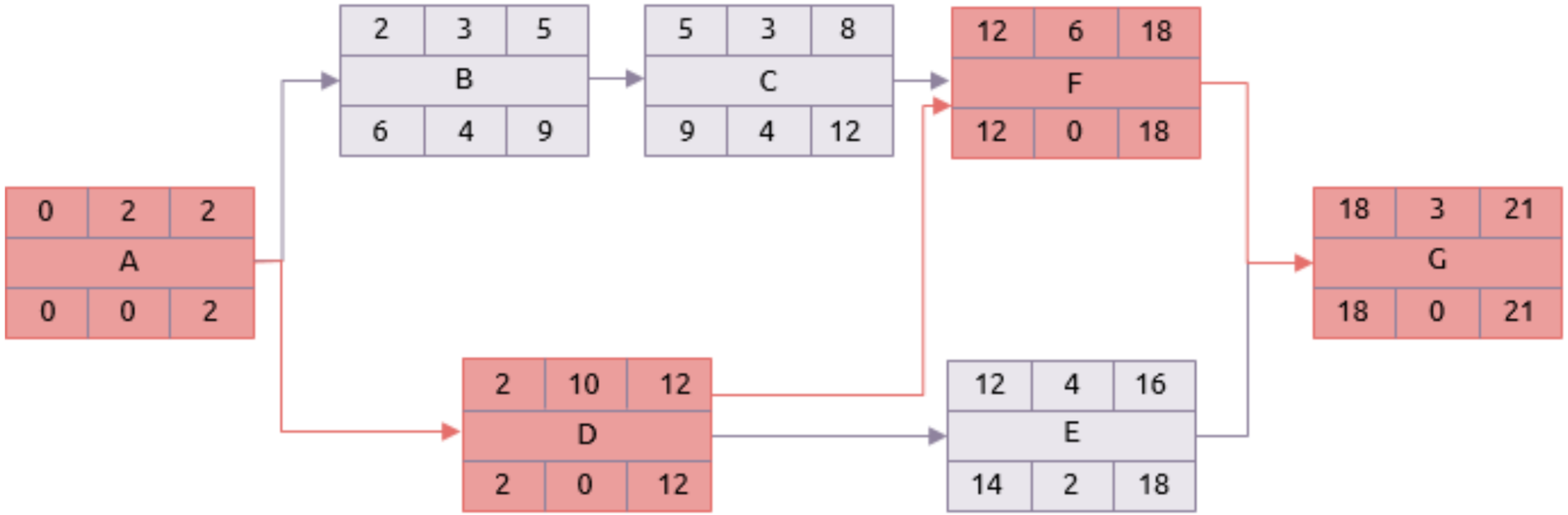

The critical path is along the path of those that have float as 0

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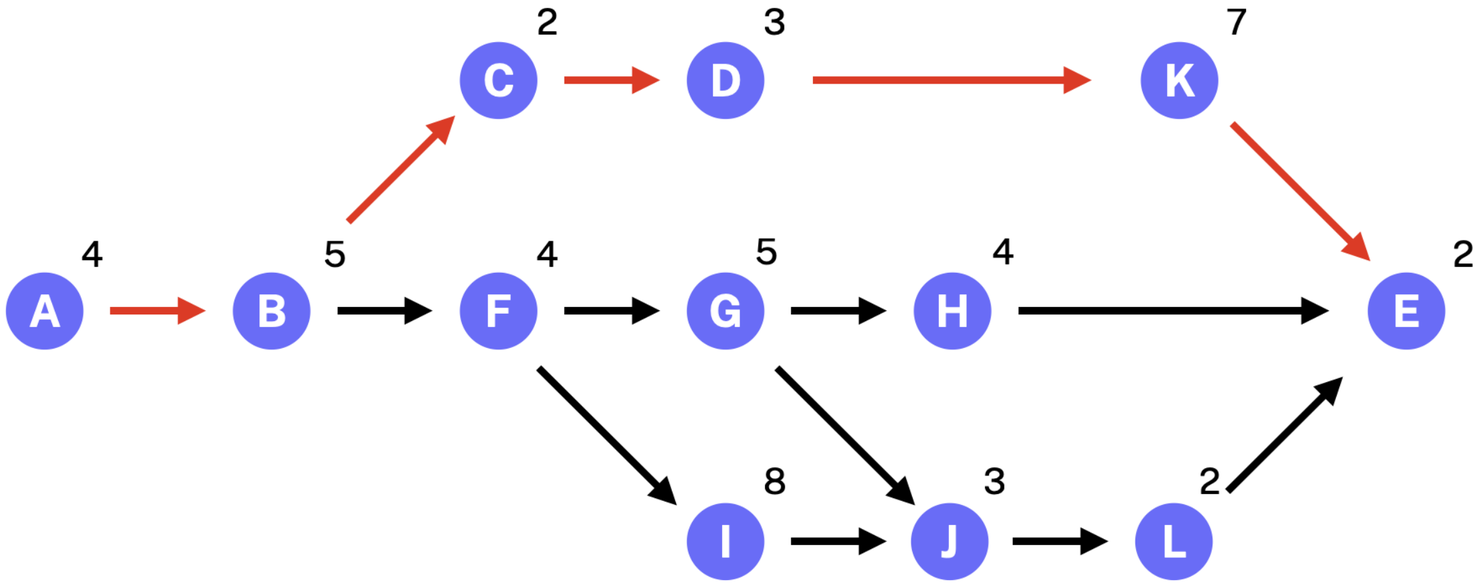

Watch the video

Click Here

Project Management

Table of Predecessors

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

Start with Day Zero

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Critical Path Analysis

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
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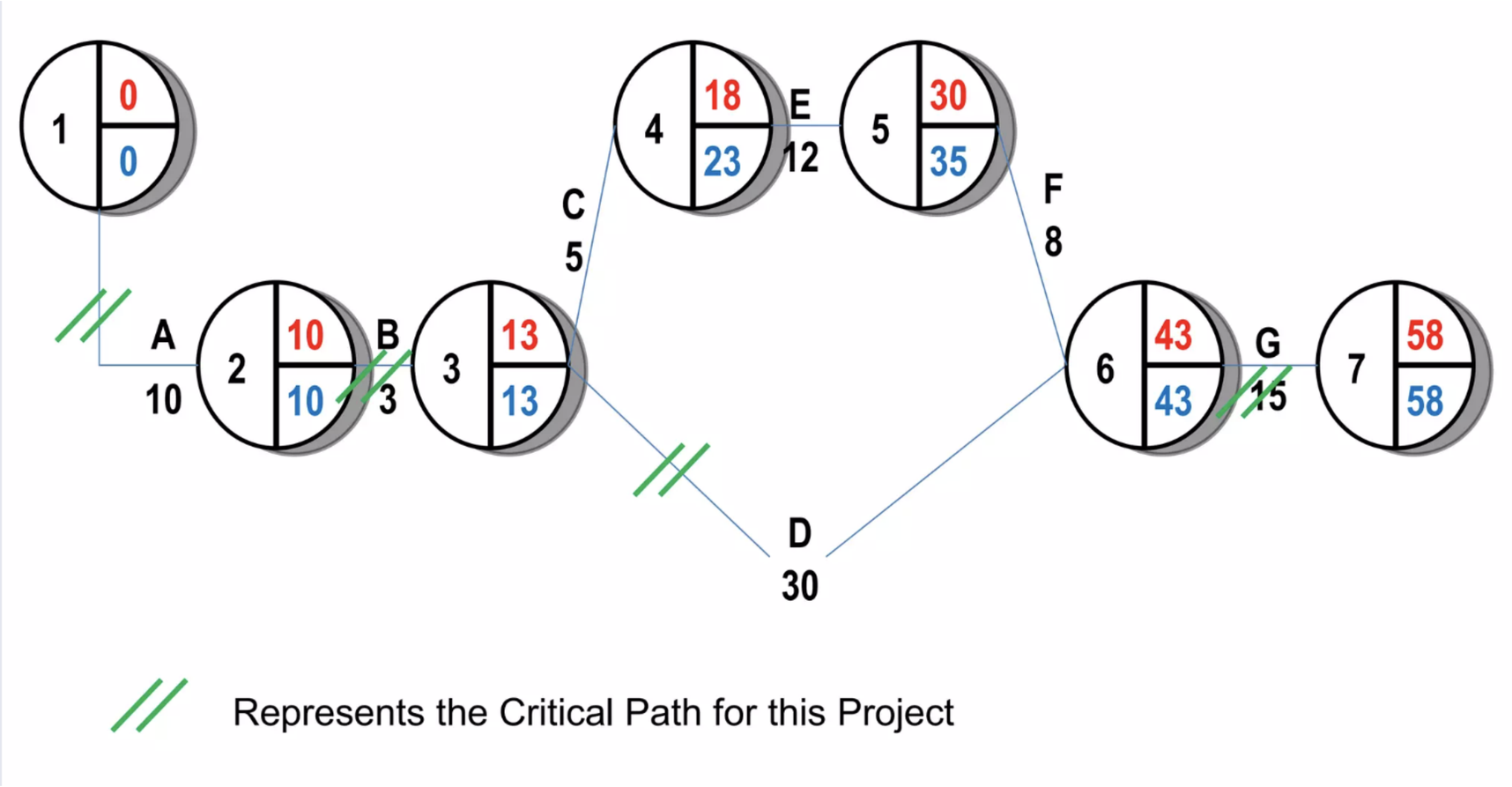
D	Procrastinate and browse Facebook	Completion of task B	30
E	Write revision plan & revision notes	Completion of task B & C	12
F	Practice past exam papers	Begin when E complete	8
G	Complete last minute cramming		15

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

Critical Path Analysis



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Critical Path Analysis

Task ID	Task Description	Task Predecessors	Task Duration (hours)
A	Project start		0
B	Buy materials for A	A	10
C	Buy materials for B	A	20
D	Build A	B, C	30
E	Build B	B, C	20
F	Polish and finish B	E	40
G	Join A and B	D, F	20
H	Project finish	G	0

- **Sketch the network diagram**
- **Determine the critical path**

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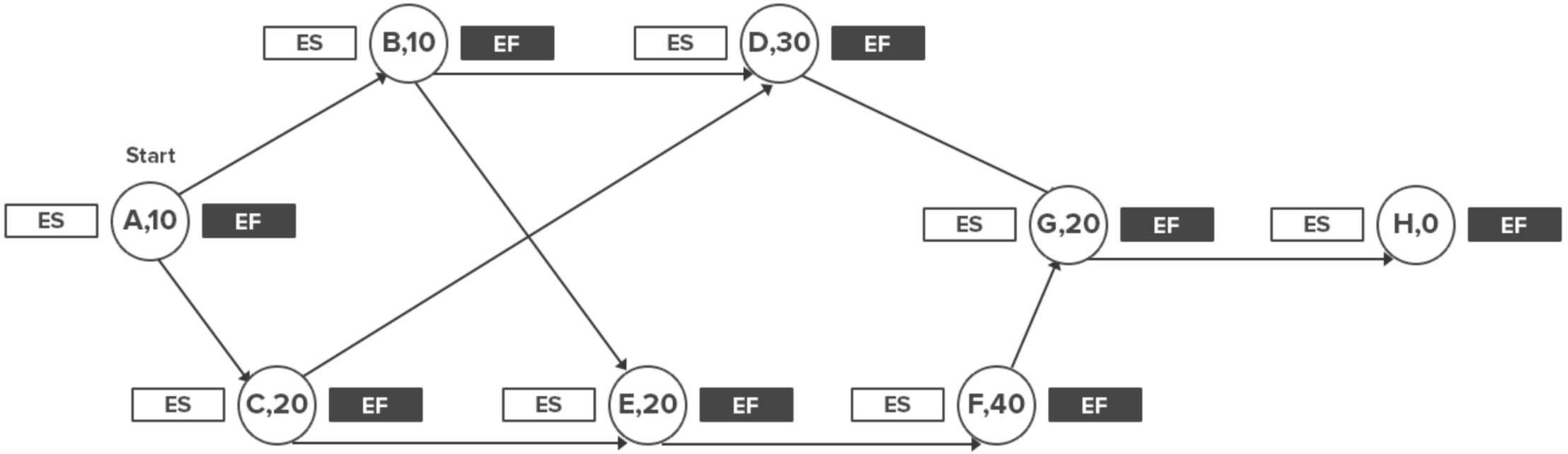
Critical Path Analysis



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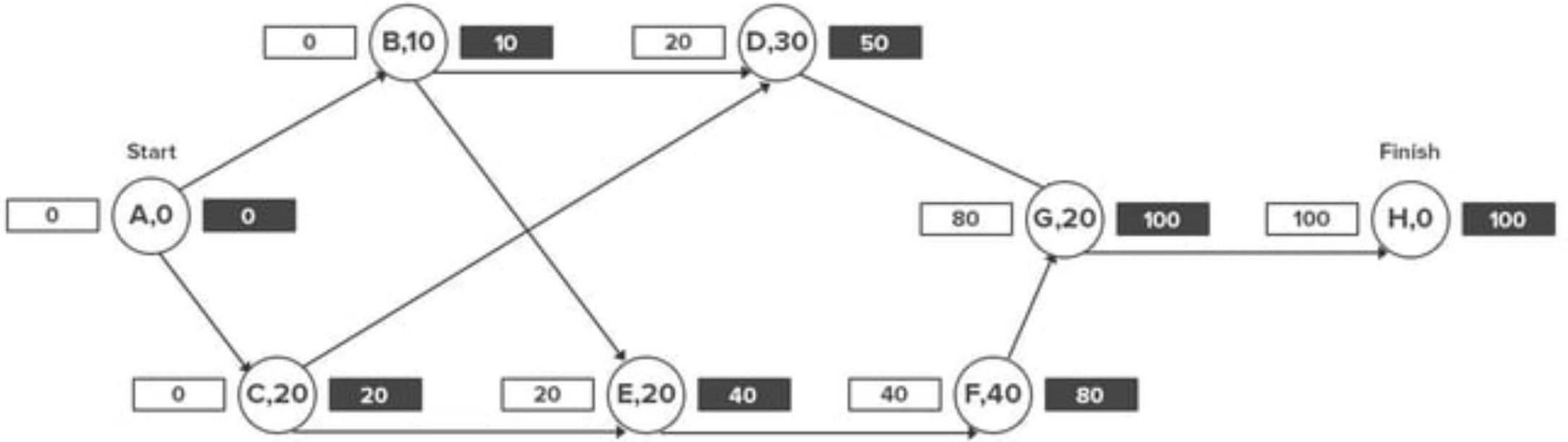
Critical Path Analysis



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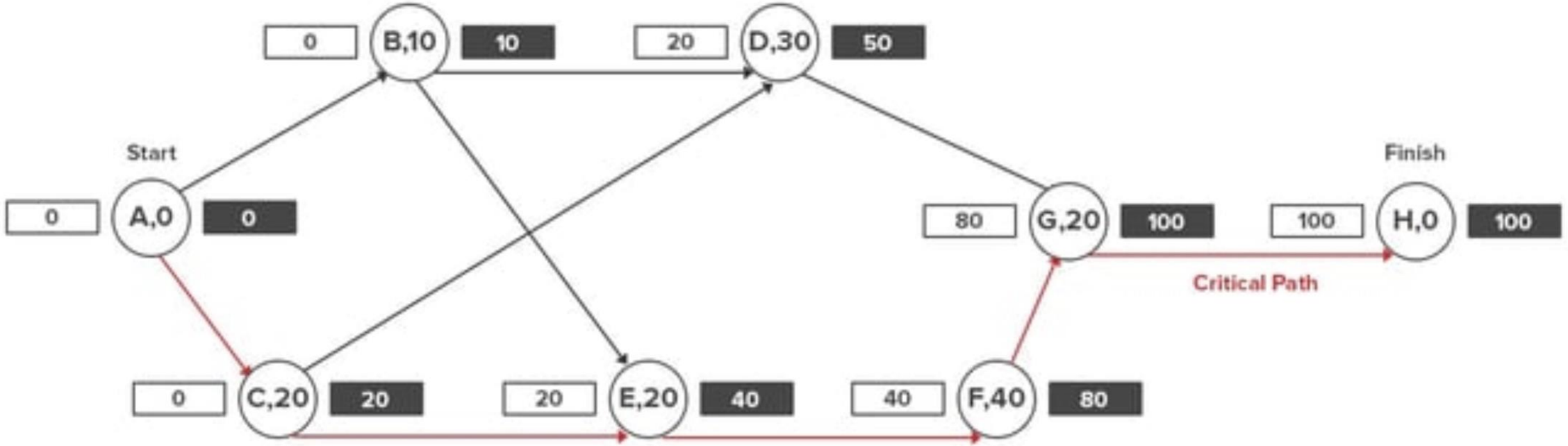
Critical Path Analysis



Critical Path Analysis

The importance of slack should not be understated. Calculating the float or slack of all activities in the project is crucial for better distribution of resources.

