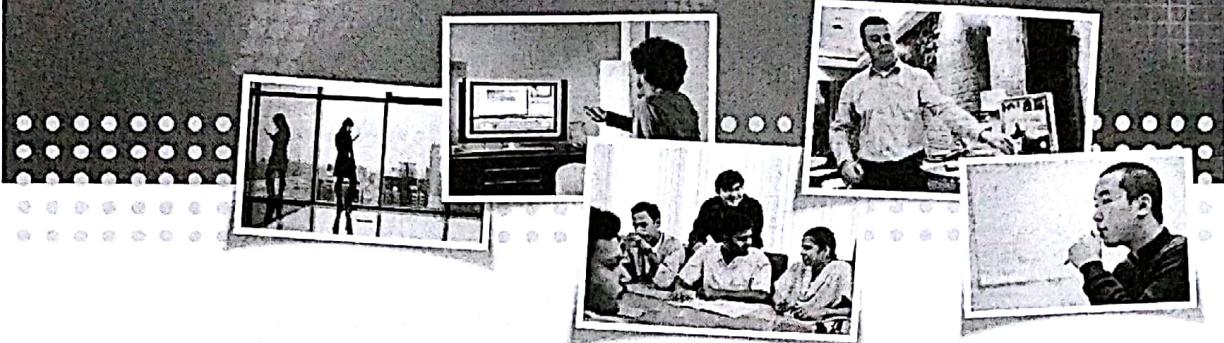


## Project Schedule Management

Instructor: Phùng Thanh Cường, Msc, PMP



### 6.6 Develop Schedule

#### What?

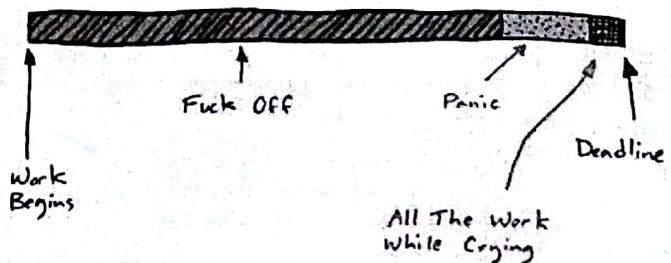
- Process of analyzing activity sequence, duration, resources requirement and constraints to create project schedule model

#### Why?

- A viable and acceptable schedule model is used to determine the planned start and finish dates for project activities and milestones.

#### When?

- Iterative process and throughout the project.



## 6.6 Develop Schedule



### How?

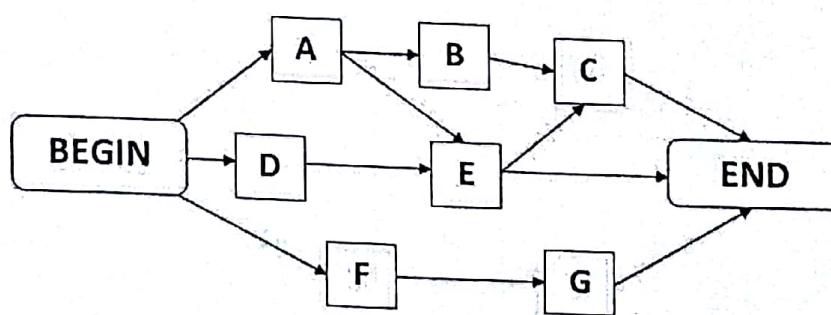
- Once the project start or finish dates have been imposed , it is common to have the project staff assigned to the activities review their assigned activities. The project schedule is then analyzed to:
- Estimate the minimum project duration (**critical path**) and determine the amount of schedule flexibility.
- Determine conflicts with resource calendar and if **resource optimization** is required
- Determine conflict with milestones and if **schedule compression** is required
- Review and revise the duration estimates, resource estimates, and **schedule reserves** needed for risks
- Establish an approved project schedule that can serve as a **baseline** to track progress.

## 6.6 Develop Schedule : Tools & Techniques



### 1. Schedule Network Analysis

- Schedule network analysis is a technique that generates the project schedule.
- Analytical techniques:
  - Critical path method
  - Resource optimization
  - Modeling (What-if analysis)

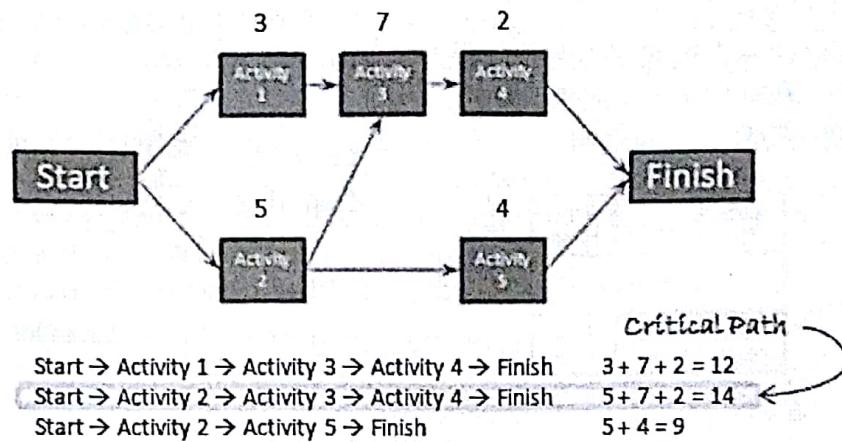


## 6.6 Develop Schedule : Tools & Techniques



### 2. Critical Path Method (CPM)

- CPM is used to calculate the critical path(s) and the amount of schedule flexibility (total float).
- The **critical path** is the one with the longest duration, which is the shortest possible project duration.



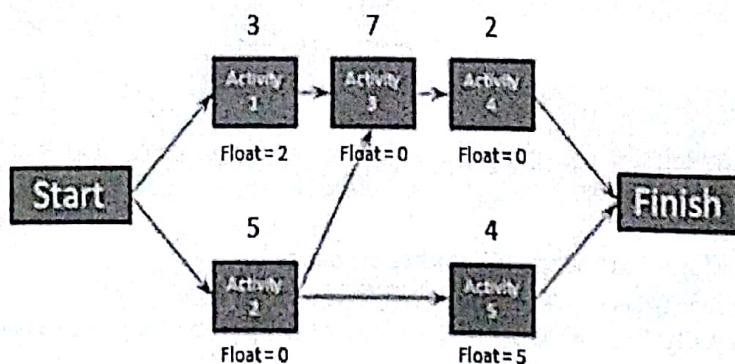
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## 6.6 Develop Schedule : Tools & Techniques



### Float (or total float) determination

- Activities 2, 3, and 4 are on the critical path -> float of zero.
- The next longest path is Activities 1, 3, and 4. the float will be the  $14 - 12 = 2$ . So Activity 1 has a float of 2.
- Float of activity 5???



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## 6.6 Develop Schedule : Tools & Techniques



### Network Diagram Nodes

- ES = Earliest date an activity can be started
- EF = Earliest date an activity can be completed
- LS = Latest date an activity can start
- LF = Latest date an activity can be completed

Early Start	Duration	Early Finish
Activity Name		
Late Start	Total Float	Late Finish

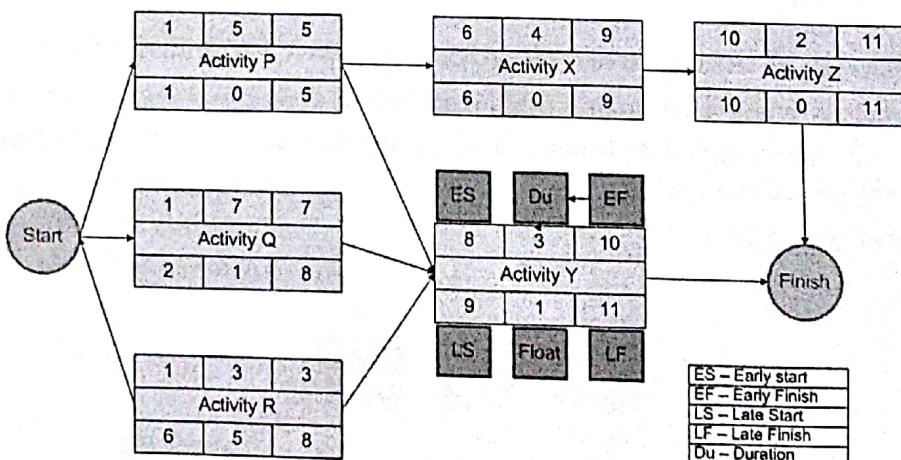
### Early Start & Early Finish Calculation

- Forward Pass: to determine the earliest start and finish date
- **Early Finish (EF) = Early Start (ES) + Duration - 1**

### Late Start & Late Finish Calculation

- Backward Pass: to determine the latest start and finish date
- **Late Start (LS) = Late Finish (LF) - Duration + 1**

## 6.6 Develop Schedule : Tools & Techniques



Free Float = ES of next activity – EF of predecessor - 1

Free Float of Activity Q? is 0 as any delay in Q will delay ES of Y.