If an activity has a high float, you can divert its resources to a higher-priority task.

Generally speaking, high float activities will be lower down the priority list, while those on the critical path (aka ‘zero float’ activities) will get prime attention.

Measures to deal with such contingencies

1. Fast Tracking

Fast-tracking is the process of running multiple activities on the critical path in parallel in order to reduce overall project time.

Fast-tracking is only possible for activities that don't have "hard" dependencies, i.e. they don't depend completely on their predecessors to start.

For example, you need to dig the foundation before you can build the walls of a house. But while you're doing the digging, you can also buy bricks and mix the cement.

Thus, while "build walls" is dependent on "dig foundation", you can run "buy bricks" and "mix cement" in parallel to digging the foundation.

Measures to deal with such contingencies

2. Crashing

What if you need to rush an activity because of an early deadline?
In such a situation, you can allocate additional resources to the activity to bring it to completion faster.

This process is called 'crashing'.

Having a crash duration is useful in activities that:

Benefit from having additional resources, i.e., follow a linear relationship between resources and time to completion. Can utilize resources from activities with high floats. Since there is significant "slack" in these activities, you can delay them without jeopardizing the project.

Crashing is generally not recommended, barring emergencies, since it can impact activities on and outside the critical path. If you have to do it, however, divert resources from high-float tasks, not those on the critical path.

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Measures to deal with such contingencies

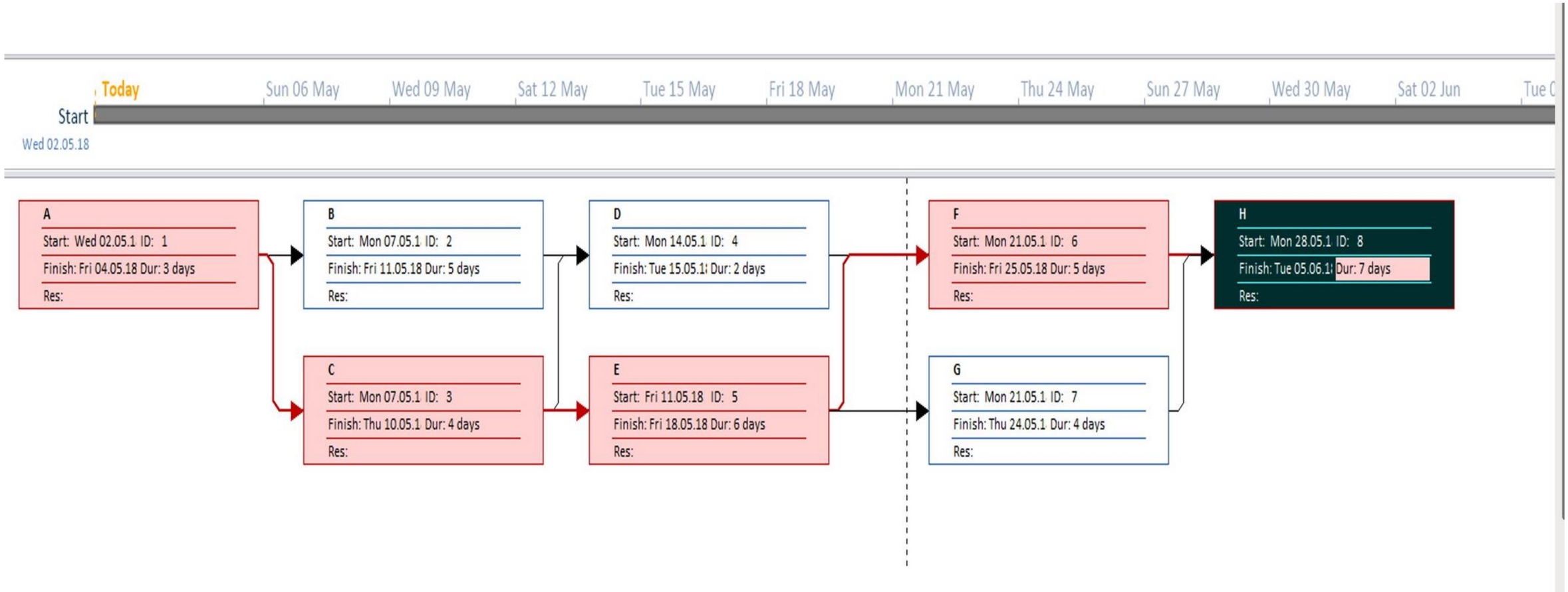
As an aspiring PM - there is another reason to understand the Critical Path Method: it is a core part of the PMP exam. You can’t hope to be a certified project management professional without a deep understanding of this method.

CPM vs PERT

PERT assumes that all tasks in a project are uncertain and uses a probability distribution to calculate the expected completion time for each task. This allows for the estimation of the project's overall duration - given the uncertainty in the individual tasks.

CPM, on the other hand, assumes that all tasks are well-defined and can be scheduled with certainty. It uses a mathematical algorithm to calculate the shortest path through a network of tasks, known as the critical path. This allows for the determination of the earliest possible completion date for a project and its latest allowable completion date.

Exercise: Diagram Network with MS Project



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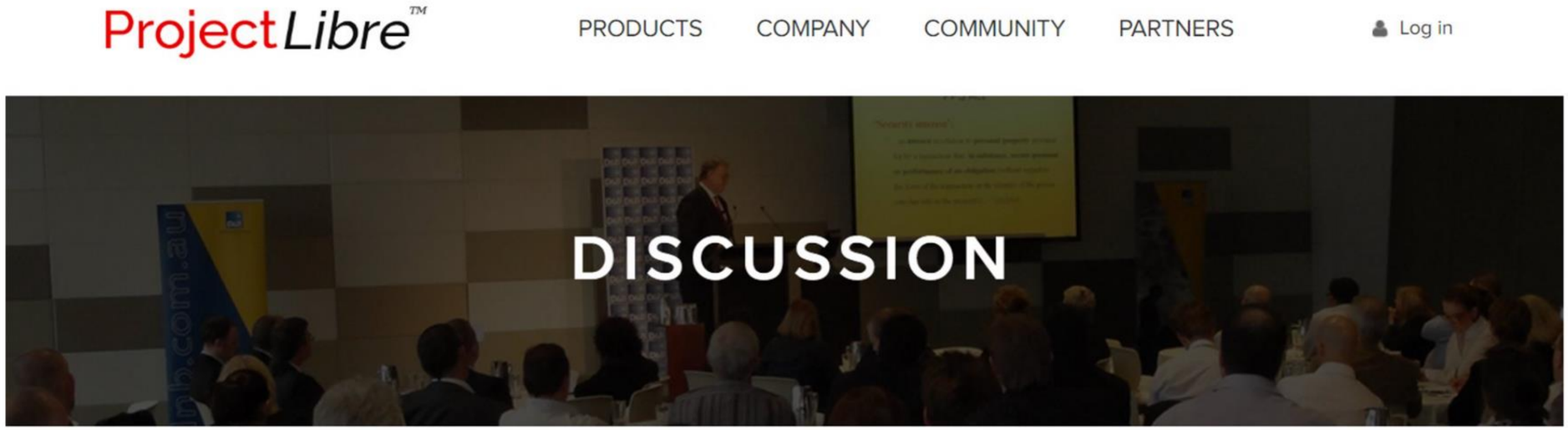
provides tools for project planning, scheduling, and management.



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https://youtu.be/1Ua-TV4vcBo?t=3

6.3 Resource estimate

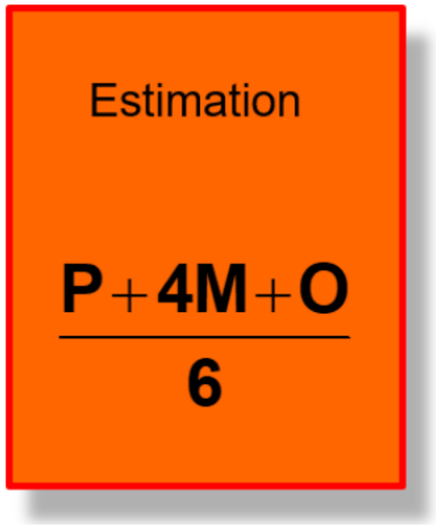
- **Estimate of resources (people, equipment or materials) needed to carry out each activity:**
  - **Resource identification (type, skills)**
  - **Quantities used**
  - **When these resources will be needed**
  - **When these resources will be available to carry out project activities**

6.4 Estimated duration

- **Process of approximation of duration or number of periods (days, weeks) to carry out individual activities with their resources**
- **The duration should be as credible and realistic as possible (do not accept filling)**
- **To estimate the duration, consider:**
  - **Level of difficulty of each activity**
  - **The experience of the organization in the execution of each activity**
  - **Availability and experience of the necessary resources**

6.4 Estimated duration

- **Rather than estimating the duration of an activity with a whole number (eg 4 weeks), it is often better to estimate at three levels.**
  - **Optimistic, pessimistic, realistic**



- **Iterative process: modify estimates over time to be closer to reality.**

6.4 Estimated duration

The formula (P + 4M + O) / 6 is used in the Program Evaluation and Review Technique (PERT) for project management. It calculates the estimated duration of an activity. Each of the three estimates is assigned a specific weight, and these weights sum to 6 in the formula.

Estimation

$$\frac{P+4M+O}{6}$$

- P (Pessimistic Time): **worst-case scenario or the maximum amount of time an activity might take.**
- M (Most Likely Time): **the most realistic estimate of the time an activity would take under normal conditions or typical circumstances.**
- O (Optimistic Time): **the best-case scenario or the minimum amount of time an activity might take.**

Class Example

You are tasked with managing the development of a mobile app for a client. The project involves various tasks, and one of the critical tasks is "***UI/UX Design and Prototyping***" for the app. You have collected the following time estimates from your team:

Pessimistic (P) estimate: 16 days
Most Likely (M) estimate: 10 days
Optimistic (O) estimate: 8 days

Using the PERT formula ((P + 4M + O) / 6), calculate the estimated duration for pouring the foundation.

Solution

Estimated Duration = (16 days + 40 days + 8 days) / 6
Estimated Duration = (64 days) / 6)
Estimated Duration = **10.67 days**

So, the estimated duration for the "UI/UX Design and Prototyping" task in the app development project, using the PERT formula, is approximately **10.67 days**.

This estimate takes into account both the optimistic and pessimistic estimates and provides a more balanced and probabilistic estimate for project planning and scheduling.

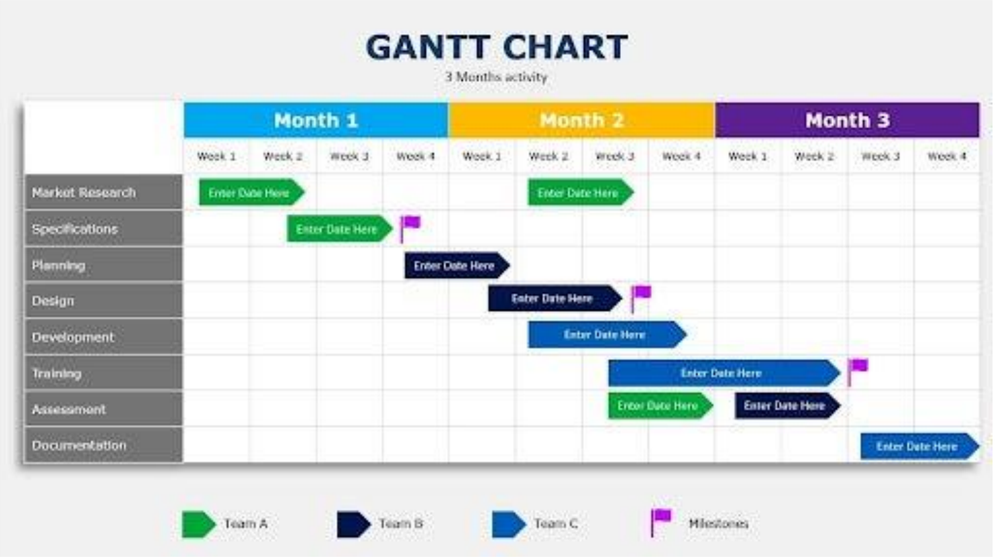
6.5 Preparation of the plan

- Analysis of activity sequences, durations, resource requirements and calendar constraints to create the project schedule.
- Iterative process
- Use project management software
- Important tools for developing the plan:
  - Gantt diagrams: temporal visualization of project activities
  - Critical path analysis: useful for controlling critical project times

Gantt Chart

A visual representation of a project schedule that displays tasks, activities, and their respective timelines.

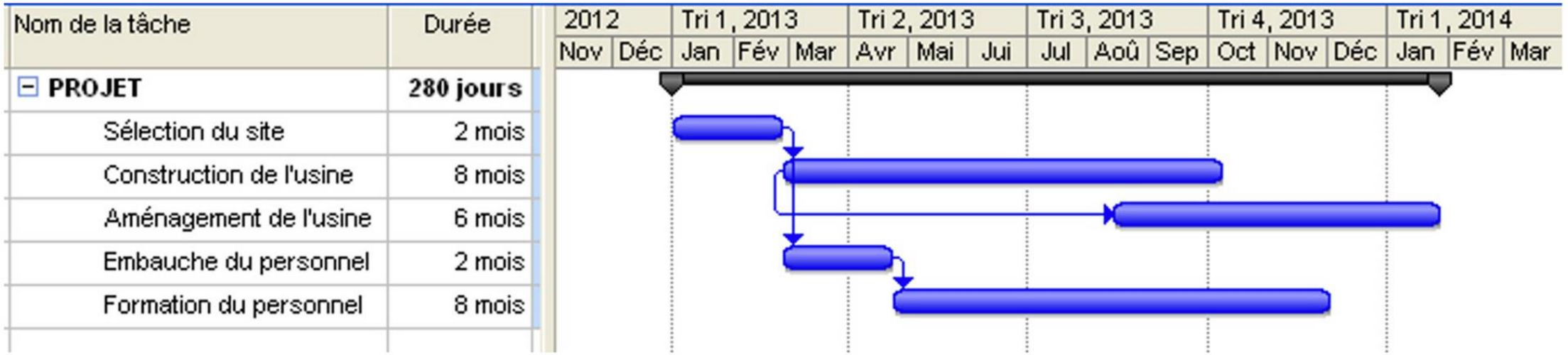
- Tasks are listed on the left side.
- The timeline runs horizontally from left to right.



Project Management

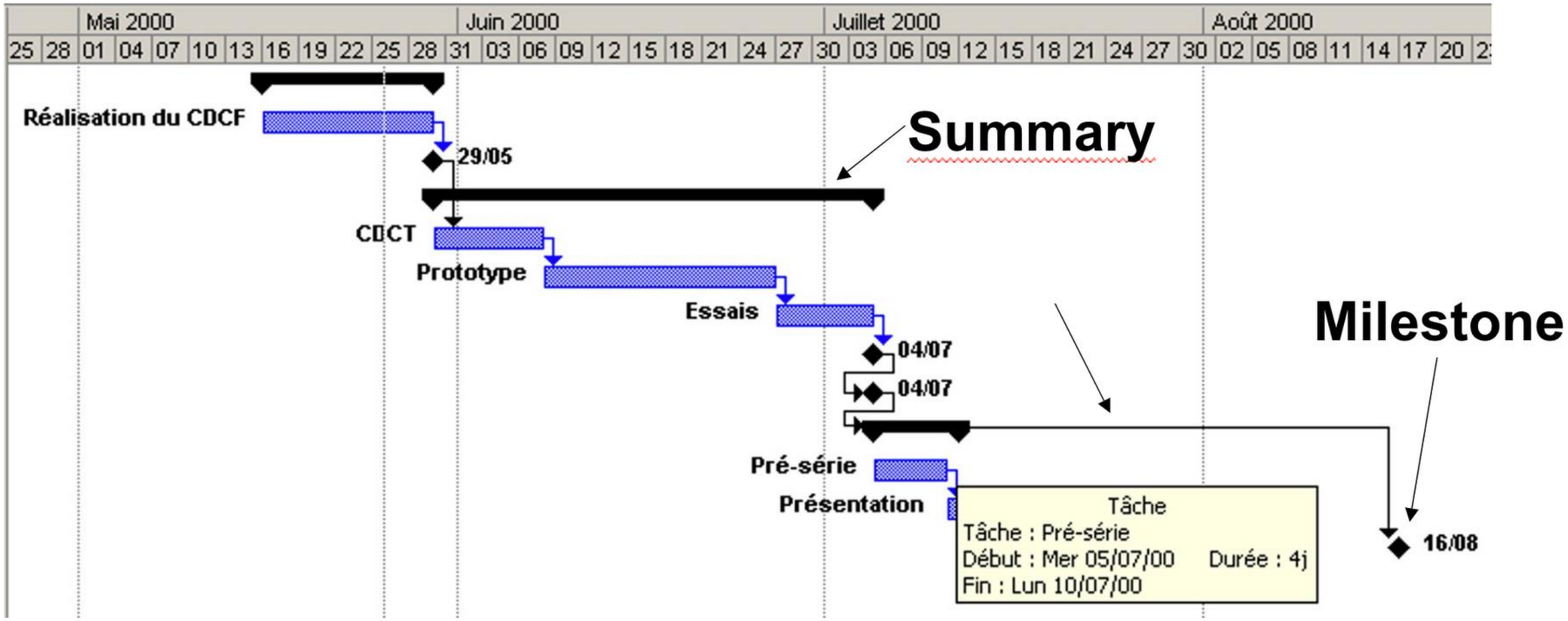
Gantt chart

- **Timescale**
- **User-friendly view and life to the project plan**
- **Dependencies between phases and tasks**



Project Management

Gantt chart

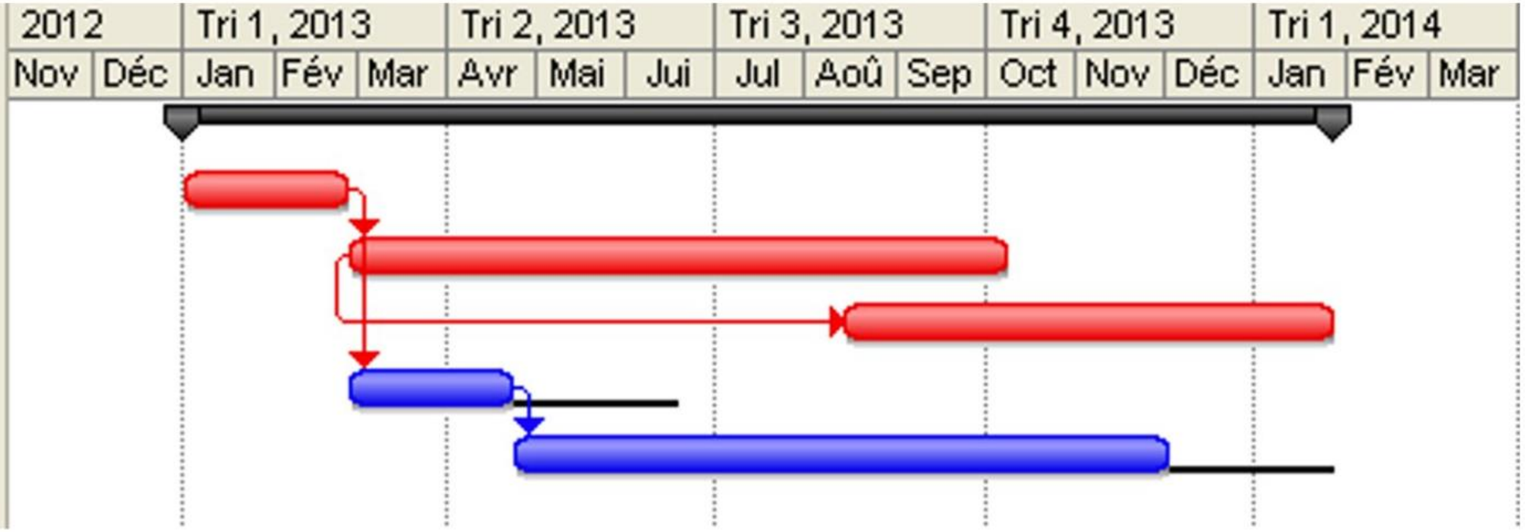


Project Management

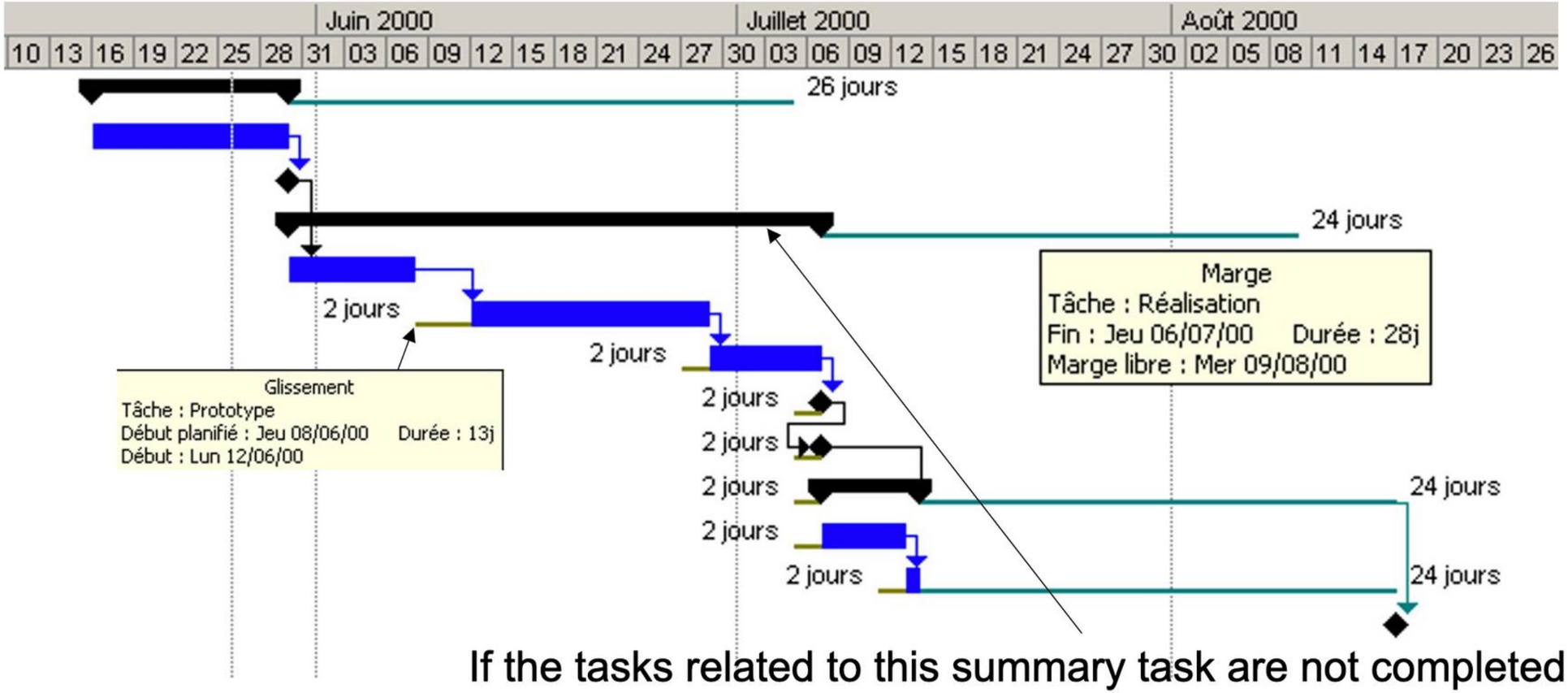
Gantt chart

Allows you to quickly determine and visualize the critical path.

Nom de la tâche	Durée
PROJET	**280 jours**
Sélection du site	2 mois
Construction de l'usine	8 mois
Aménagement de l'usine	6 mois
Embauche du personnel	2 mois
Formation du personnel	8 mois

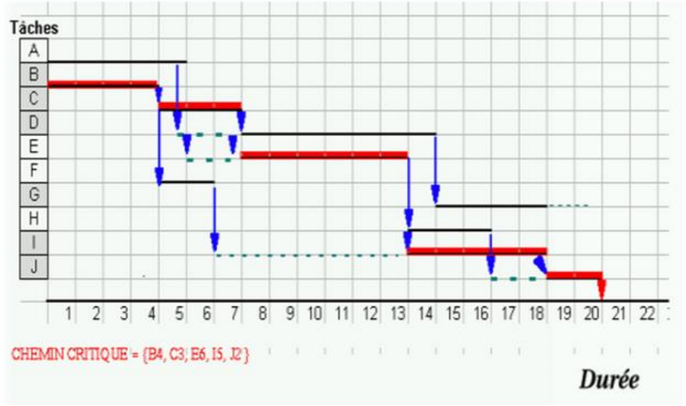


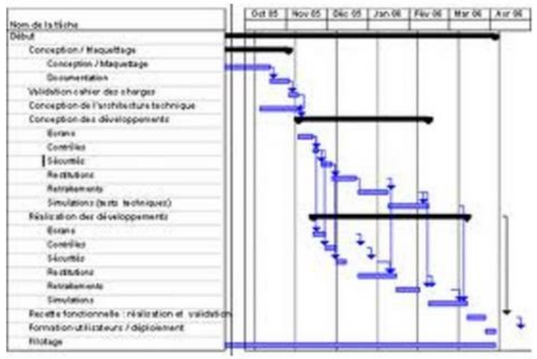
Float or Slack (Mou in French)

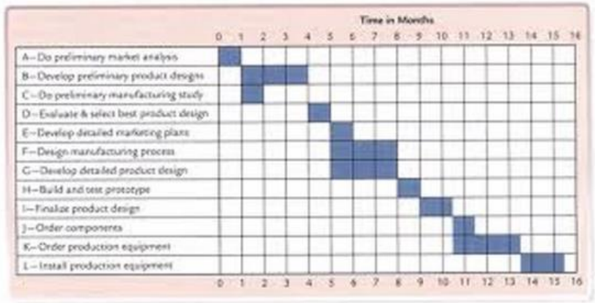


If the tasks related to this summary task are not completed before 09/08, then the project will be late ...

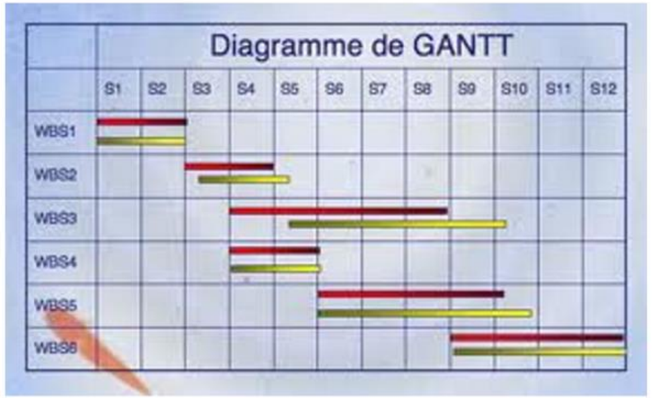
Project Management

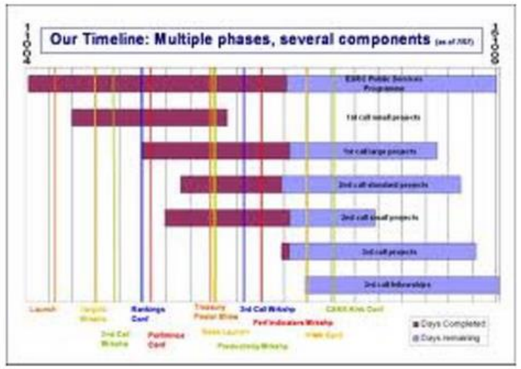






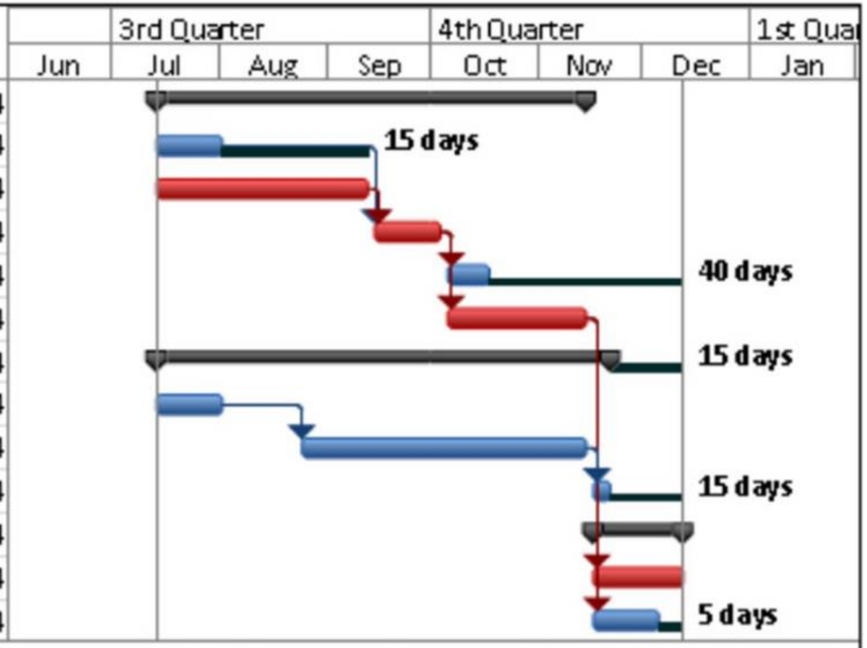
Various tools, various representations



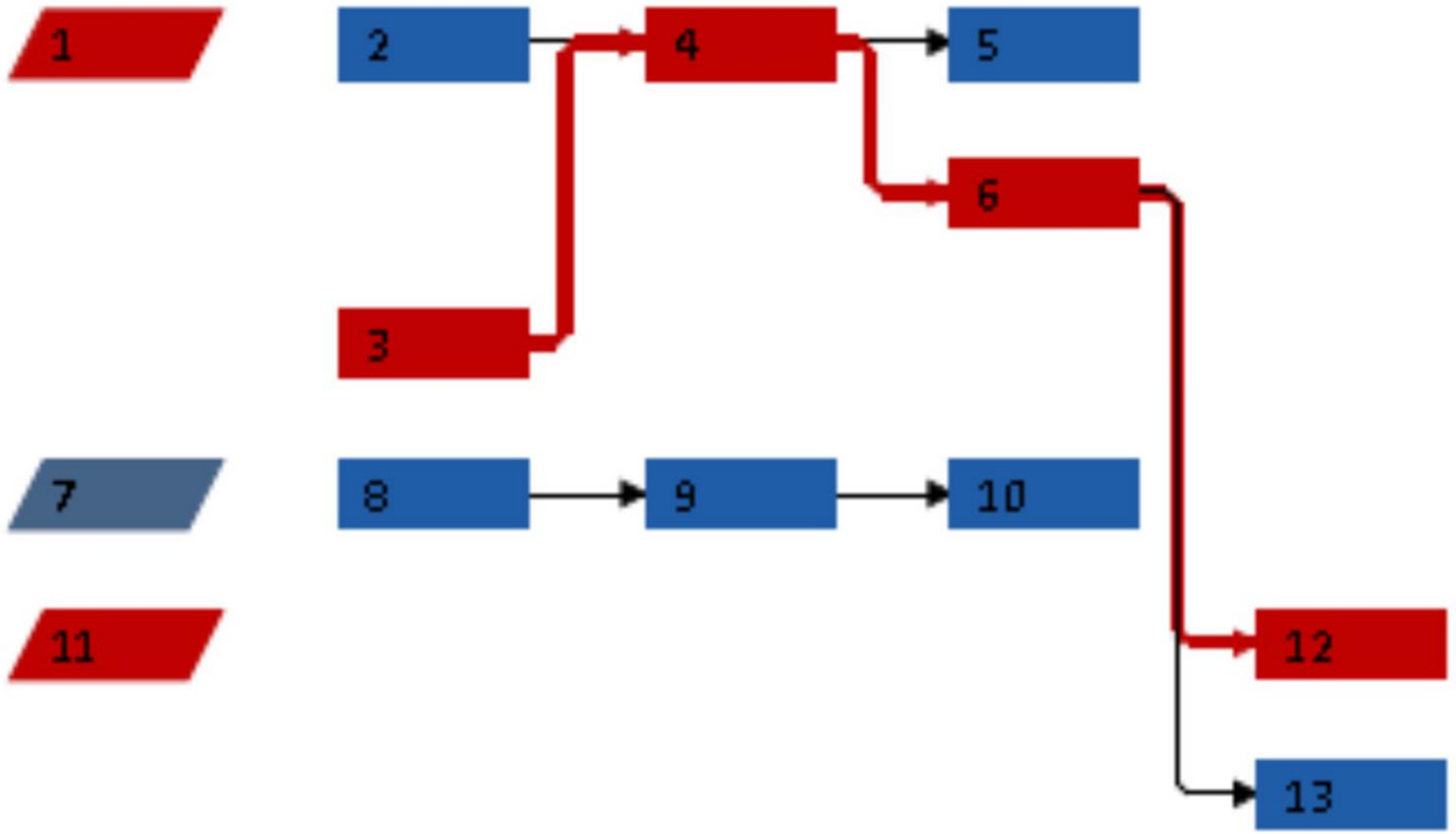


Project Management

ID	Task Mode	Name	Leveling Delay	Duration	Start	Finish
1		**Développement**	**0 edays**	**75 days**	**Mon 14/07/14**	**Fri 14/11/14**
2		Construction bancs d'éss	0 edays	15 days	Mon 14/07/14	Fri 01/08/14
3		Etudes de conception	0 edays	30 days	Mon 14/07/14	Fri 12/09/14
4		Fabrication prototypes	0 edays	15 days	Mon 15/09/14	Fri 03/10/14
5		Essais amortissement	0 edays	10 days	Mon 06/10/14	Fri 17/10/14
6		Essais endurance	0 edays	30 days	Mon 06/10/14	Fri 14/11/14
7		**Prospection**	**0 edays**	**80 days**	**Mon 14/07/14**	**Fri 21/11/14**
8		Création fichier prospect	0 edays	15 days	Mon 14/07/14	Fri 01/08/14
9		Prospection test	0 edays	60 days	Mon 25/08/14	Fri 14/11/14
10		Rédaction plaquette, pul	0 edays	5 days	Mon 17/11/14	Fri 21/11/14
11		**Industrialisation**	**0 edays**	**20 days**	**Mon 17/11/14**	**Fri 12/12/14**
12		Ordonnancement	0 edays	20 days	Mon 17/11/14	Fri 12/12/14
13		Mise en place sous-traita	0 edays	15 days	Mon 17/11/14	Fri 05/12/14



Project Management



CPM vs Gantt Chart

If you need to track complex task dependencies and want a more detailed view of the project timeline then the ***Critical Path Method*** is the better choice. If you just need a simple way to track progress and don't need every detail, then ***Gantt Chart*** may be a preferred option.