Free Float of Activity R? is 4 as ES of Y will not be impacted till R is delayed by 4 days or less.

## 6.6 Develop Schedule : Tools & Techniques



### Float (or Slack)

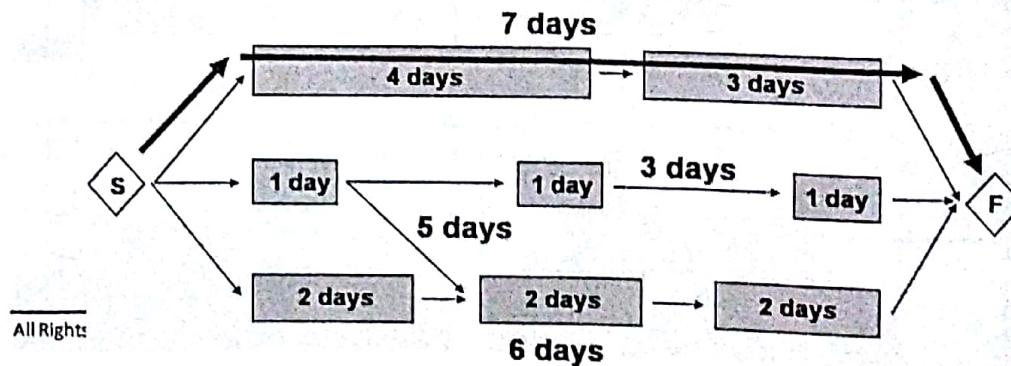
1. **Float or total float:** the total amount of time that a schedule activity may be delayed from its early start date without delaying the project finish date, or violation a schedule constraint
2. **Free float:** the amount of the time that a schedule activity can be delayed without delaying the early start date of any immediately following schedule activity. Free float can only occur when two or more activities share a common successor
3. **Project float:** project float is the amount of time a project can be delayed without delaying the externally imposed project completion date required by the customer or management, or the date previously committed to by the project manager

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## 6.6 Develop Schedule : Tools & Techniques



- Can we have more than one critical path?
  - Yes, in this case the risk will be increase.
- Can we change the critical path?
  - Yes.
- Can the critical path have negative total float?
  - It means project is behind schedule
- Near-critical path? → *dùng dài thay*
  - A lesser critical sequence of activities

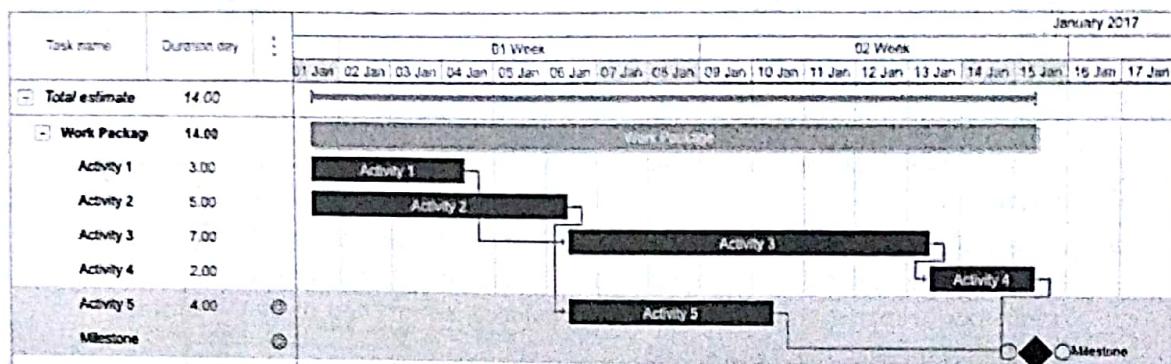


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## 6.6 Develop Schedule : Tools & Techniques



## Gantt Chart ( Bar chart)



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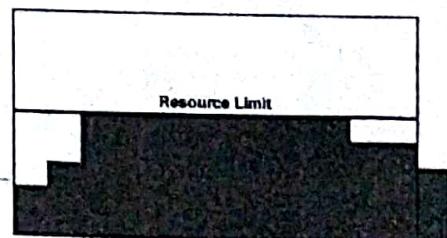
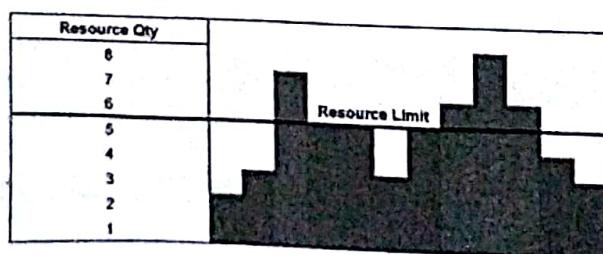
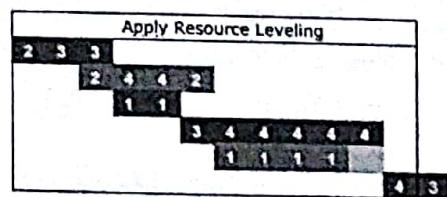
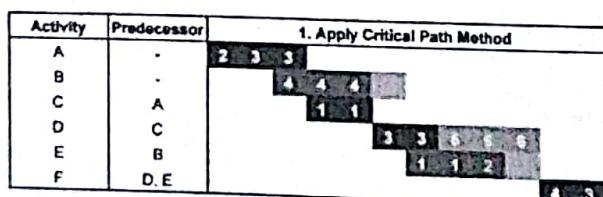
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### 6.6 Develop Schedule : Tools & Techniques



### **3. Resource Optimization Techniques (1)**

- **Resource leveling:** Technique to adjust activities to balance demand for resources
  - Used when shared and critical resources only available at certain times, or a resource assigned to two or more activities at the same time
  - Project's critical path is changed, usually to increase

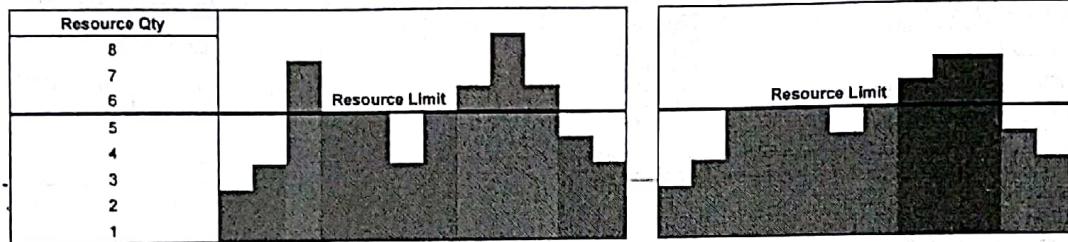
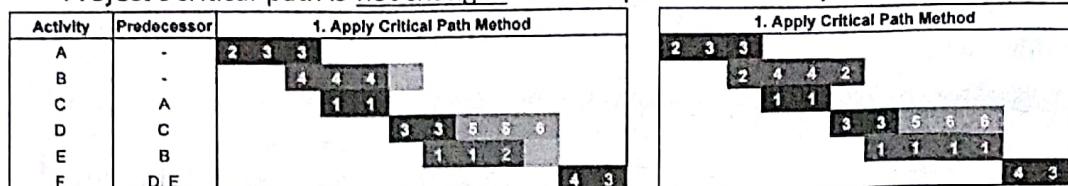


## 6.6 Develop Schedule : Tools & Techniques



### 3. Resource Optimization Techniques (2)

- **Resource Smoothing:** Technique to adjust activities to meet predefined resources limits
- Activities only be delayed within their free and total float. Resource smoothing may not be able to optimize all resources
- Project's critical path is not changed and completion date may not be delayed

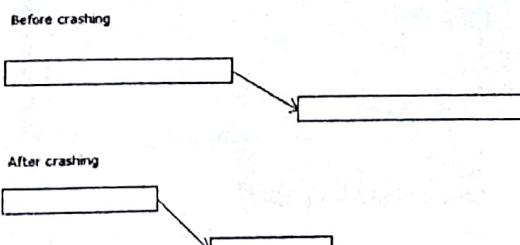


## 6.6 Develop Schedule : Tools & Techniques



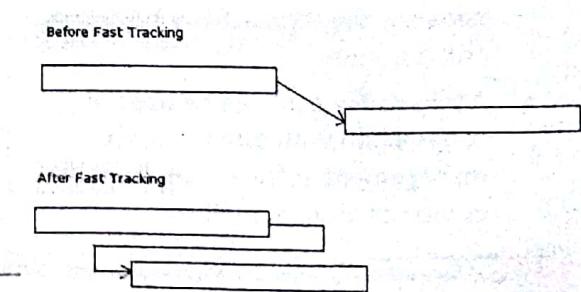
### 4. Schedule Compression (1)

- **Crashing –** This approach adds more resources to activities on the critical path to complete the project earlier.
- Crashing almost always result in increased cost. Many options are considered and the option with maximum compression with minimum cost impact is selected.



### 4. Schedule Compression (2)

- **Fast Tracking –** Critical activities that would normally be done in sequence are allowed to be done in parallel or with some overlap.
- Fast track may result in rework and increases the risk. Communication requirements increases during fast tracking.



## 6.6 Develop Schedule : Tools & Techniques



### 5. Data analysis

- **Three point estimates (PERT)**
  - E for the total project work
  - SD for the total project work

$$E(\text{ProjectWork}) = \sum E(\text{Task})$$

$$SD(\text{ProjectWork}) = \sqrt{\sum SD(\text{Task})^2}$$

#### ➤ What-If Scenario Analysis

- What if the situation represented by scenario "X" happens?
- Used to assesses the feasibility of the project schedule under adverse conditions
- **Monte Carlo Simulation:**
  - A specific kind of what-if analysis using a computer simulation



tảng mây  
 mưa  
 tay cùi đất nát  
 - Computer cui's Functional Manager

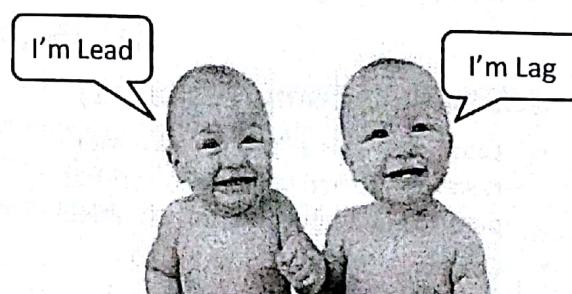
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## 6.6 Develop Schedule : Tools & Techniques



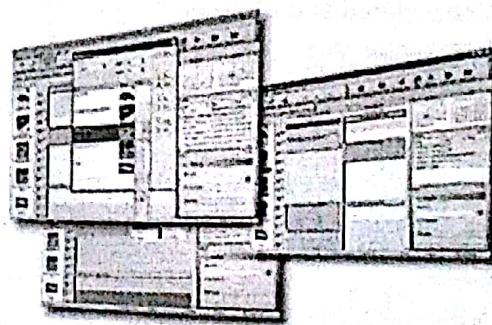
### 6. Leads and Lags

- Leads and lags are now adjusted to get a realistic and viable schedule by adjusting the start time of the successor activities.



### 7. PMIS

- Automated scheduling tool generates start and finish data of the activities based on the inputs of activities, network diagram, activity resources and durations.
- A scheduling tool can be used in conjunction with other project management software applications as well as manual methods



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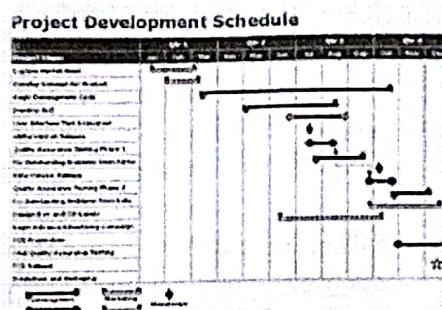
## 6.6 Develop Schedule: Outputs



## **1. Project Schedule**

- Output of a schedule model, including planned dates, durations, milestones and resources
  - At the beginning of project execution, the Project Schedule is the same as the Schedule baseline.
  - As work is done on the project, the actual progress is updated on the Project Schedule. At any given date, the latest version of the actual (Project) Schedule is referred to as the “Project Schedule”.

- The schedule can be displayed in a variety of ways:
    - *Milestone Charts (or Master schedule)*
    - *Project Schedule Network Diagram (PDM)*
    - *Gantt Charts/ Bar Charts*



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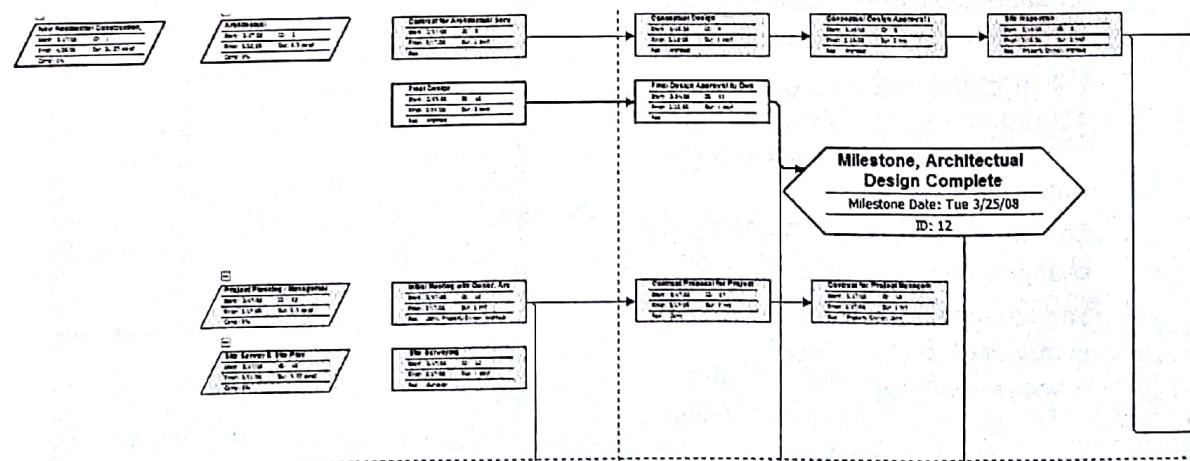
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17

## 6.6 Develop Schedule: Outputs



- Project Schedule Network Diagram (PDM)



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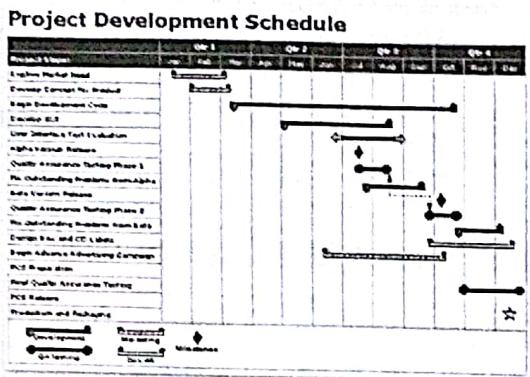
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## 6.6 Develop Schedule: Outputs

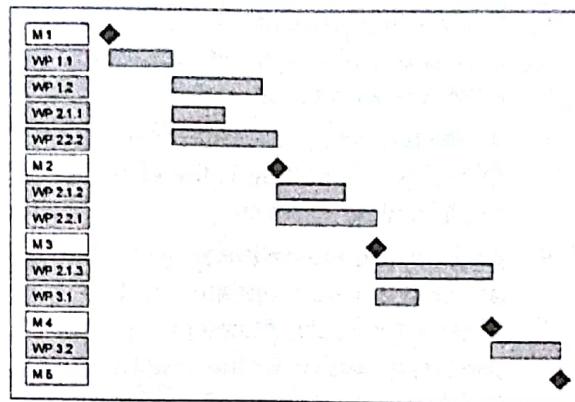


*Team*

- **Gantt Charts/ Bar Charts**



- **Milestone Charts** *Boss + Cus*



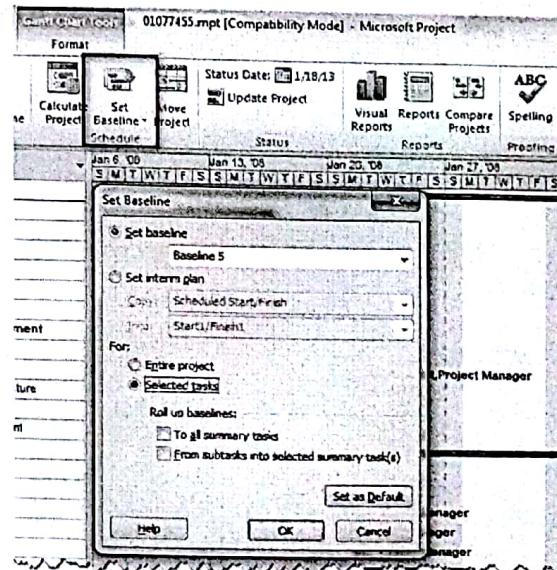
**Milestone charts** are used to report to senior management, while **Bar charts** are used to track progress, to report to the team.

## 6.6 Develop Schedule: Outputs



### **2. Schedule Baseline**

- A specific version of the project schedule developed from the schedule network analysis
- It is accepted and approved by the appropriate stakeholders, normally the project management team and functional managers.
- Can be changed only through formal change control procedures
- The schedule baseline is a component of the project management plan



## 6.6 Develop Schedule: Outputs



### **3. Schedule Data**

- Milestones
- Schedule activities and activity attributes
- Identified assumptions and constraints
- Supporting Details: Resource Requirements, resource histograms, etc.