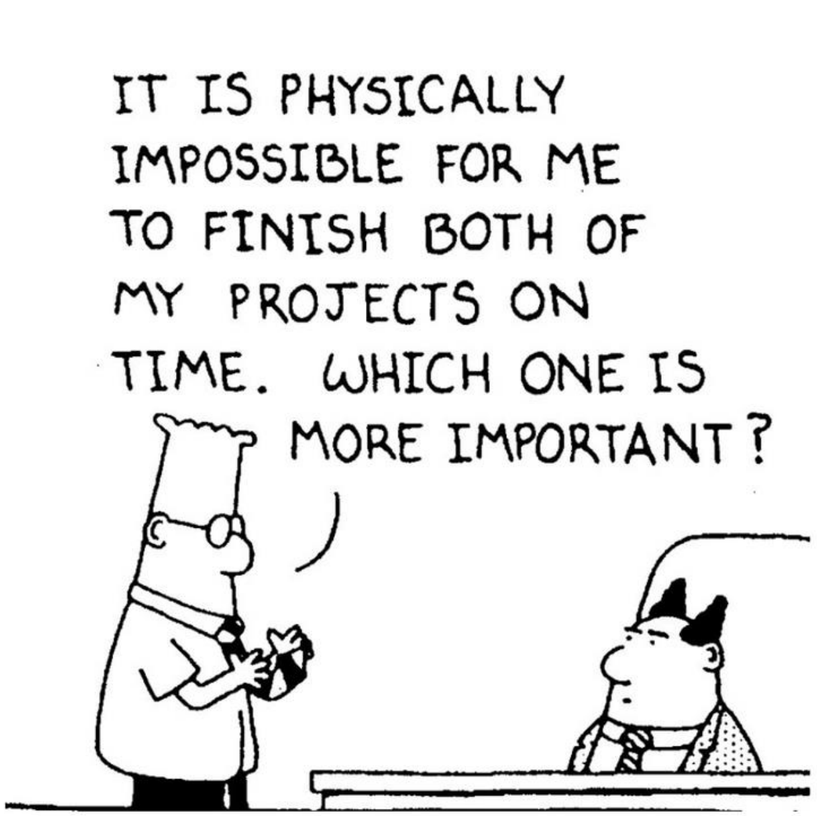
In addition, the ***Critical Path Method*** should be used when you need to accurately predict the length of a project and when there are multiple dependencies between tasks. ***Gantt charts*** are best suited for projects where changes occur frequently, and you need to be able to quickly adapt to those changes.

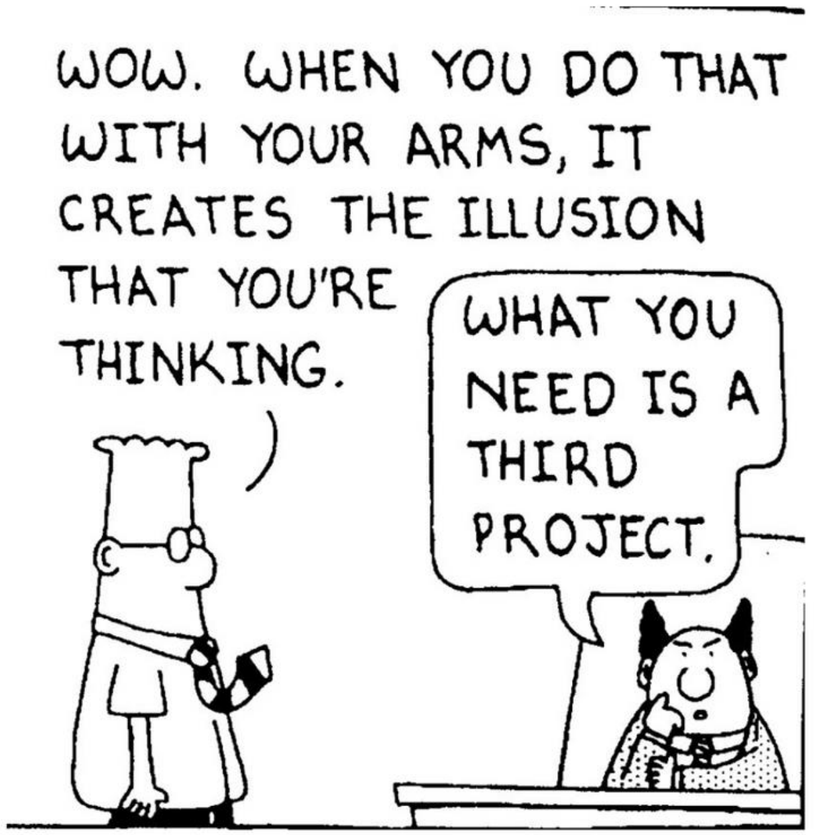
5.6. Control of the Plan

- Periodic progress reports
- Various performance measures
- Plan for the unexpected
- Alert management in case of problems

Project Management is

…





… a Balancing Act

Cost Management

Cost Management

- The process of estimating, budgeting, and controlling costs so that the project can be completed within the approved Initial Budget

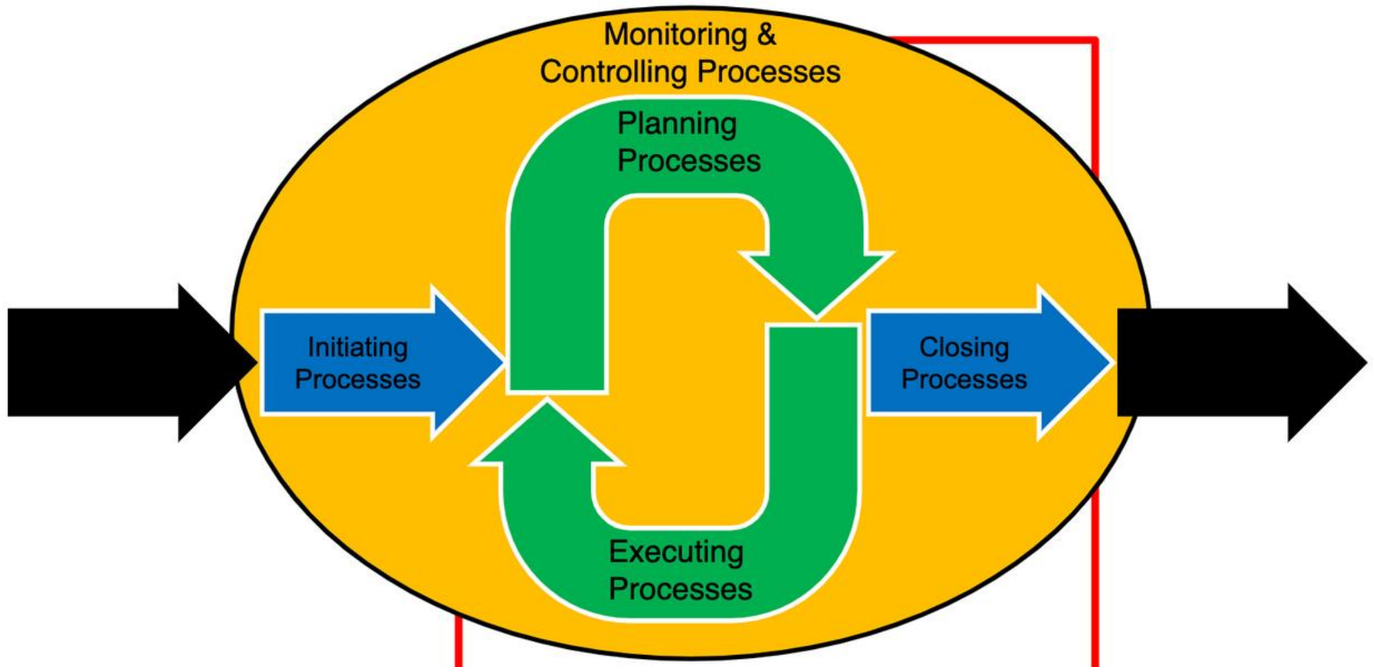
- Value Analysis (value engineering): looking for less expensive ways to do the same job with the same content.

- Law of diminishing returns: It is not by adding twice as many resources for a task that one can accomplish this task at half the time.

Objectives of the module

- Understand the importance of cost management for a project to measure its performance
- Understand cost estimation techniques and budget preparation
- Master the use of the EARNED VALUE technique to control the cost of a project.

Project Management



Knowledge Area	Process				
	Initiating	Planning	Executing	Monitoring & Contol	Closing
Cost		Cost Estimate Preparation of the project budget		Control cost	

Types of costs

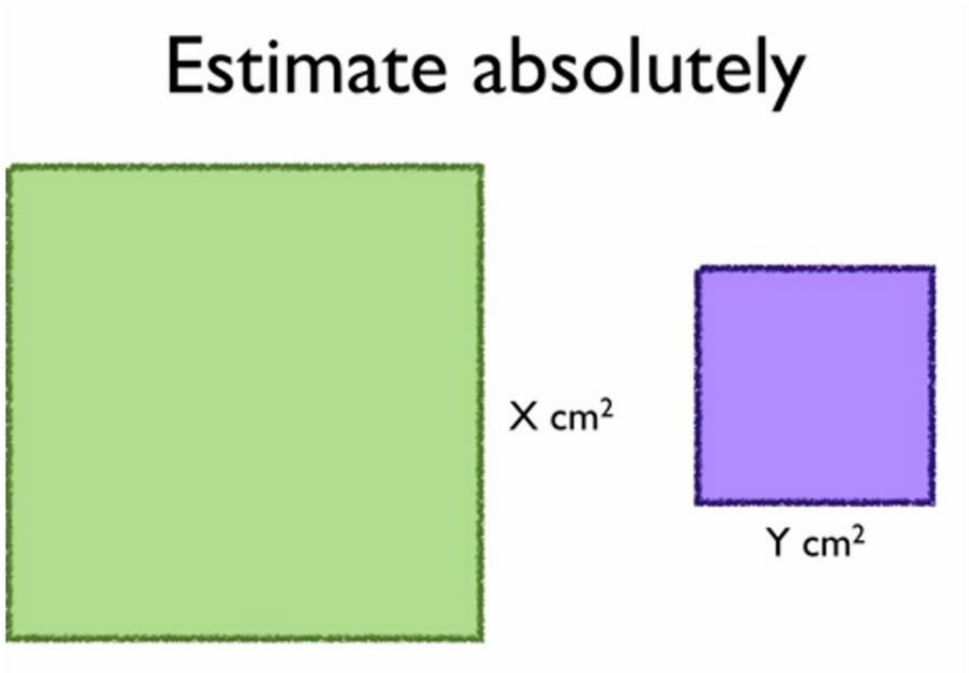
- **Variable costs**
  - are proportional to the amount of work for example hours spent in labor costs, materials, supplies.
- **Fixed costs**
  - Do not change with volume changes e.g. start-up costs, setting up, renting an office space
- **Direct costs**
  - Directly attributable to the work of the project e.g. travel of team members, recognition awards, team salaries.
- **Indirect costs**
  - Overheads or costs incurred for the benefit of more than one project such as taxes, social security charges, business services, marketing, electricity etc.

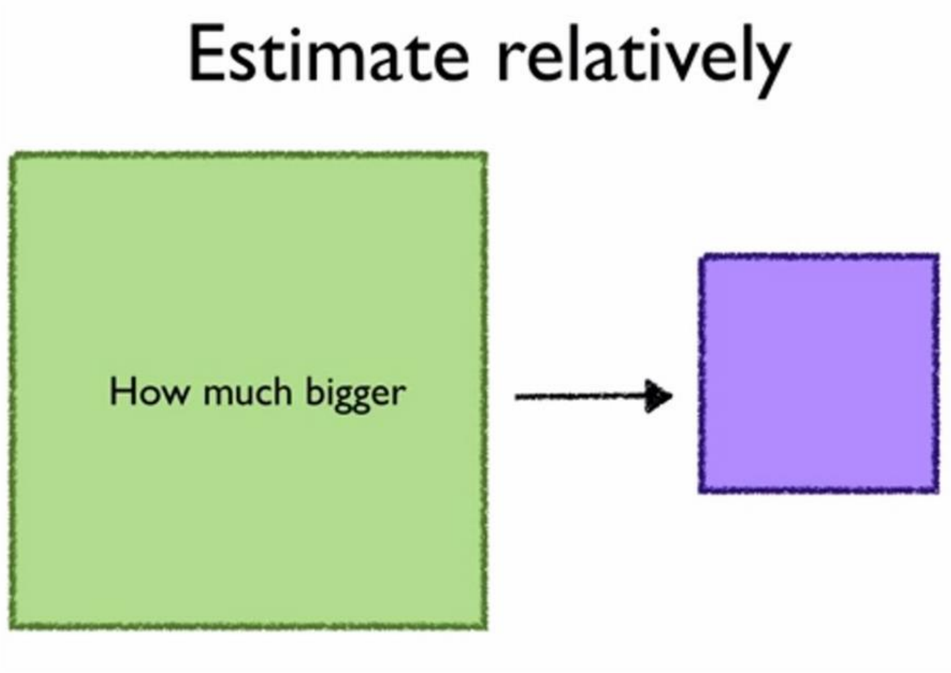
Quality and accuracy of the cost estimate

Estimate	Accuracy
Rough order of Magnitude (ROM)	+/- 50%
Budgetary Estimate	+/- 10%
Final Estimate	+/- 5%

- The most difficult to estimate because very little information about the project is available during the project initiation process
- Used to finalize the authorization request and to establish a commitment made during the planning phase
- During the project. Used to establish the initial Estimated Budget. Refined and updated during the project

Estimation





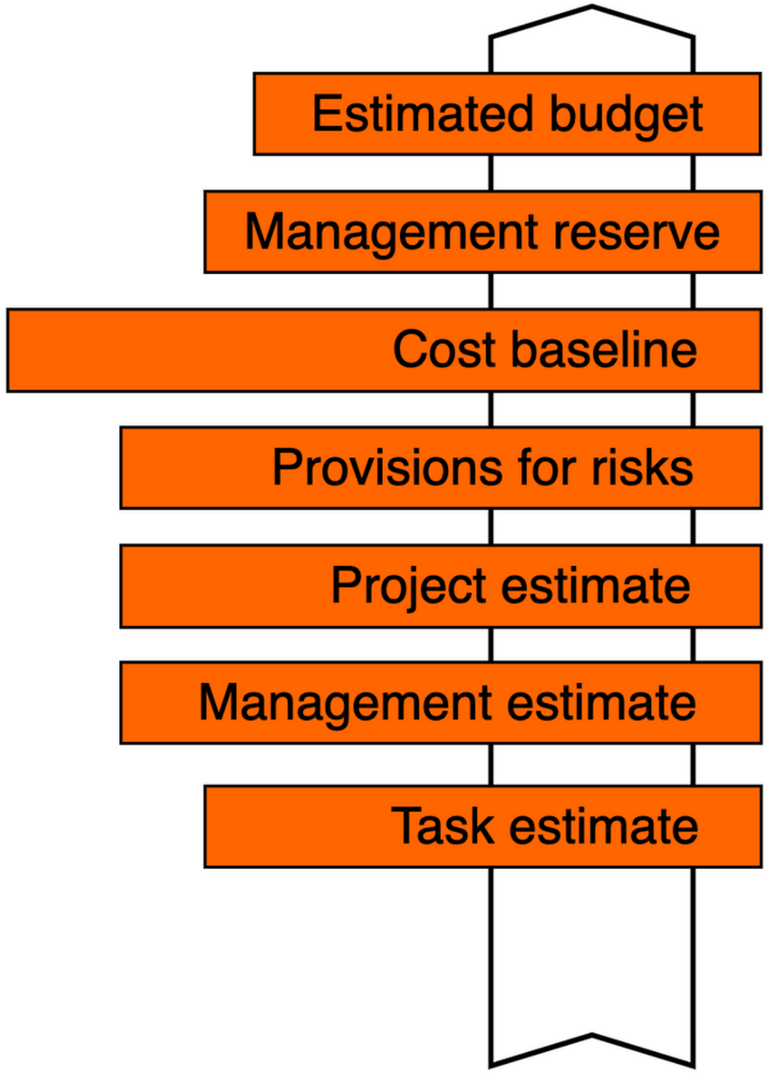
Estimate Type	Precision	Data Requirements	Typical Use	Certainty	Stage
Estimate Absolutely	High	Detailed	Well-defined, routine	More certain	Later
Estimate Relatively	Lower	General	Broad categories, early	Less certain	Initial

Estimating methods

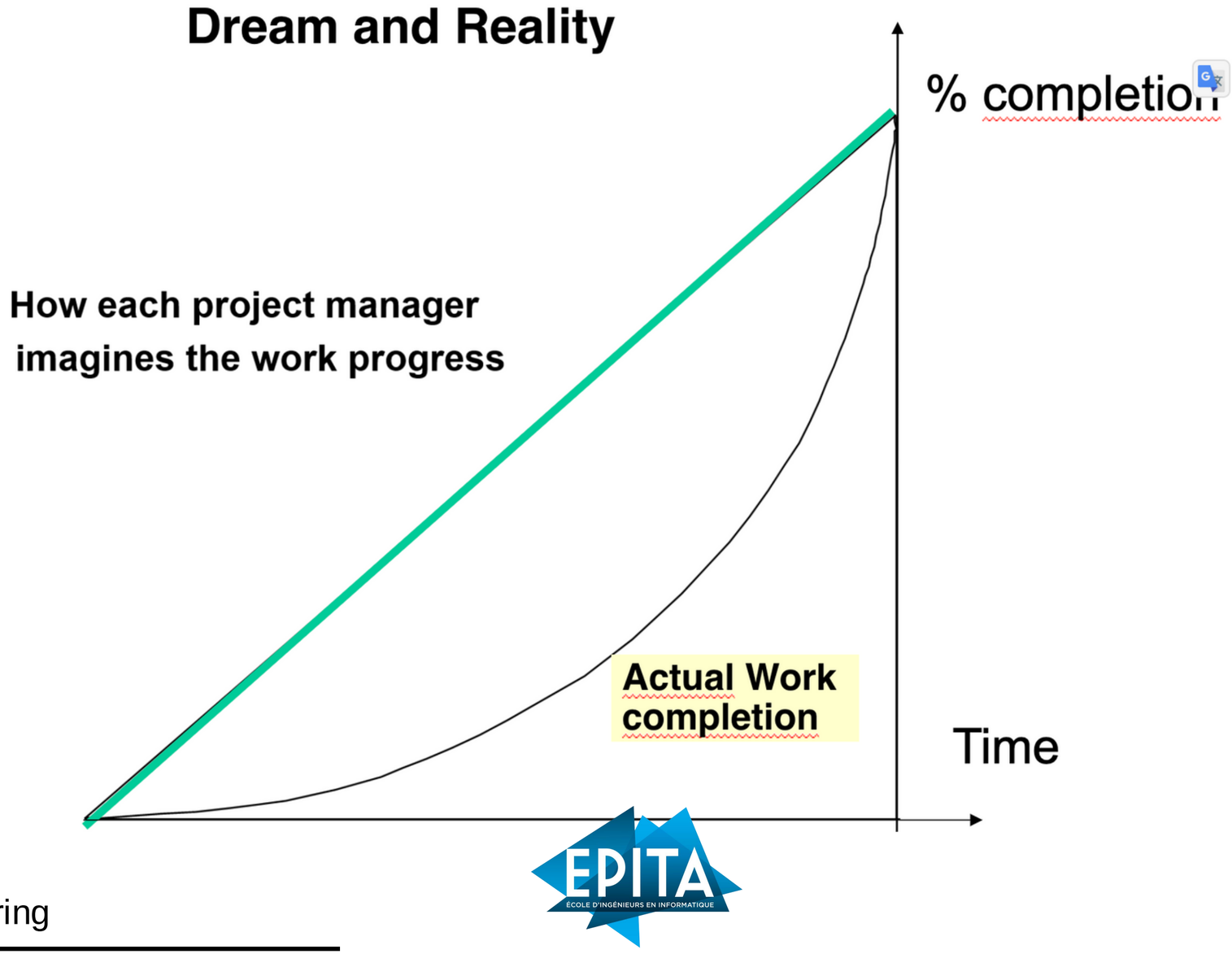
- **Estimate by analogy**
  - Uses the Actual cost of similar past projects as a basis for estimating the cost of the current project
- **Ascending estimate**
  - Estimate the cost of the detailed activities (WBS work breakdown structure) then total by level
- **Expert judgment**
  - Involves an expert who will most often apply the analogical method informally
- **Delphi**
  - Involves several experts and helps to organize the confrontation in order to bring them to a consensus while limiting the mutual influences
- **Analysis of suppliers' offers**
  - Tender and Bid Process. The estimates obtained are used to determine costs.

Costs consolidation

- Provisions for risks are important for budget preparation
  - Provisions for risk included in the baseline
    - Known unknowns (contingency reserve)
  - Management reserve: additional funds to cover unforeseen circumstances or certain changes
    - Unknown unknowns (discretionary reserve)

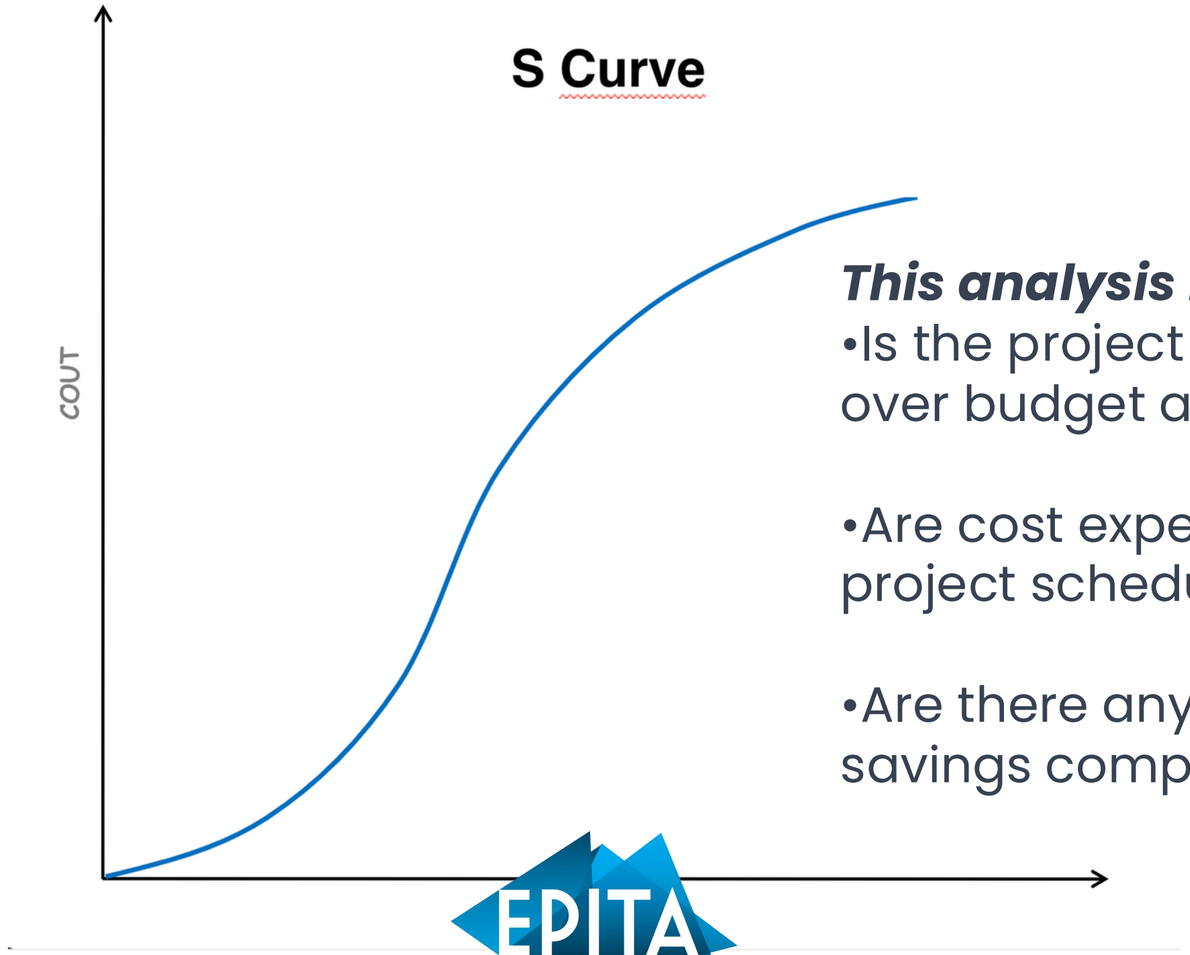


Project Management



Project Management

S curve analysis offers a clear visual representation of a project's financial performance over time to monitor costs, identify variances, make informed decisions.



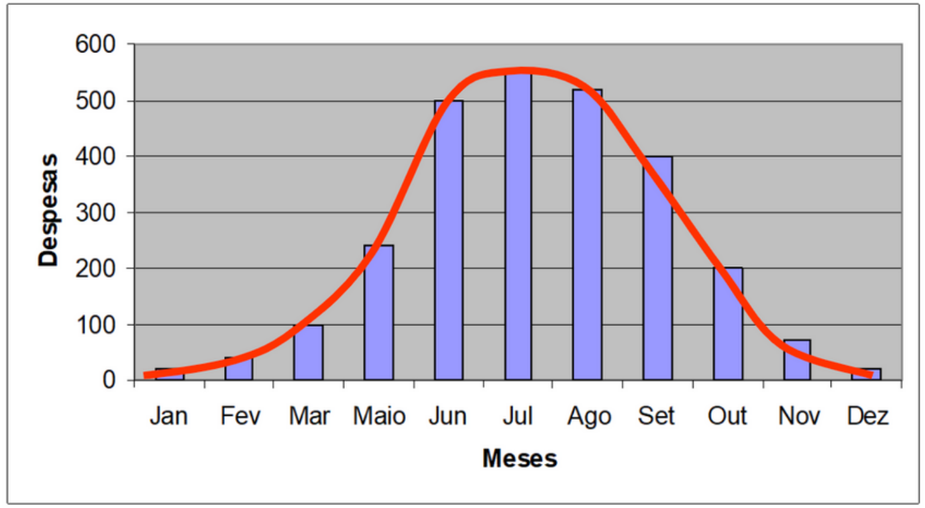
This analysis helps answer questions like:

•Is the project on budget, under budget, or over budget at a particular point in time?

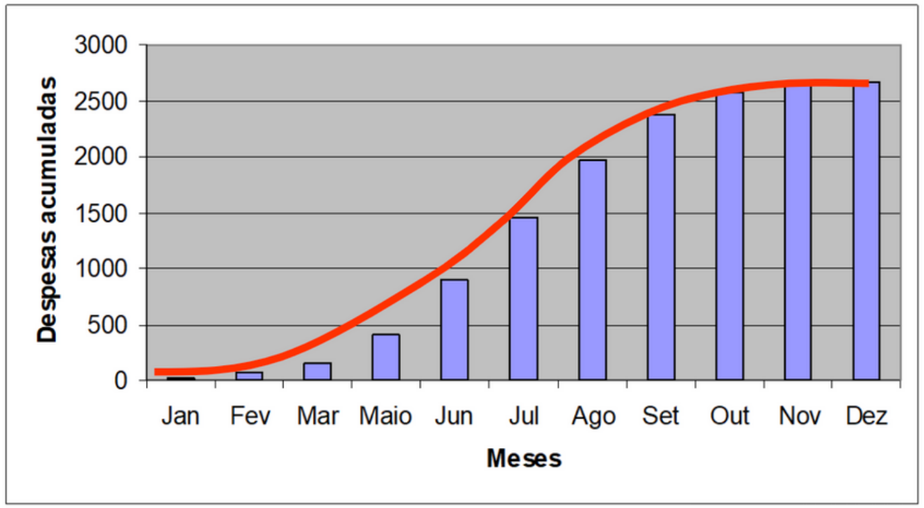
•Are cost expenditures in line with the project schedule?

•Are there any cost overruns or cost savings compared to the baseline?

S Curve



Spend by month



Cumulated spend

Exercise

- Trip of 300 km (mission) in 3 hours consuming 30 liters of gasoline (resources). After one hour we traveled 120 km and consumed 14 liters. What is the gap compared to the plan?
  - We did 20 km more than expected in one hour (achievement variance).
  - We consumed 4 liters more than expected for one hour (consumption gap).
  - In fact, for 120 km we had planned to consume 12 liters.
  - So we are 20 km ahead but we consumed more than expected.

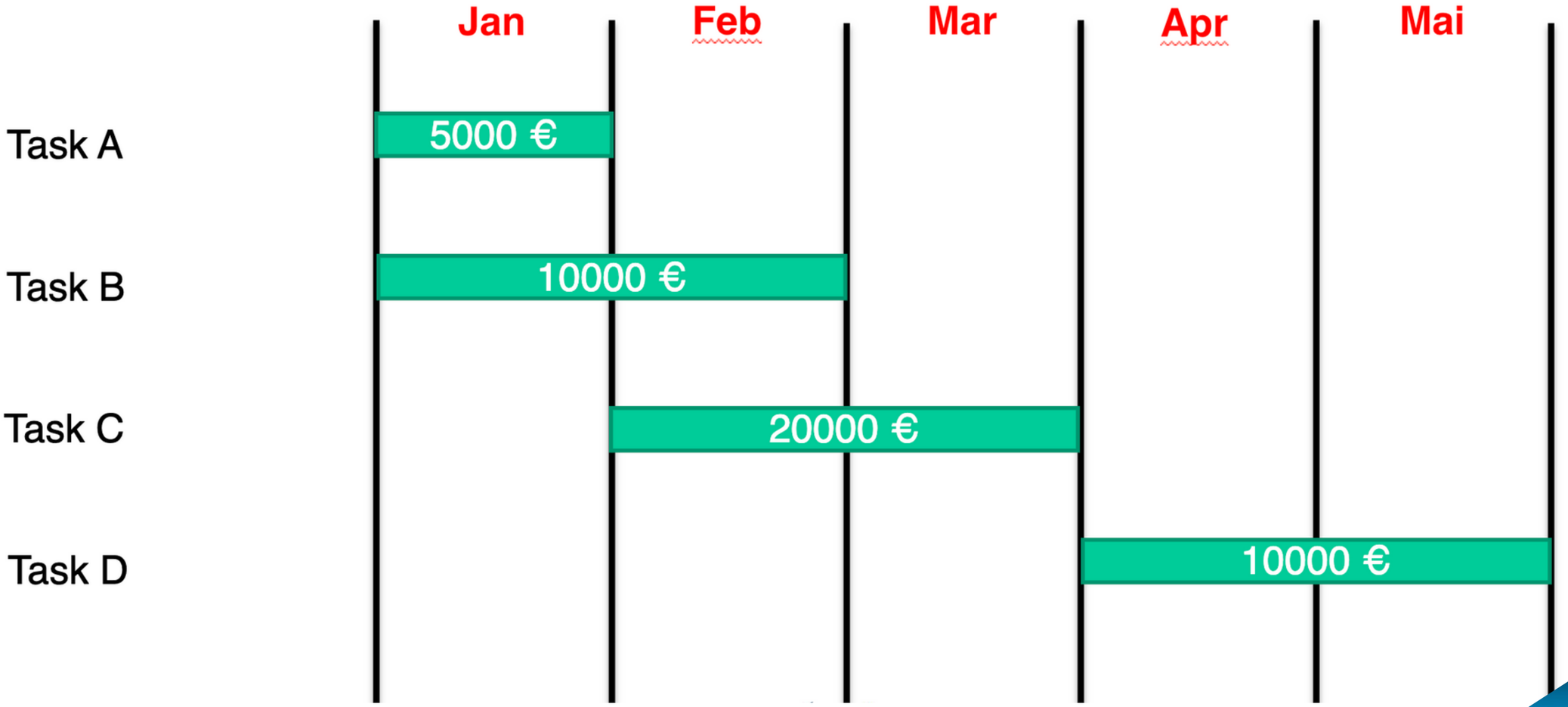
Three basic values

- **Planned value (PV)**: budgeted amount to complete an activity. This is the project's budget.
  - Total budget for an activity,
  - Cumulative budget for an activity at a given time