### **4. Project Calendar**

- Working days and shifts available for schedule activities
- Like timetable, outlook calendar

### **5. Change request**

- Preventive actions to eliminate or reduce the probability of negative schedule variances.

### **6. Project management plan updates**

- Schedule management plan
- Cost baseline

### **7. Project document updates**

- **Resource requirements:** resource leveling has significant effect on project resource requirement
- Activity attributes
- Calendar
- Risk register ...

## 6.6 Develop Schedule: Inputs



### **1. Project Management Plan**

- Schedule Management Plan
- Scope baseline

### **2. Project documents**

- Milestone list
- Activity attributes
- Activity list
- Assumption log
- Project team assignments
- Resource calendars
- Resource requirements
- Duration estimates
- Basis of estimates
- Project schedule network diagrams
- Lessons learned register
- Risk register

### **3. Agreement**

- Detailed schedule developed by suppliers to meet contractual commitments

### **4. Enterprise environmental factors**

- Government or industry standards, and
- Communication channels.

### **5. Organizational process assets**

- Scheduling methodology containing the policies governing schedule model development and maintenance, and
- Project calendar(s).

## 6.6 Develop Schedule



Inputs	Tools & Techniques	Outputs
<ol style="list-style-type: none"><li>1. Project management plan</li><li>2. Project documents</li><li>3. Agreements</li><li>4. Enterprise environmental factors</li><li>5. Organizational process assets</li></ol>	<ol style="list-style-type: none"><li>1. Schedule network analysis</li><li>2. Critical path method</li><li>3. Resource optimization</li><li>4. Schedule compression</li><li>5. Data analysis<ul style="list-style-type: none"><li>• What-if scenario analysis</li><li>• Simulation</li></ul></li><li>6. Leads and lags</li><li>7. Project management information system</li><li>8. Agile release planning</li></ol>	<ol style="list-style-type: none"><li>1. Project schedule</li><li>2. Schedule baseline</li><li>3. Schedule data</li><li>4. Project calendars</li><li>5. Change requests</li><li>6. Project management plan updates</li><li>7. Project document updates</li></ol>

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## 6.7 Control Schedule



### What?

- Monitoring the status of the project and maintaining the project schedule baseline to sustain a realistic schedule continues throughout the duration of the project

Hurry up! You are behind the Schedule



### Why?

- Missing deadline, behind the schedule
- The schedule baseline is maintained throughout the project.

### When?

- Throughout the project.

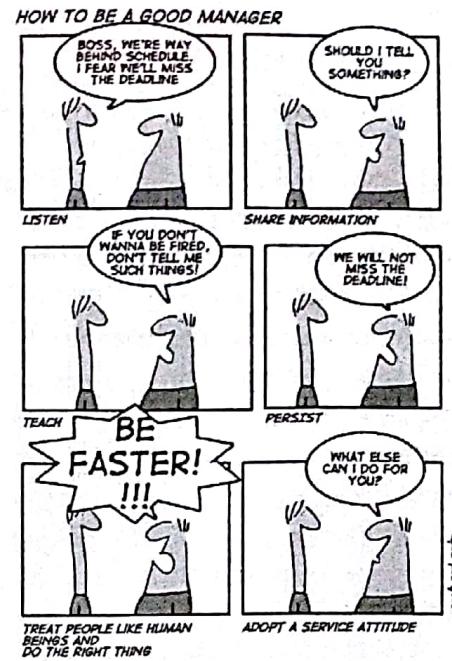
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## 6.7 Control Schedule



### How?

- Monitoring status of project activities and knowing the actual performance to date.
- Updating the schedule model
- Compare the actual start and finish dates to the approved baseline dates to determine if variances have occurred.
- Manage change to the schedule baseline.
- Any change to the schedule baseline can only be approved through the Perform Integrated Change Control process

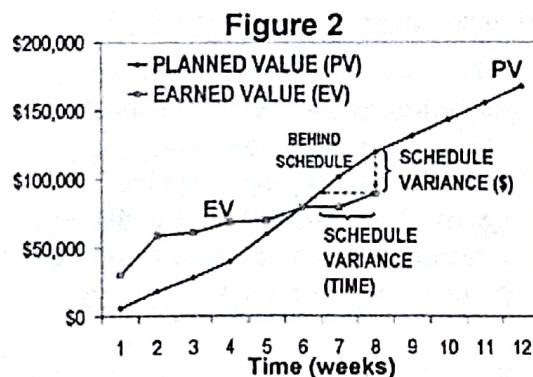


## 6.7 Control Schedule : Tools and Techniques



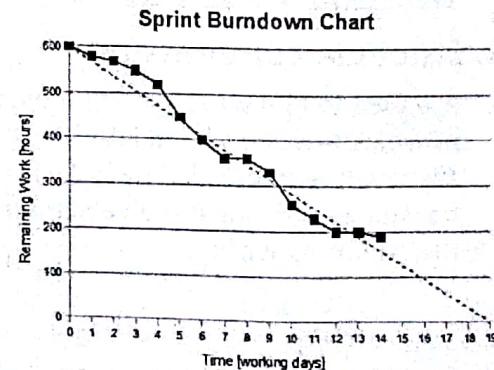
### 1. Data analysis (1)

- **Earned Value Analysis:** the SV and the SPI are used to assess the magnitude of schedule variations



### 1. Data analysis (2)

- **Burndown Chart:** used to analyze the variance with respect to an ideal burndown based on the work committed from iteration planning



## 6.7 Control Schedule : Tools and Techniques

PIIIA

### **1. Data analysis (3)**

- **Performance Reviews:** Performance reviews measure and analyze schedule performance such as actual start and finish dates, % complete, and the remaining duration for the work in progress.
- **Variance analysis:** measure the actual against the plan.
- **Trend analysis:** examine project performance over time
- **What-if scenario analysis:** used to assess the various scenarios guided by the output from the Project Risk Management processes

### **2. Critical path method**

- Determine variance on critical path and near critical path
- Comparing the progress along the critical path can help determine schedule status.
- The variance on the critical path will have a direct impact on the project end date.
- Evaluating the progress of activities on near critical paths can identify schedule risk.

## 6.7 Control Schedule : Tools and Techniques

PIIIA

### **4. Resource optimization**

- Resource optimization techniques involve the scheduling of activities and the resources required by those activities while taking into consideration both the resource availability and the project time.

### **5. Schedule compression**

- Are used to find ways to bring project activities that are behind into alignment with the plan by fast tracking or crashing the schedule for the remaining work.

### **5. Leads and lags**

- Is applied during network analysis to find ways to bring project activities that are behind into alignment with the plan.

### **6. Project management information system (PMIS)**

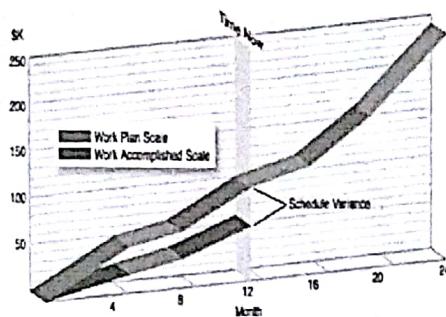
- Scheduling software that provides the ability to track planned dates versus actual dates, to report variances to and progress made against the schedule baseline, and to forecast the effects of changes to the project schedule model.

## 6.7 Control Schedule : Outputs



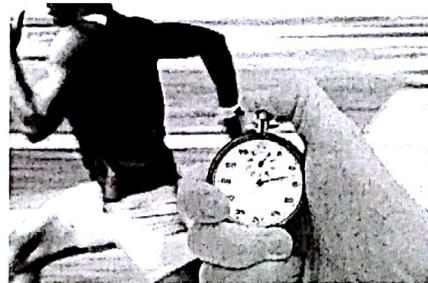
### **1. Work Performance Information**

- Information on how the project work is performing compared to the schedule baseline
  - Schedule variance (SV)
  - Schedule performance index (SPI)



### **2. Schedule Forecasts**

- Prediction of future performance based on available information and knowledge
- Earned Value performance indicators
- We will see about SV, SPI, forecasting in Cost Management.



## 6.7 Control Schedule : Outputs



### **3. Change Requests**

- Preventive actions may include recommended changes to eliminate or reduce the probability of negative schedule variances.
- Approved schedule baselines shall be only updated through integrative change control.

### **4. Project Management Plan Update**

- Schedule Management Plan
- Schedule baseline
- Cost baseline

### **5. Project Document Updates**

- Schedule data
- Project schedule
- Risk register

## 6.7 Control Schedule : Inputs

### **1. Project management plan**

- Scope baseline
- Schedule baseline
- Schedule management plan
- Performance measurement baseline.

### **2. Project documents**

- Project schedule
- Project calendar: allow different work periods for some activities
- Schedule data
- Resource calendar
- Lessons learned register.

### **3 Work performance data**

- Activities status: remaining duration, percent complete...

### **4. OPAs**

- Existing formal and informal schedule control-related policies, procedures, and guidelines;
- Schedule control tools; and
- Monitoring and reporting methods to be used.