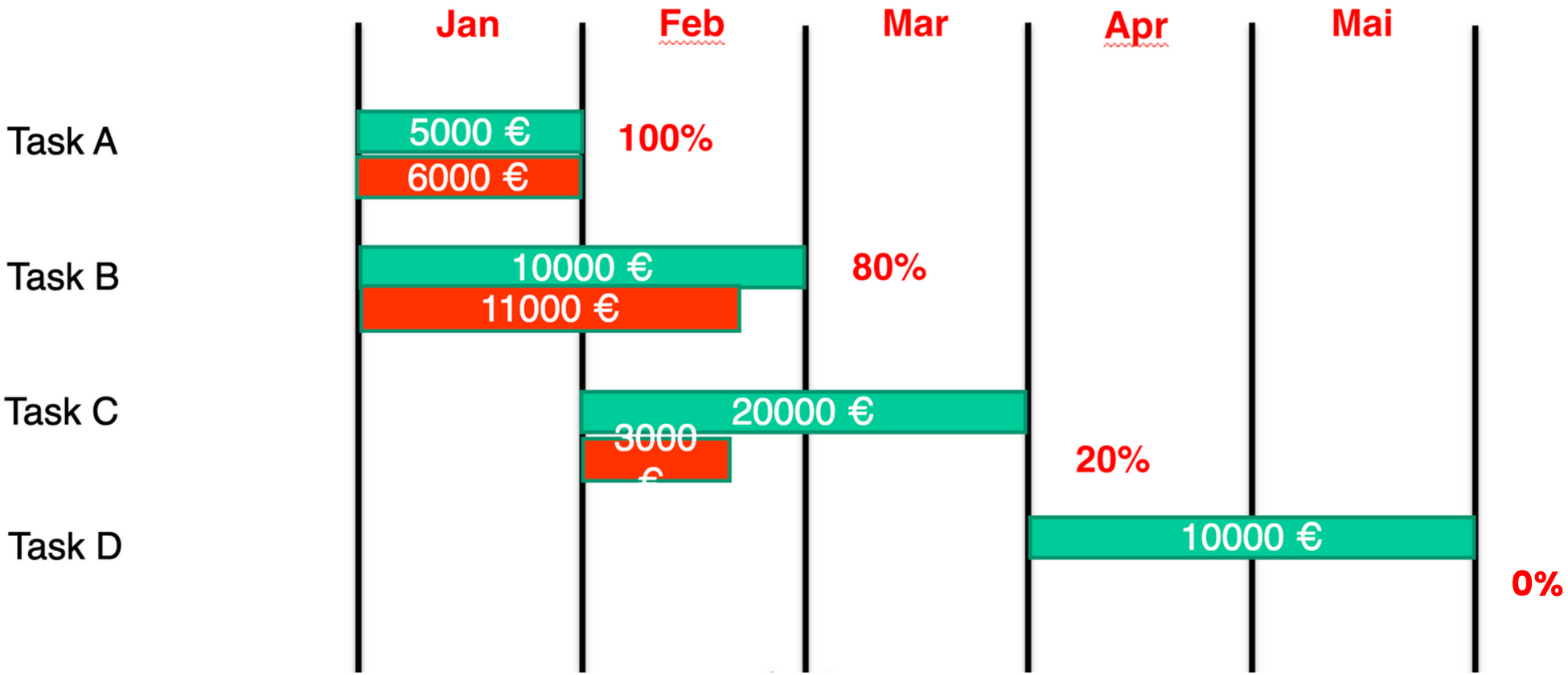
- **Actual cost (AC)**: Actual cost to perform the work, costs incurred on the project.

- **Earned Value (EV)**: The amount of budgeted work actually done for a task in a given period.
  - Calculation: Planned value * percentage of completion

Another exercise



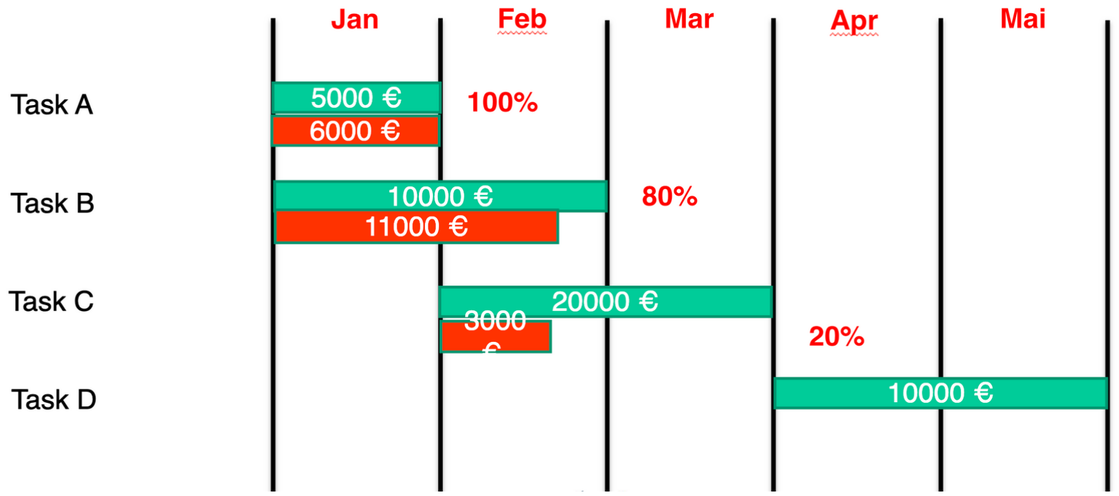
Project Management



Project Management

- **End of February, we had planned**
  - 5000+10000+(1/2*20000)=25000
  - This is what we had planned
- **We spent**
  - 6000+11000+3000=20000
- **BUT TO DO WHAT ?**
- **We have earned in value**
  - 100%*5000+80%*10000+20%*20000 = 17000

That is authorized work that has been completed so far.



- **Planned Value 25000 €**
- **Actual costs 20000 €**
- **EARNED VALUE 17000 €**

EARNED VALUE Management

Earned Value (EV) represents the *budgeted value of work actually performed* **as of the status date;** not just the work that was *planned* to be finished by then.

Further speaking…

Planned Value (PV) → what we *intended* to complete by end of Feb

Earned Value (EV) → what we *actually* completed with the work done so far.

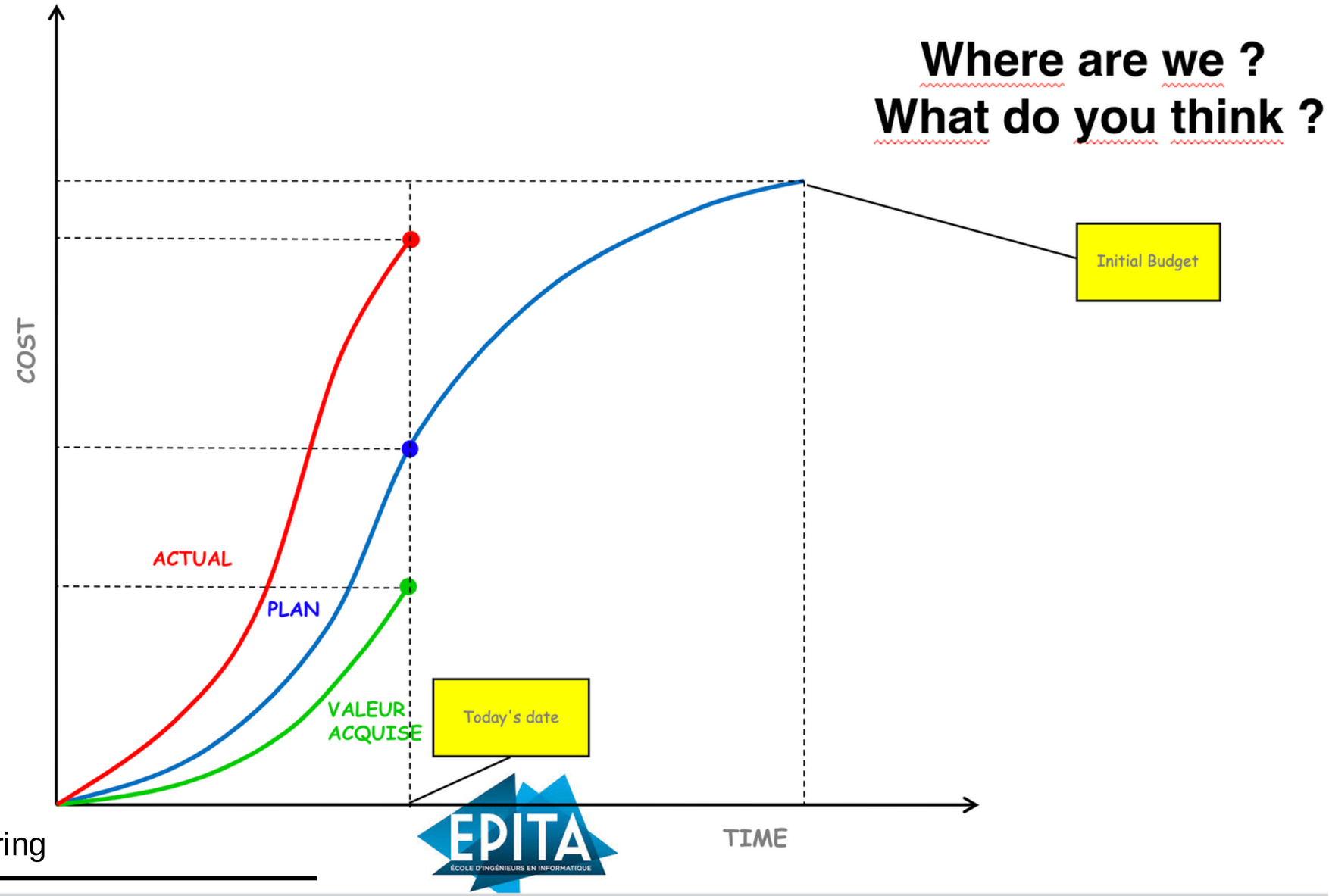
PMI rule:

"EV is credited when work is performed, regardless of when it was planned."

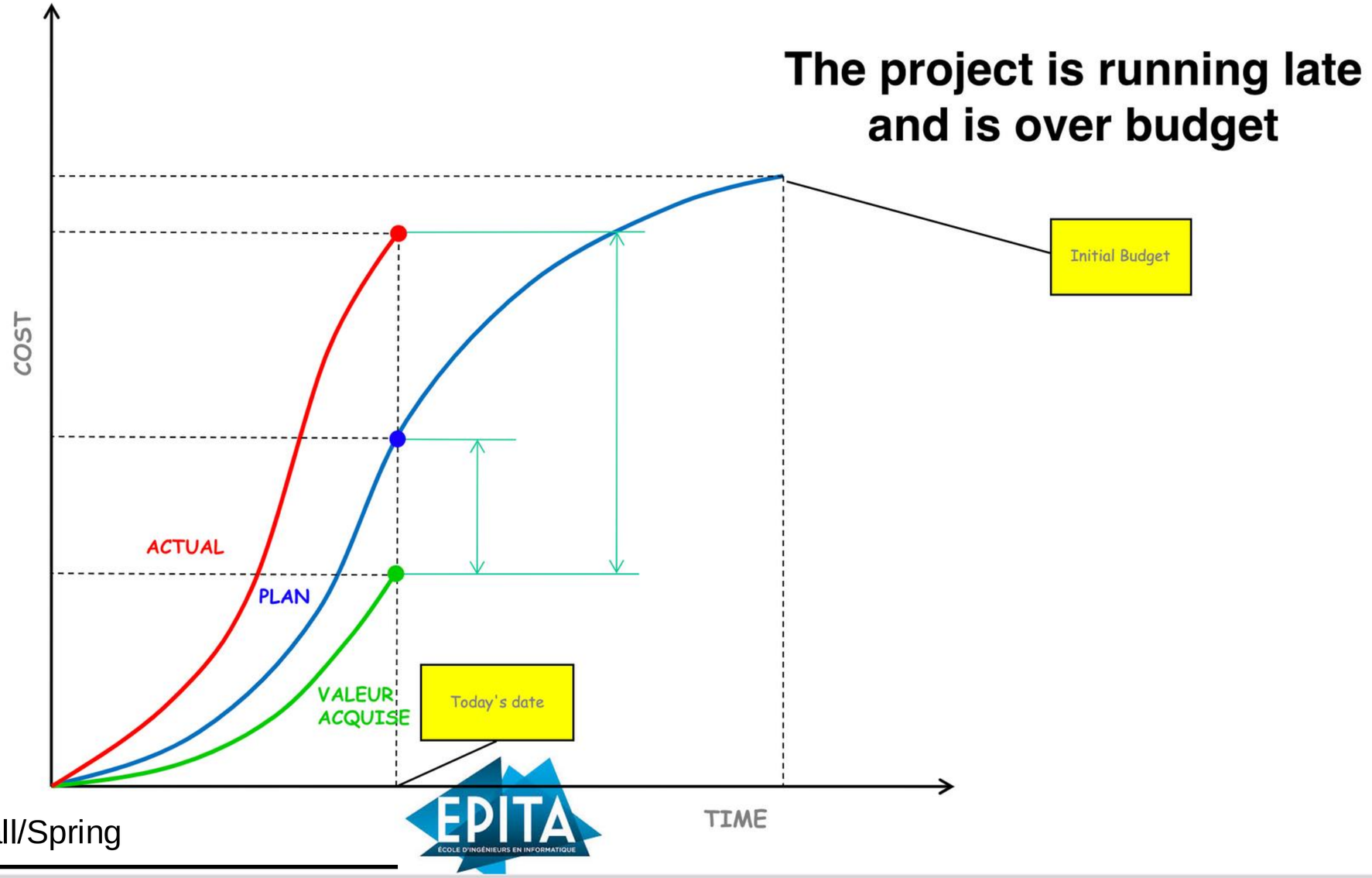
EARNED VALUE Technique

- Project performance management technique that takes into account: content, time, and cost elements
- Comparison of the actual situation (content, costs, and time) versus a baseline
  - Baseline: Approved Schedule + Approved Changes