## 6.7 Control Schedule

Inputs	Tools & Techniques	Outputs
1. Project Management Plan	1. Data analysis	1. Work Performance information
2. Project documents	2. Critical path method	2. Schedule forecasts
3. Work performance data	3. Resource optimization	3. Change Requests
4. Organizational Process Assets	4. Schedule compression	4. Project Management Plan updates
	5. Leads and lags	5. Project Document Updates
	6. Project management information system	

## Key outputs

PIMA

Process	Key Outputs
6.1 Plan Schedule Management	<ul style="list-style-type: none"><li>Schedule Management Plan</li></ul>
6.2 Define Activities	<ul style="list-style-type: none"><li>Milestone List</li><li>Activity List</li><li>Activity Attributes</li></ul>
6.3 Sequence Activities	<ul style="list-style-type: none"><li>Project Schedule Network Diagrams</li></ul>
6.4 Estimate Activity Duration	<ul style="list-style-type: none"><li>Activity Duration Estimates</li><li>Basis of estimate</li></ul>
6.5 Develop Schedule	<ul style="list-style-type: none"><li>Project Schedule</li><li>Schedule Baseline</li><li>Schedule Data</li></ul>
6.6 Control Schedule	<ul style="list-style-type: none"><li>Work Performance Information</li><li>Schedule Forecasts</li></ul>

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## Recommendation for complex environment

PIMA

- Tasks are not clearly defined
- Tasks are not independent
- Tasks are not the same complexity
- Tasks are not easy to be compressed



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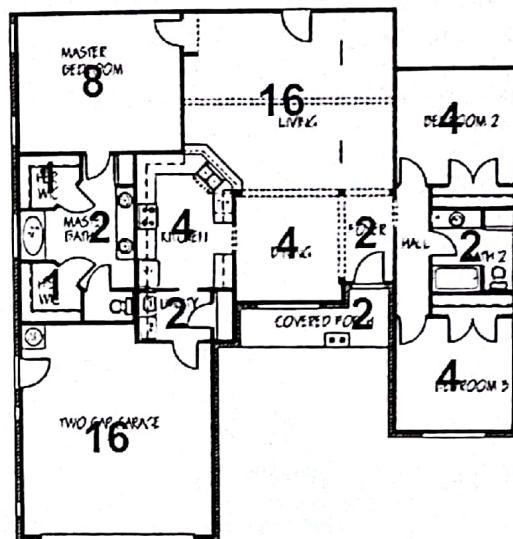
## Let's estimate!

IPMIA

Total = 58

- Let's paint the rooms!
- How many hours will it take?
- Why all of the different answers?
- Have any of you painted before?
- Compared to something else you have painted, would it be easier to determine how difficult it would be to paint the room?
- Is it easier to reach consensus?

- Lần đánh dấu 0'8'  
- Đánh giá phong cách theo khía  
nhiều phiên bản, so sánh,  
để phục vụ, tính toán.

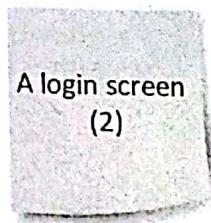


Size is different from Duration

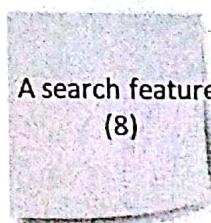
## Relative Estimate and Story points

IPMIA

- Story point is the “bigness” of a task, influenced by how hard it is. Hard could be related to **complexity, unknowns and effort**.
- Find a **baseline story**.
  - It does not have to be the smallest one, but one that all in the team can relate too.
- From then on all sizing should be done compared to that baseline.
  - *“This story is like that story, so its estimate is what that story’s estimate was.”*
- Relative values are what is important.



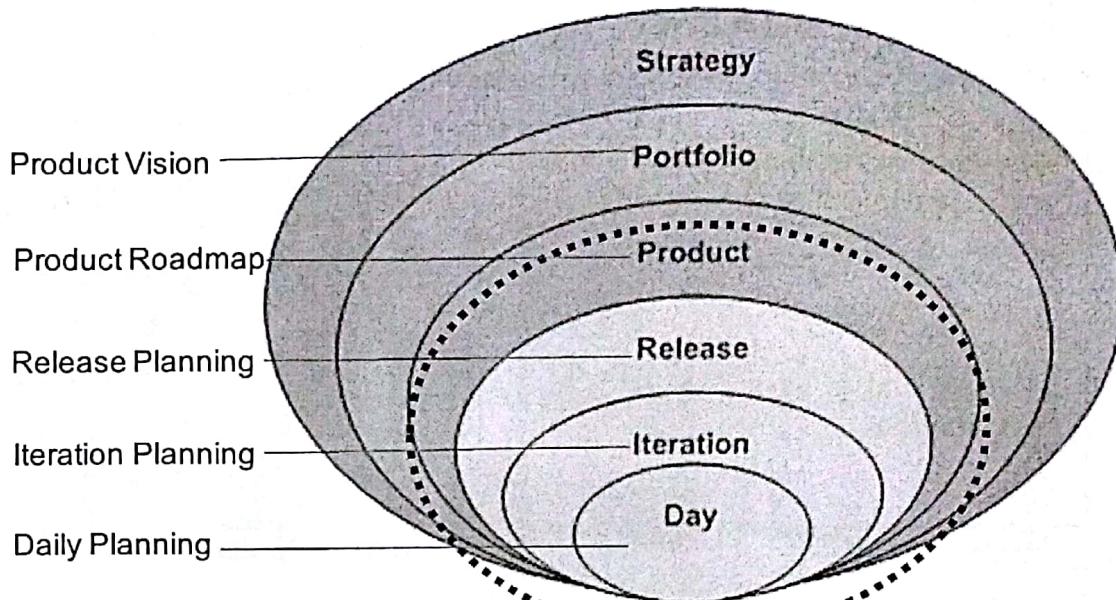
A login screen  
(2)



A search feature  
(8)

## Five levels of Agile Planning

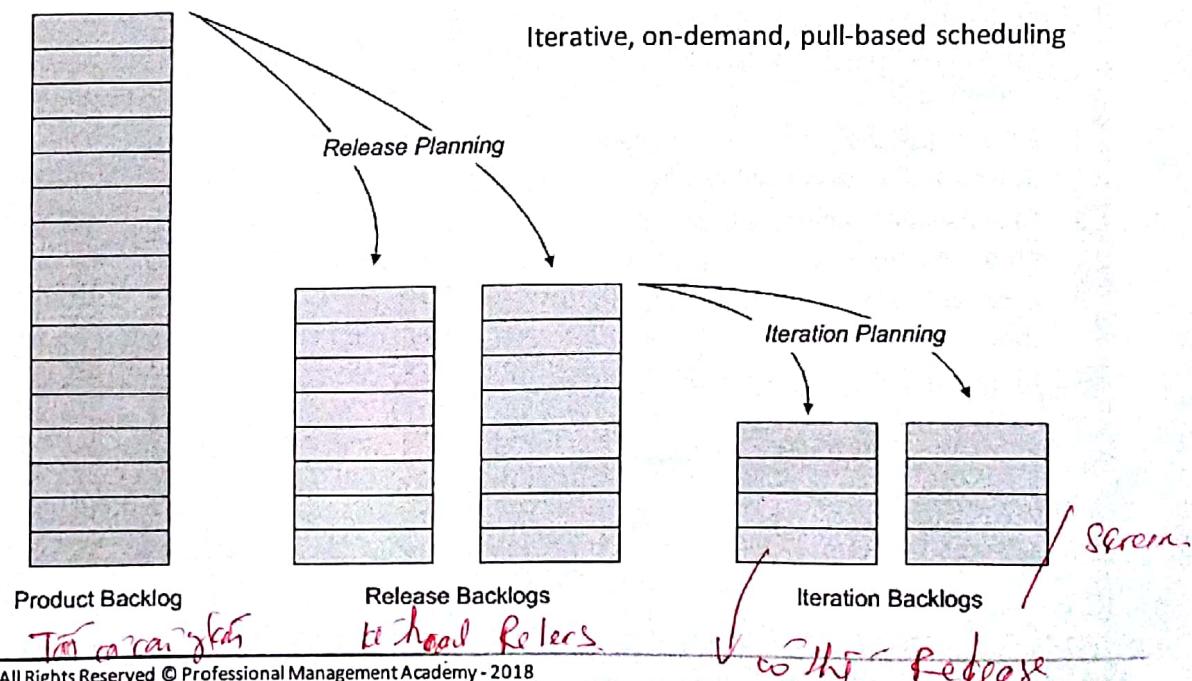
PMIA



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## Agile Release Planning

Crum  
PMIA

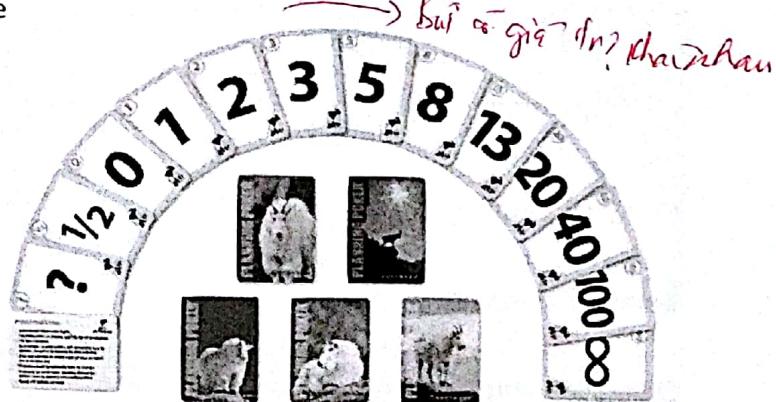
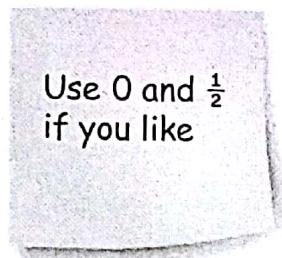


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## Planning Poker - How It Work?

IPMA

- Can you distinguish a 1-point story from a 2?
  - How about a 17 from an 18?
- Use a set of Fibonacci numbers that make sense:
  - 1, 2, 3, 5, 8, 13
- Stay mostly in a 1-10 range

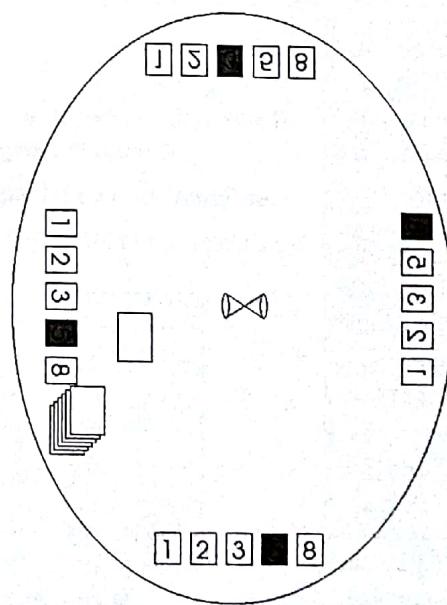


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## Planning Poker - Step by step

IPMA

1. Each estimator is given a deck of cards, each card has a valid estimate written on it
2. Product owner/Scrum Master reads a story and it's discussed briefly
3. Each estimator selects a card that's his or her estimate
4. Cards are turned over so all can see them
5. Discuss differences (especially outliers)
6. Re-estimate until estimates converge



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## Planning Poker - Example

IPMIA



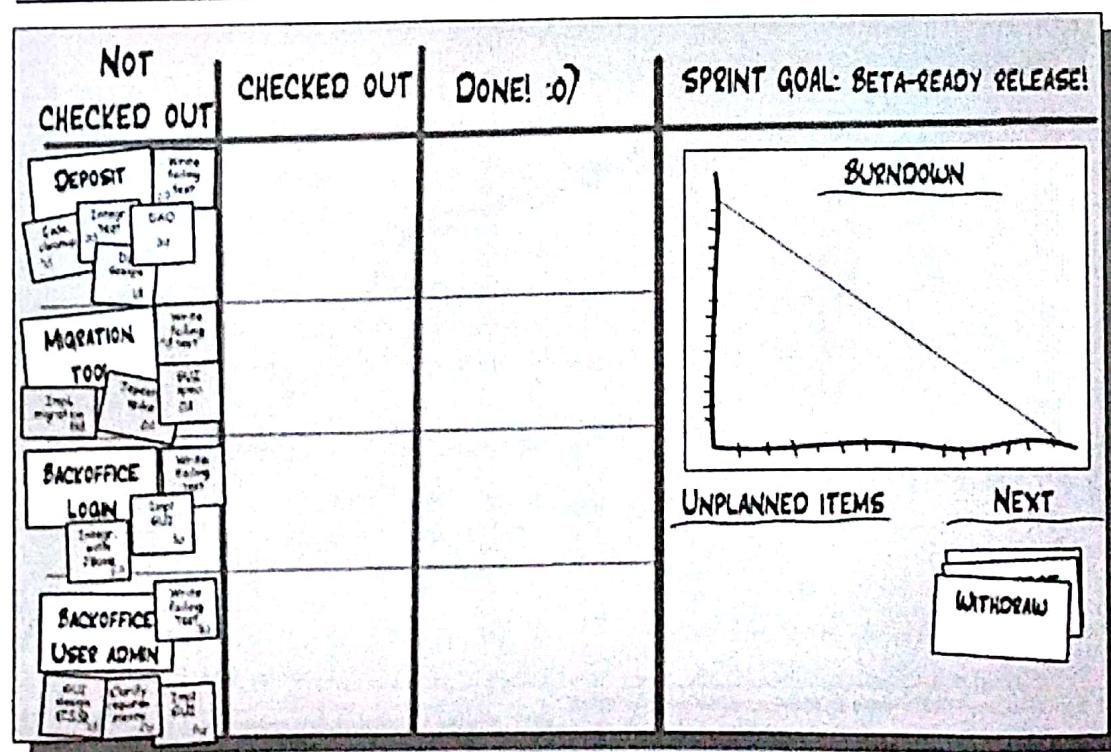
Estimator	Round 1	Round 2
Nam	3	5
Ngân	8	5
Thắng	2	5
Long	5	8

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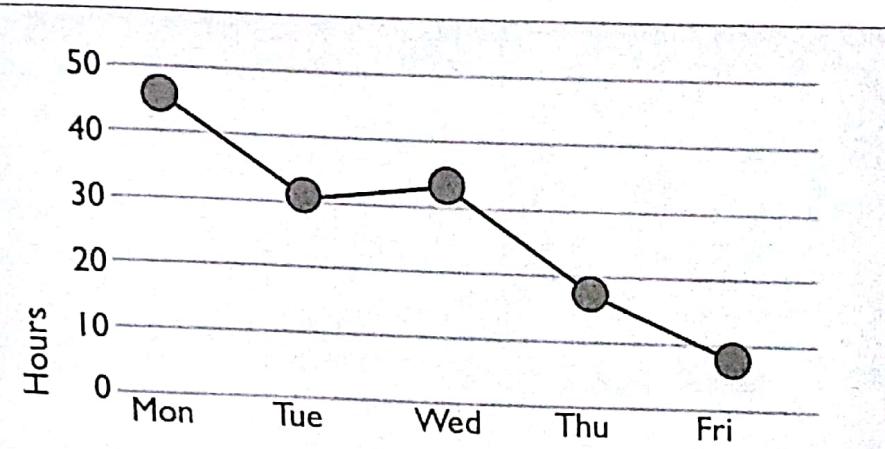
## Kanban board and Burndown Chart

Screencast

IPMIA

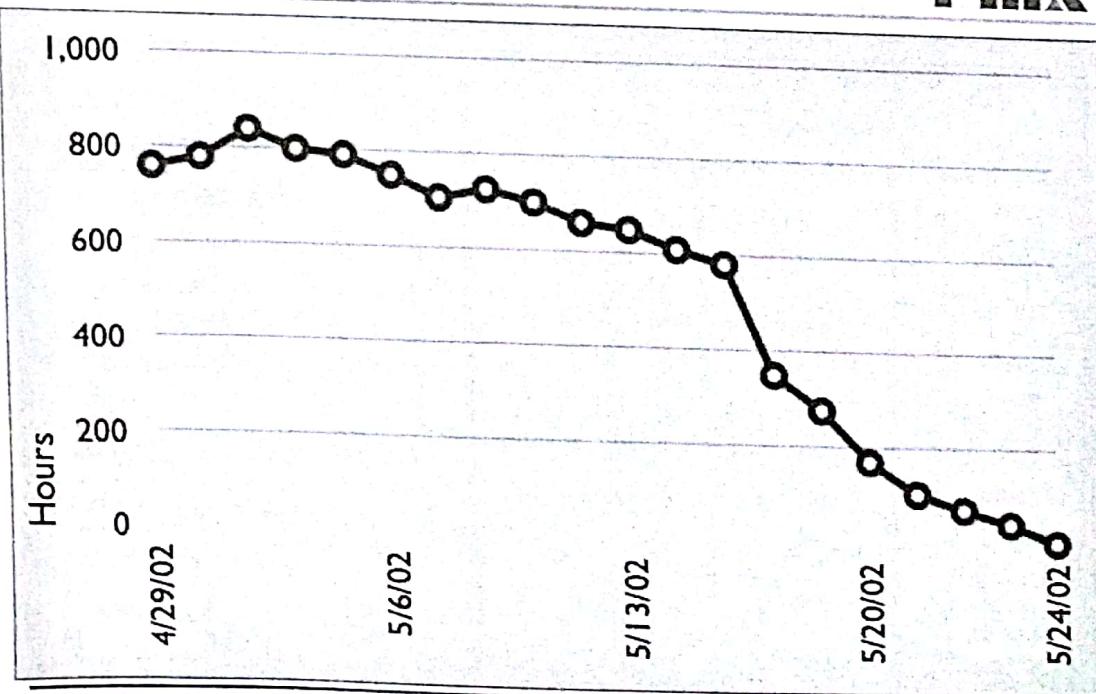


Code the middle tier	16	12	10	7	
Test the middle tier	8	16	16	11	8
Write online help	12				