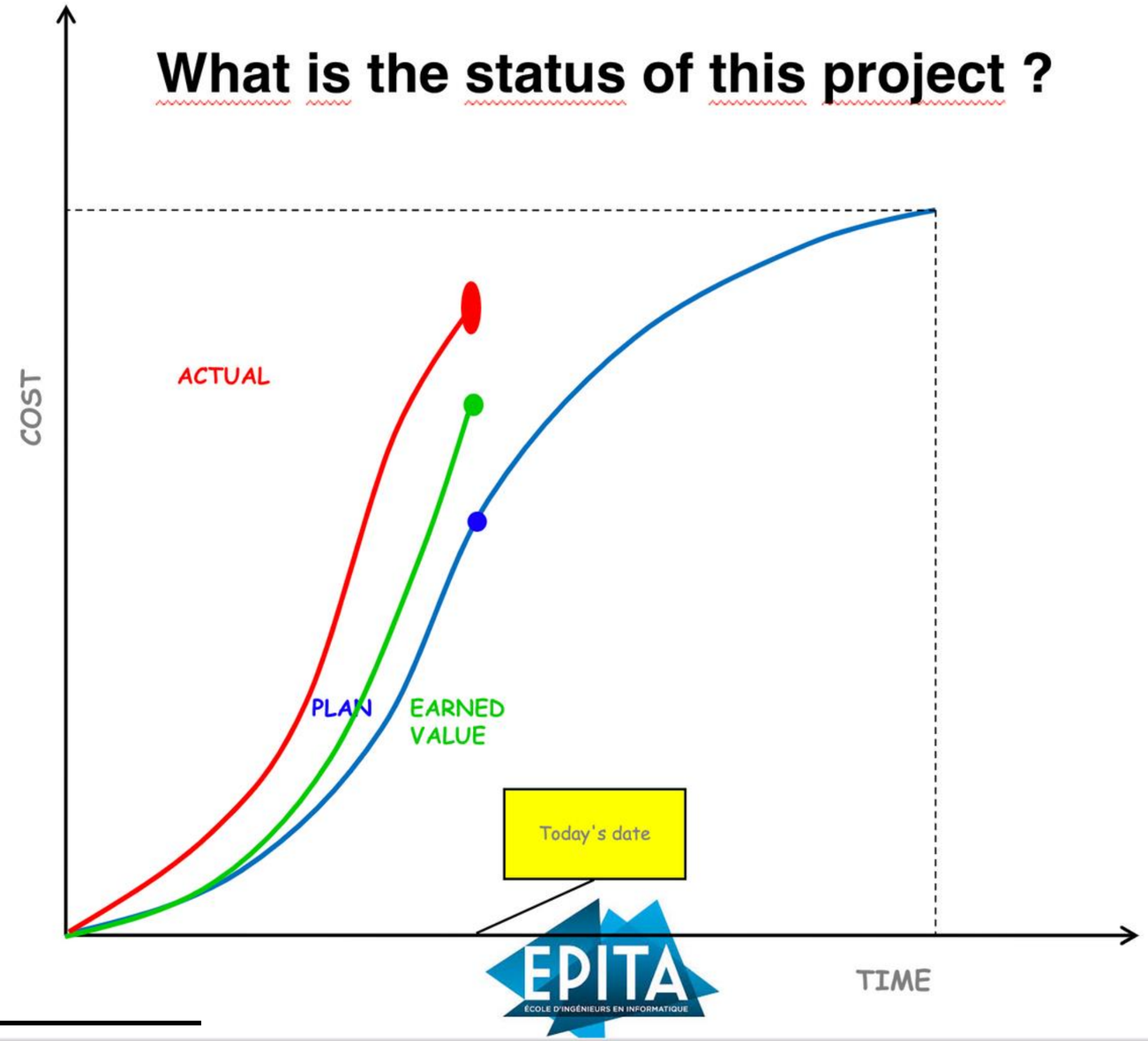
Project Management



Project Management



Project Management

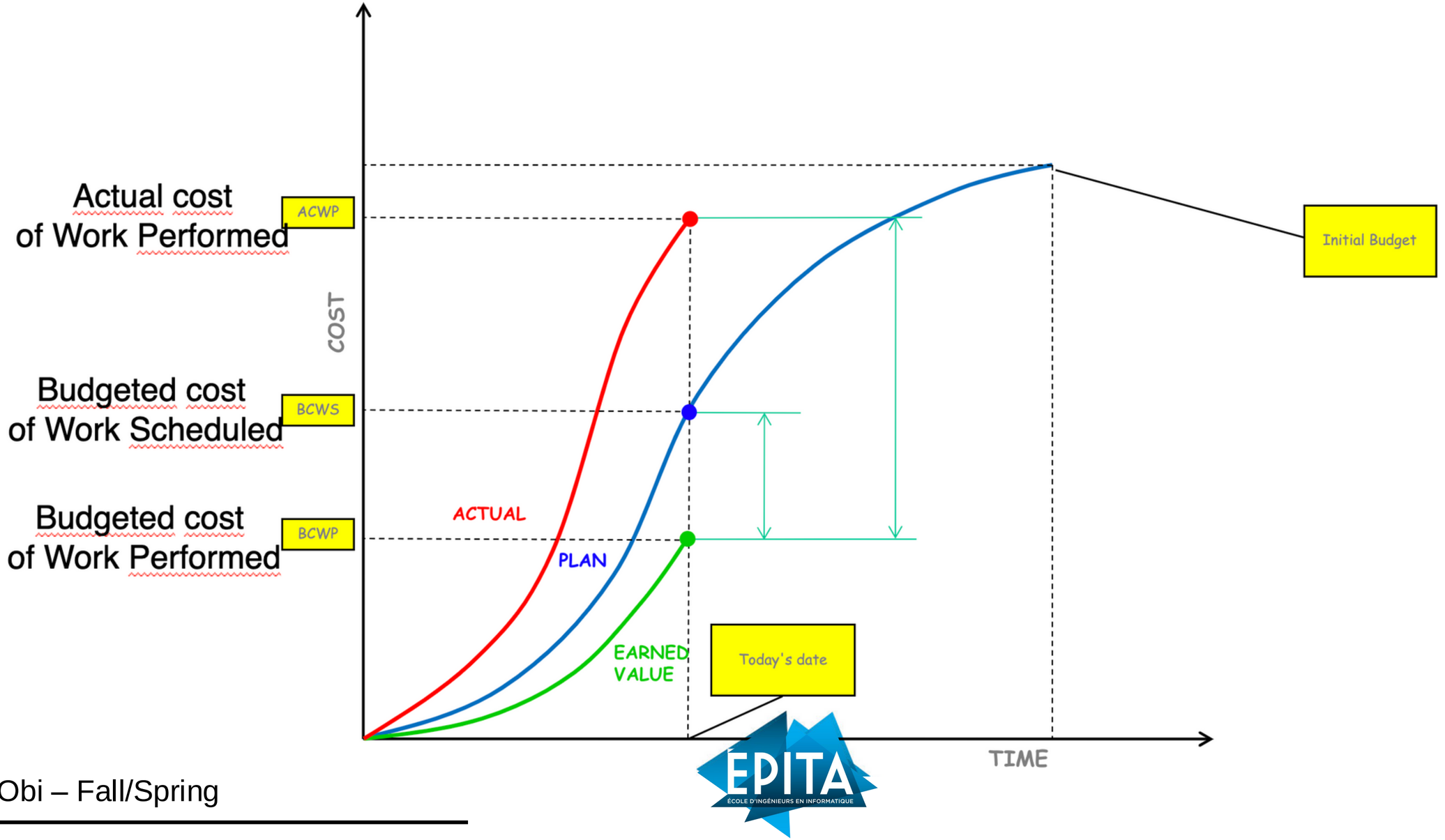


Project Management

Terme	Signification	Définition
BCWS	Budgeted cost of Work Scheduled	This is the expected cost of the project corresponding to the expected progress. It is determined at the beginning of the project.
ACWP	Actual cost of Work Performed	This is the actual cost. This is the actual cost of the project applied to the progress made on a given date. This cost shows what really happened on the project.
BCWP	Budgeted cost of Work Performed	It is the budgetary value of the realized or the projected cost of the project applied to the progress made at a given date.

Now let's put these terms on the graph

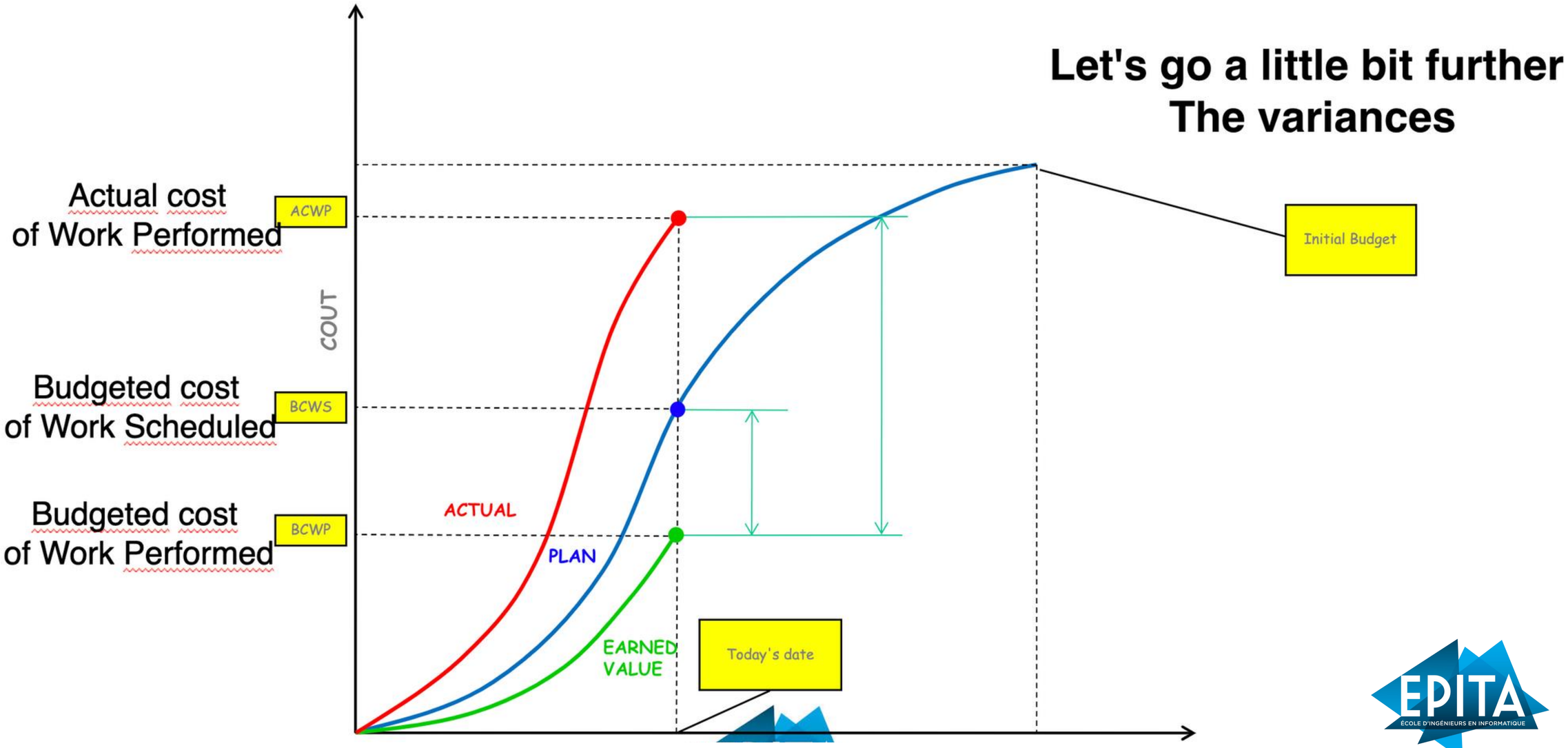
Project Management



Terminology

Acronym	Meaning	Abbreviation	Signification
BCWS	Budgeted cost of Work Scheduled	PV	Planned Value
ACWP	Actual cost of Work Performed	AC	Actual Cost
BCWP	Budgeted cost of Work Performed	EV	Earned Value

Project Management



Les Variances

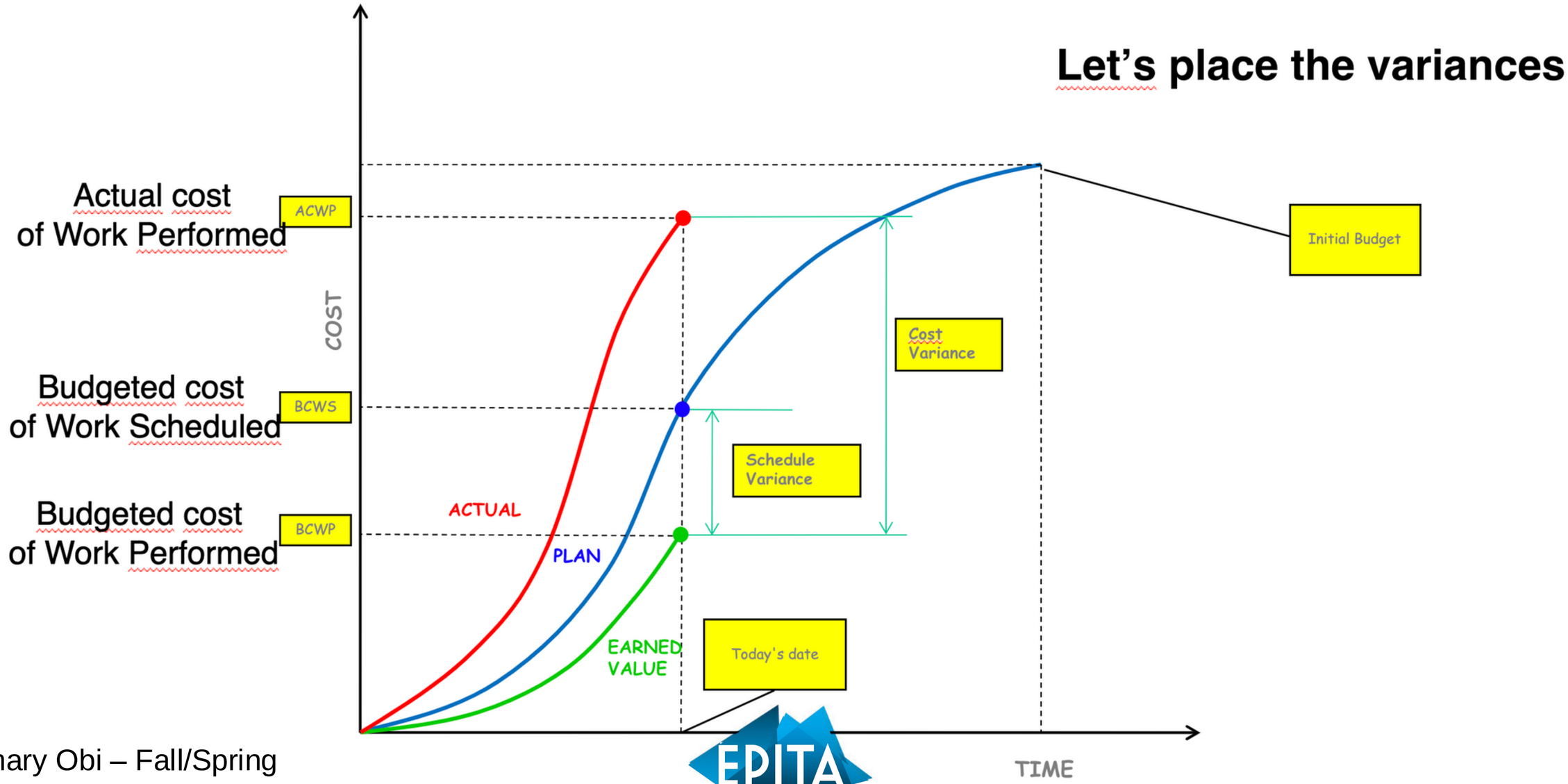
Terme	Signification	Formule	Définition
CV	Cost Variance	= BCWP - ACWP	The ACWP and the BCWP have the same basis of physical advancement: the work actually done. For this work actually done, it cost more or less to do what we got. The cost difference if there is one, is explained by the cost of the tasks performed.
SV	Schedule Variance	= BCWP - BCWS	The BCWP and the BCWS are calculated on the same basis: the Budgeted cost. The difference can only be explained by the difference in physical progress: more or less tasks were measured in value. But the difference can also be converted into deadlines: number of days, weeks

In a nutshell

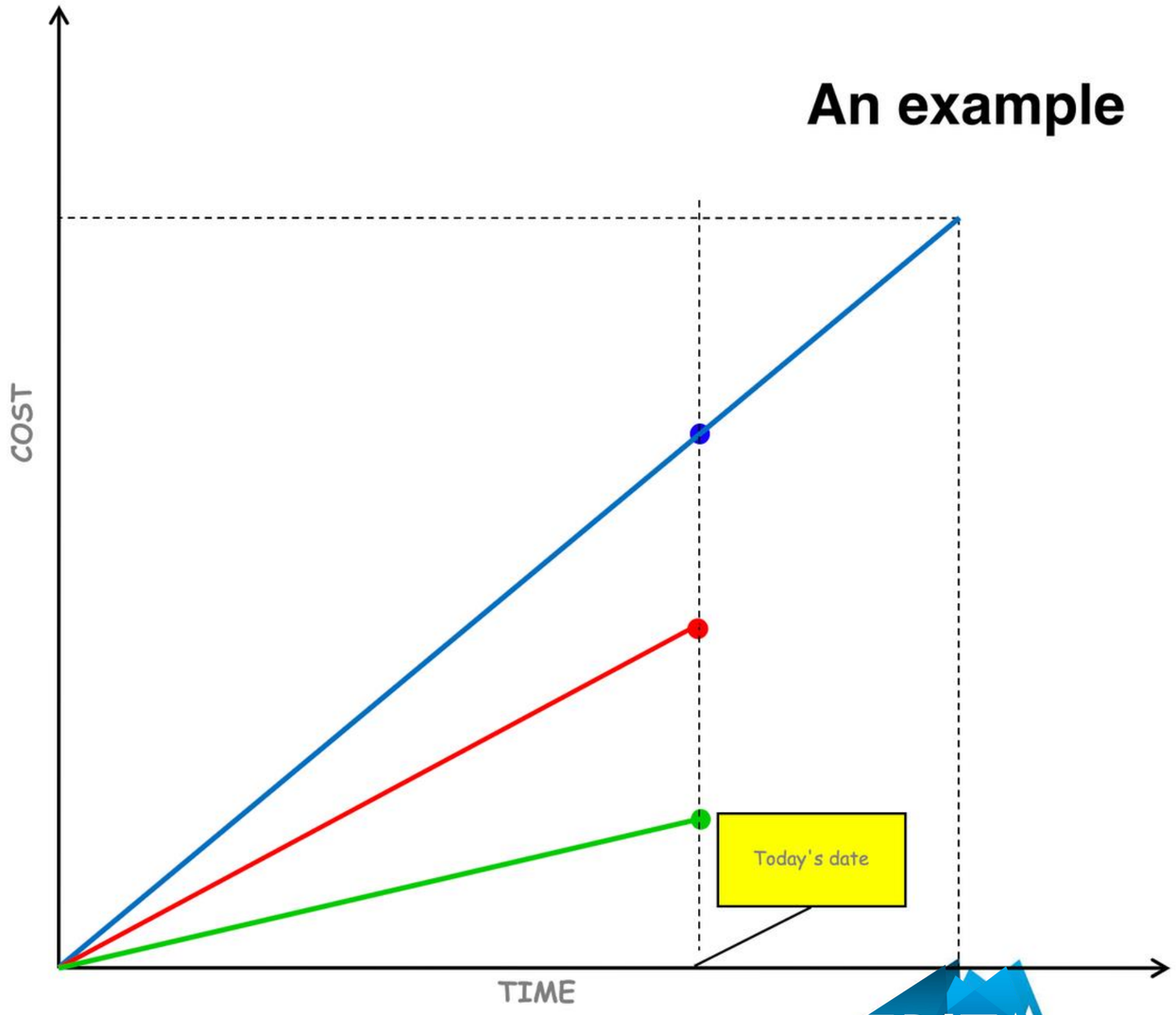
- CV indicates whether the project is under or over budget at a specific point in time.

- SV helps in determining whether the project is ahead of, on, or behind schedule.

Project Management



Project Management



- **Project**
  - Budget 400 k€, Duration 4 months, Linear planning
- **Situation after 3 months**
  - Actual cost 200 k€, Work completed 100 k€
- **Questions**
  - BCWS
  - ACWP
  - BCWP
  - SV
  - CV

Solution

- **BCWS** = (Budget / Duration) x (Months Elapsed)

BCWS = (400 k€ / 4 months) x 3 months = 300 k€
So, BCWS is 300 k€.

- **ACWP** = Actual Cost after 3 months = 200 k€

- **BCWP** = Work completed after 3 months = 100 k€.

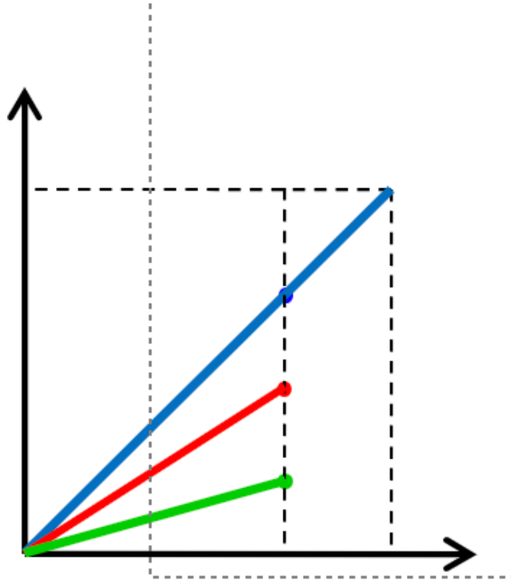
- **SV** = BCWP - BCWS

SV = 100 k€ - 300 k€ = -200 k€

- **CV** = BCWP - ACWP

CV = 100 k€ - 200 k€ = -100 k€

- **Project**
  - Budget 400 k€, Duration 4 months, Linear planning
- **Situation after 3 months**
  - Actual cost 200 k€, Work completed (EV) 100 k€



Solution

Terme	Signification	Calcul
BCWP	Budgeted cost of Work Performed	100 k€
BCWS	Budgeted cost of Work Scheduled	300 k€
ACWP	Actual costof Work Performed	200 k€
EC	Ecart de coûts = BCWP - ACWP	-100 k€
EP	Ecart de prévisions ou retard = BCWP - BCWS	-200 k€

In summary:

- BCWS is 300 k€.
- ACWP is 200 k€.
- BCWP is 100 k€.
- CV is -100 k€, indicating that the project is over budget by 100 k€.
- SV is -200 k€, which means the project is behind schedule by 200 k€.

Performance indicators

- The status of the work done is also indicated by two performance factors:
  - CPI (« Cost Performance Index », Efficiency) = What we did / What we spent = BCWP / ACWP
  - SPI (« Schedule Performance Index », Effectiveness) = What we did / What we should have done (at that date) = BCWP/BCWS
- The coefficient of efficiency: if less than 1, indicates that the value of Work Performed is less than the money spent. The project could exceed its budget.
- The coefficient of effectiveness: if less than 1, indicates that the work done is less than the planned work. The project is late.
- **These indicators give an idea of the delay and the final cost, if the project continues at the same pace as until the measurement date.**

Difference between...

- While efficiency helps optimize resource use, effectiveness ensures that the organization's efforts align with its mission and achieve meaningful results.
- Efficiency helps in optimizing the means to achieve project goals, while effectiveness ensures that the project is focused on the right goals.
- Achieving a balance means minimizing resource waste and using resources wisely (efficiency) to ensure that the project is on the right track and meets its goals (effectiveness).

Project Management

Variances

Terme	Signification	Formule
CV	Cost Variance	= BCWP - ACWP
SV	Schedule Variance	= BCWP - BCWS

Indicators

Terme	Signification		Formule
CPI	Cost Performance Indicator	Efficiency	= BCWP / ACWP
SPI	Schedule Performance Indicator	Effectiveness	= BCWP / BCWS

Finding the CPI and the SPI

In calculation:

CPI = BCWP / ACWP

CPI = 100 k€ (BCWP) / 200 k€ (ACWP)

- CPI = 0.5 = 50% (which is less than 1)

SPI = BCWP / BCWS

SPI = 100 k€ (BCWP) / 300 k€ (BCWS)

- SPI = 1/3 = 33% (which is less than 1)

Project Management

In summary, the project is facing significant challenges:

It's behind schedule by 200 k€.

It's over budget by 100 k€.

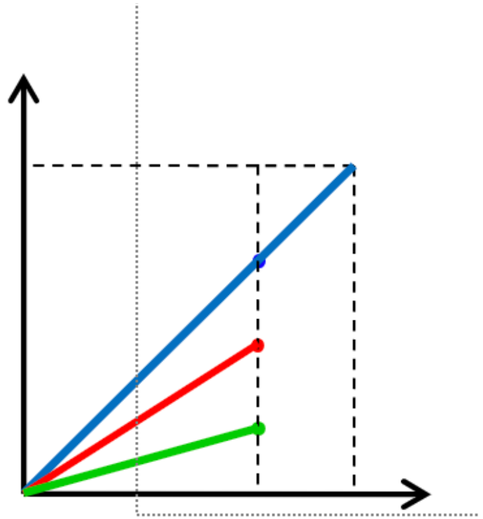
It's cost-inefficient (CPI < 1), meaning it's not getting the expected value for the resources spent.

It's schedule-ineffective (SPI < 1), indicating that the work progress is significantly slower than planned.

Avec les indicateurs

Terme	Signification	Calcul
BCWP	Budgeted cost of Work Performed	100 k€
BCWS	Budgeted cost of Work Scheduled	300 k€
ACWP	Actual costof Work Performed	200 k€
EC	Ecart de coûts = BCWP - ACWP	-100 k€
EP	Ecart de prévisions ou retard = BCWP - BCWS	-200 k€
CPI	Efficience	50%
SPI	Efficacité	33%

- **Project**
  - Budget 400 k€, Duration 4 months, Linear planning
- **Situation after 3 months**
  - Actual cost 200 k€, Work completed 100 k€



Reposons nous les bonnes questions

Terme	Signification	Calcul
BCWP	A la date d'aujourd'hui quelle est la valeur estimée du travail réellement effectué ?	100 k€
BCWS	A la date d'aujourd'hui quelle est la valeur du travail qui avait été prévu d'être fait ?	300 k€
ACWP	Actual costof Work Performed ?	200 k€
EC	Ecart de coûts = BCWP - ACWP	-100 k€
EP	Ecart de prévisions ou retard = BCWP - BCWS	-200 k€
CPI	Efficience	50%
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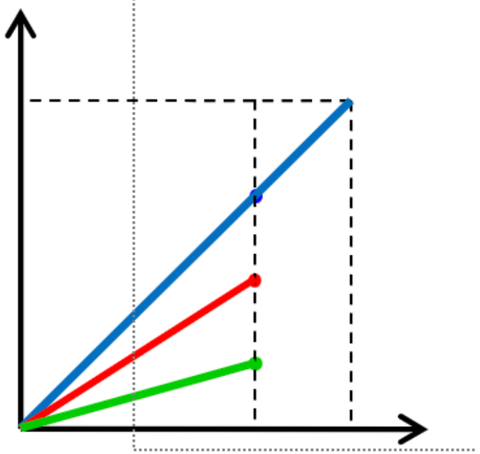


Earned Value Method

- Method for measuring project performance on content, time, and cost
- Performance interpretation using CPI and SPI indicators

Performance Measures		Schedule		
		SV > 0 & SPI > 1.0	SV = 0 & SPI = 1.0	SV < 0 & SPI < 1.0
Cost	CV > 0 & CPI > 1.0	Ahead of Schedule Under Budget	On Schedule Under Budget	Behind Schedule Under Budget
	CV = 0 & CPI = 1.0	Ahead of Schedule On Budget	On Schedule On Budget	Behind Schedule On Budget
	CV < 0 & CPI < 1.0	Ahead of Schedule Over Budget	On Schedule Over Budget	Behind Schedule Over Budget

Improvement actions

- Gain in Productivity: resources are now trained before tackling the last 3 faces
- Automation of processes
- Increased number of resources to catch up

Now let us look at the future

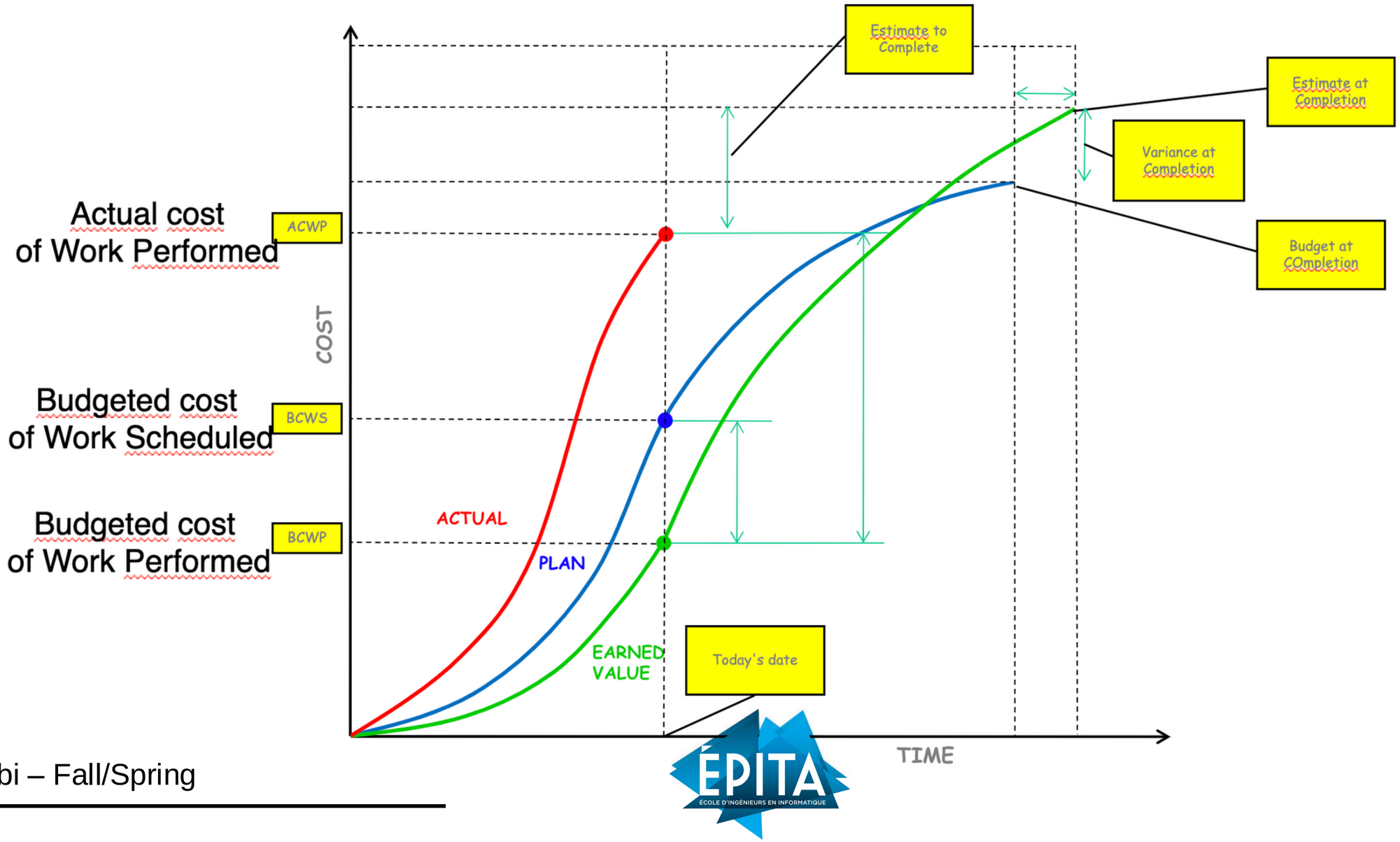
- **What does the EARNED VALUE method tell us about the end of the project?**

Forecast values

Terme	Signification	Formule	Définition
BAC	Budget At Completion		The initial total cost budgeted
EAC	Estimate at Completion	= BAC / CPI	The expected forecast of the revised total cost
ETC	Estimate to Complete	= EAC – ACWP	Revised total cost minus the cost of Work Performed
VAC	Variance at Completion	= BAC - EAC	Difference at the end of the project between the final cost and the budget

EAC Estimate at Completion or the Final cost

Project Management



Exercise

- **Project**
  - Budget 400 k€, Duration 4 months, Linear planning
- **Situation after 3 months**
  - Actual cost 200 k€, Work completed 100 k€

Terme	Signification	Calcul
BCWP	Budgeted cost of Work Performed	100 k€
BCWS	Budgeted cost of Work Scheduled	300 k€
ACWP	Actual cost of Work Performed	200 k€
CPI	Efficiency	50%
SPI	Effictiveness	33%
BAC	Budget at Completion	400 k€
EAC	Estimate at Completion	800 k€
ETC	Estimate to Complete	600 k€
VAC	Variance at Completion	400 k€

Signification	Formule
Budget At Completion	
Estimate at Completion	= BAC / CPI
Estimate to Complete	= EAC – ACWP
Variance at Completion	= BAC - EAC

It is now your turn to play

- Your project is to build a box. The box has six faces
- Each face takes a day to build. Each face is budgeted at 1000 €
- Faces must be built one after the other
- Today we are at the end of the 3rd day, Your team reports you the following situation

Tâche	Progrès	Coût ACTUAL
Tâche 1	100%	€1,200
Tâche 2	100%	€1,000
Tâche 3	75%	€750
Tâche 4	50%	€500
Tâche 5	0%	€0
Tâche 6	0%	€0

It is now your turn to play

- Using the following table, calculate the parameters and give your interpretation of the project's performance

Parameter	Calculation	Result
BAC		
BCWP		
BCWS		
ACWP		
CV		
SV		
CPI		
SPI		

Exercise

- Your project is to build a box. The box has six faces
- Each face takes a day to build. Each face is budgeted at 1000 €
- Faces must be built one after the other
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Tâche 4	50%	€500
Tâche 5	0%	€0
Tâche 6	0%	€0

Parameter
BAC
BCWP
BCWS
ACWP
EC
EP
CPI
SPI

Exercise

Parameter	Calculation	Result
BAC		
EAC		
ETC		
VAC		

Solution

Parameter	Calculation	Result	Summary
BAC	6 * 1000€ (6 faces * 1000€ per face)	6000€	
BCWP	€1,000 + €1,000 + €750 + €500	3,250€	
BCWS	Budget per Day x Number of Days = €1,000 x 3	3,000€	
ACWP	1200€ (Tache 1) + 1000€ (Tache 2) + 750€ (Tache 3) + 500 (Tache 4)	3,450€	
EC (CV)	BCWP - ACWP	-200€	the project is currently over budget
EP (SV)	BCWP - BCWS	250€	this indicates the project is ahead of schedule
CPI	BCWP / ACWP	0.942	the project is over budget.
SPI	BCWP / BCWS	1.083	the project is ahead of schedule

Project Management

Solution

Parameter	Calculation	Result	Summary
BAC	6 * 1000€ (6 faces * 1000€ per face)	6000€	
EAC	BAC / CPI (6000/0.942)	6369€	Project is over budget
ETC	EAC – ACWP	2919€	
VAC	BAC – EAC	-369€	The project would need more funds

In summary, the project is currently over budget (CPI < 1), slightly ahead of schedule (SPI > 1), but is expected to require additional funding to complete within the budget (negative VAC).

The project has a positive schedule variance (ahead of schedule) but a negative cost variance (over budget) and would need more funds.