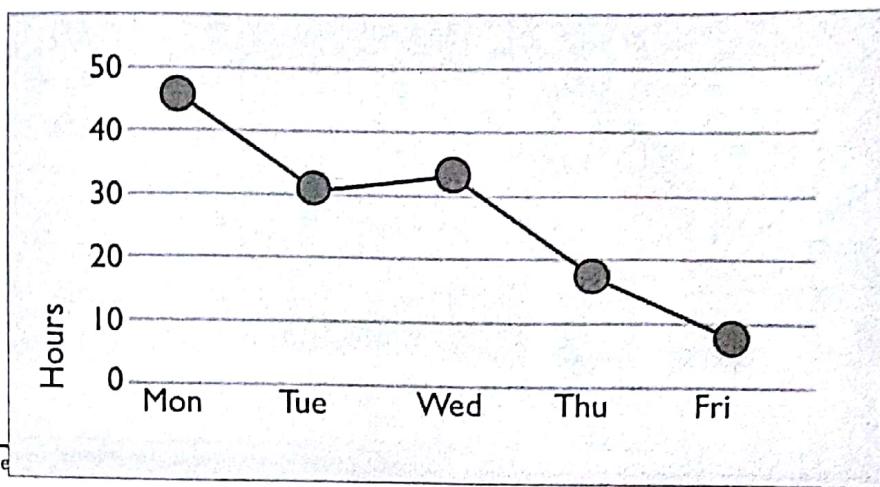
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### An iteration's burndown chart



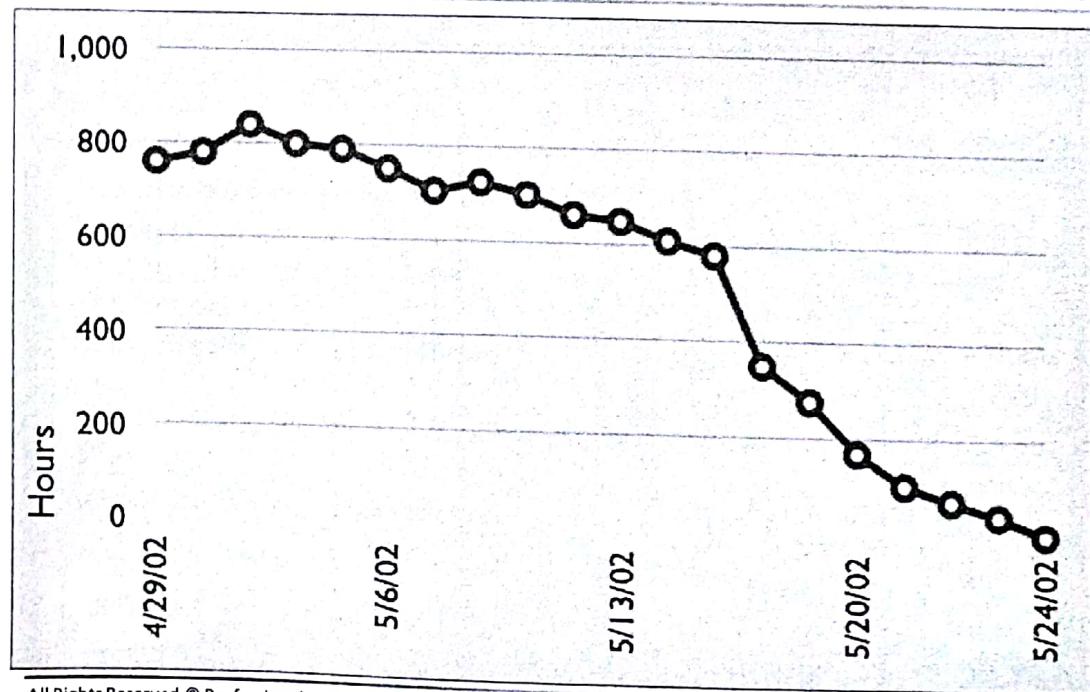
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Tasks	Mon	Tues	Wed	Thur	Fri
Code the user interface	8	4	8		
Code the middle tier	16	12	10	7	
Test the middle tier	8	16	16	11	8
Write online help	12				



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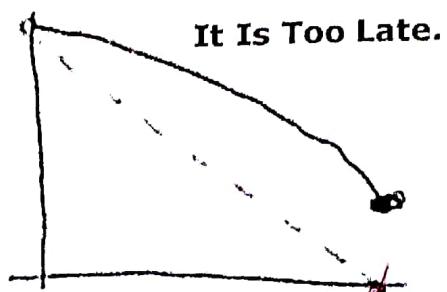
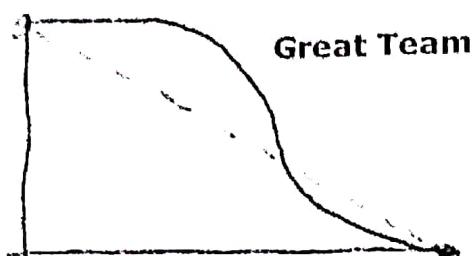
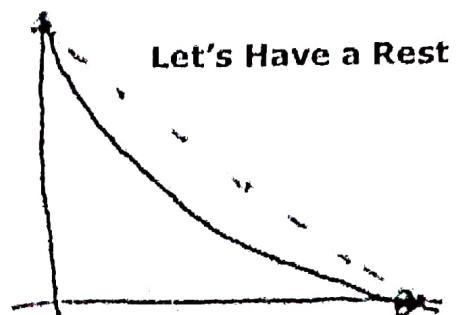
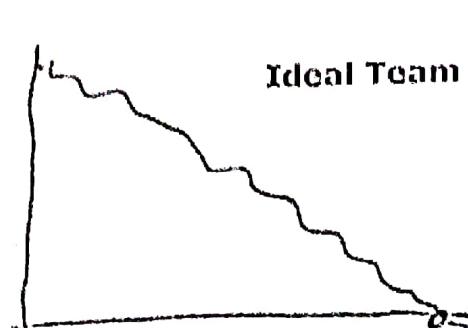
### An iteration's burndown chart



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## What a Burndown Chart Can Say?

IPMADA

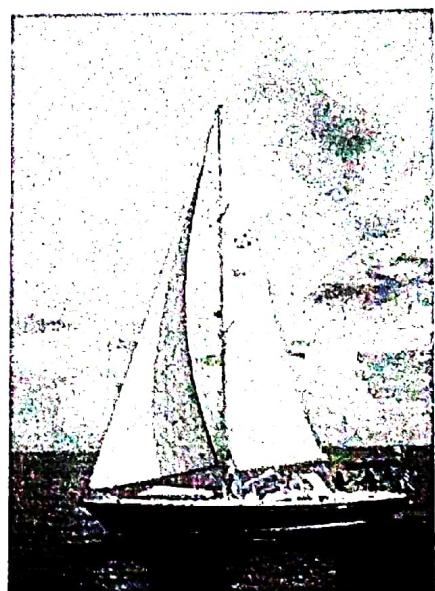


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## Velocity - Very stabilizing for our Teams.

IPMADA

- The rate at which a team can produce working software
- Measured in **non-time-referent** terms (e.g., Story Points) per Sprint
- More accurately stated, it is measured in terms of the stabilized **number of Story Points** a team can deliver per sprint of a given length, and with a given definition of Done.
- Based on history/previous experience
- Must have stabilized to be reliable
- Should not be used as a measure of comparison across teams



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## Velocity - Example

PMIA

- \* Example: Team A is working in 2-week sprints. One week they have additional capacity. Team A has been working together for several sprints, and consistently delivers between 18 and 23 points of working software every sprint.
- \* We could reasonably expect Team A to deliver roughly 20 points per 2-week sprint, and so we consider that to be the team's velocity for planning purposes.
- \* If there are eight 2-week sprints in a release, we can extrapolate that Team A has the capability to deliver 160 points in a release.

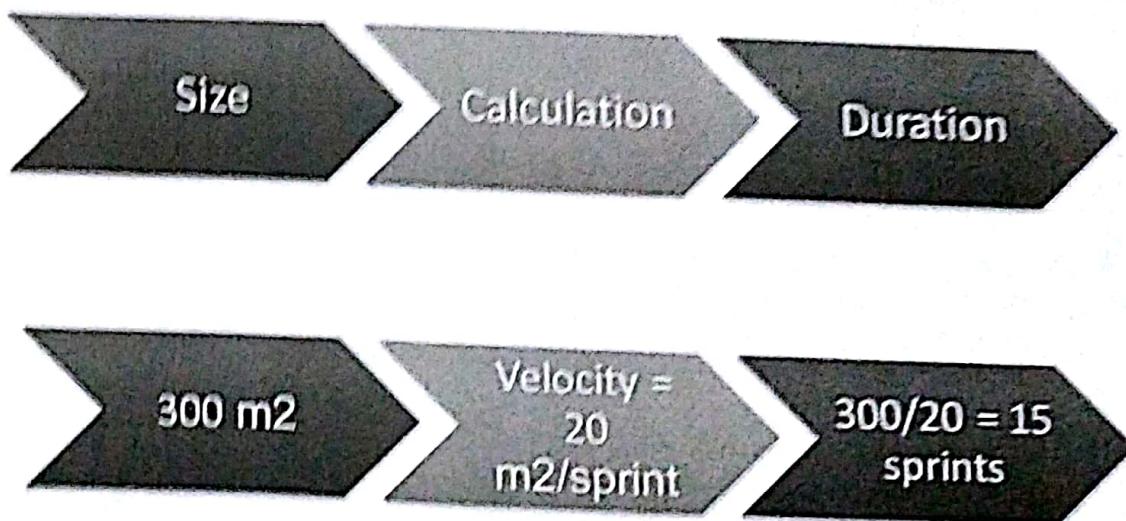


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## Estimate size; derive duration

PMIA

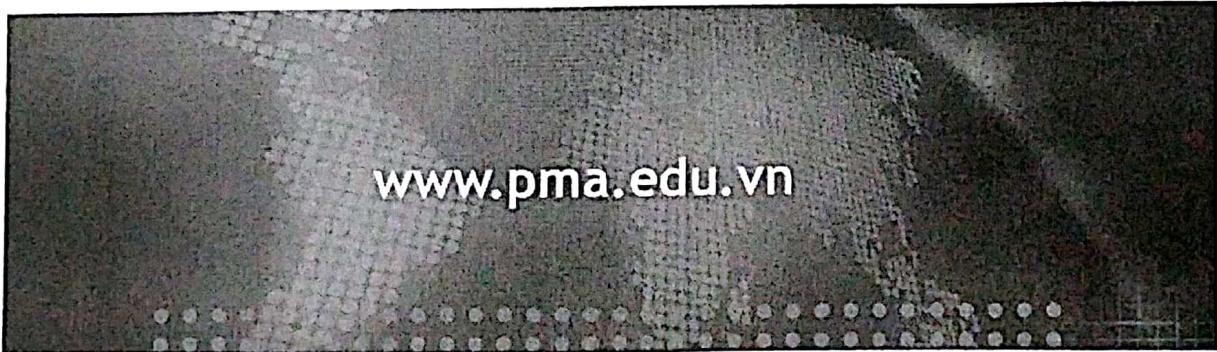


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## Review

PHIA

- Schedule management process
- Schedule management plan
- Schedule baseline
- Precedence diagramming method (PDM)
- Critical path
- Critical path method
  - Near-critical path
- Float (Slack)
  - Free float
  - Total float
  - Project float
- Schedule compression
  - Crashing
  - Fast tracking
- Monte Carlo analysis
- Bar charts
- Milestone charts
- Resource leveling
- Leads and lags
- Heuristics
- Variance
- Milestones
- User story
- Agile release planning



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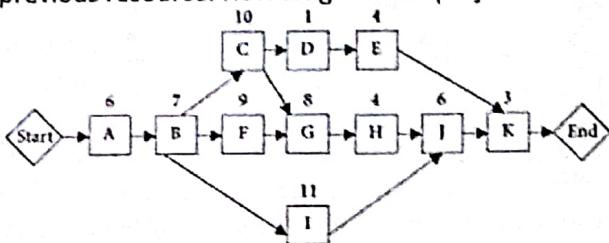


## Project Schedule Management (2<sup>nd</sup>)

1. A project manager decides to bring expected future schedule performance in line with the project management plan. What is this a definition of?

- A. Corrective action
- B. Scope validation
- C. Scope planning
- D. Lessons learned

2. Based on the network diagram in the chart, the resource working on activity G is replaced with another resource with 50% of the productivity of the previous resource. How long will this project take?



- A. 44
- B. 51
- C. 52
- D. 36

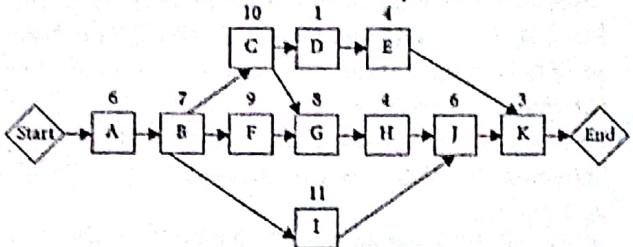
3. A project manager holds a meeting with his manager to explain that an activity has been delayed and the project manager will need additional resources to complete the project. The manager stops the meeting because the project manager has forgotten something. What might it have been?

- A. To investigate undoing previous fast tracking activities
- B. To look for options with the customer before meeting with management
- C. To try to compress the project schedule before asking for additional resources
- D. To eliminate float in the near-critical path

4. Which of the following is CORRECT?

- A. The network diagram will change every time the end date changes
- B. The critical path helps prove how long the project will take
- C. There can be only one critical path
- D. A project can never have negative float

5. Based on the network diagram show in the chart, what is the duration of the critical path?



- A. 44
- B. 36
- C. 31
- D. 33

6. Which of the following are GENERALLY illustrated BETTER by bar charts than network diagrams?

- A. Progress or status
- B. Resource trade-offs
- C. Logical relationships
- D. Critical paths

7. When the project manager completes the detailed project schedule, it is MOST important to get it approved by the:

- A. Functional managers
- B. Customer
- C. Team
- D. Project sponsor

8. A project manager is trying to coordinate all the activities on the project and has determined the following:

- Activity 1 can start immediately and has an estimated duration of 1 week
- Activity 2 can start after activity 1 is completed and has an estimated duration of 4 weeks
- Activity 3 can start after activity 2 is completed and has an estimated duration of 5 weeks
- Activity 4 can start after activity 1 is completed and has an estimated duration of 8 weeks

Both activities 3 and 4 must be completed before the end of the project. What is the duration of the critical path for this project?

- A. 10
- B. 8
- C. 14
- D. 11

22. Which of the following is the MOST likely outcome of crashing a project?

- A. Longer schedule
- B. Increased cost
- C. Added schedule risk
- D. Doing more activities in parallel

23. Which of the following processes includes asking team members about the time estimates for their activities and reaching agreement on the calendar date for each activity?

- A. Develop Schedule
- B. Develop Project Charter
- C. Sequence Activities
- D. Define Scope

24. A project manager has received activity duration estimates from his team. Which of the following does he need in order to complete the Develop Schedule process?

- A. Reserves
- B. Recommended corrective actions
- C. Schedule change control
- D. Change requests

25. What schedule network analysis technique uses free float?

- A. Schedule compression
- B. Critical chain
- C. Critical path
- D. Resource leveling

26. Your project is currently scheduled to take 117 months. Based on the chart, you could crash the project by five months at a cost of \$20,000. How long will the project take if you select this option?

Activity	Original Duration in Months	Crash Duration in Months	Time Savings	Original Cost in Dollars	Crash Cost	Extra Cost
A	24	22	2	\$100,000	\$114,000	\$14,000
F	18	15	3	\$117,000	\$135,000	\$18,000
D	23	19	4	\$225,000	\$245,000	\$20,000
C	30	25	5	\$114,000	\$134,000	\$20,000
H	25	23	2	\$127,000	\$130,000	\$3,000

- A. 112 months
- B. 55 months
- C. 25 months
- D. 117 months

27. Based on the chart, what will be the effect on the project if activity C now takes four months?

Activity	Preceding Activity	Estimate (months)
Start		
A	Start	3
B	Start	7
C	A	2
D	A	4
E	C, D	5
F	B	9
G	E, F	3
End	G	

- A. Activity B is now on the critical path
- B. There is no change to the critical path
- C. The project will take longer
- D. There will be a new critical path

28. Which of the following BEST describes the primary use of project management software?

- A. Creating a WBS
- B. Creating and controlling a schedule
- C. Creating a complete project management plan
- D. Managing a project

29. A project activity on the critical path is delayed. What is the BEST thing to do?

- A. Obtain more resources
- B. Cut scope
- C. Tell the customer the project will be late
- D. Compress the schedule

30. A project manager is in the middle of executing a very large construction project when he discovers the time needed to complete the project is longer than the time available. What is the BEST thing to do?

- A. Work overtime
- B. Cut product scope
- C. Meet with management and tell them the required date cannot be met
- D. Determine options for schedule compression and present management with his recommended option

31. An activity has an early start (ES) of day 3, a late start (LS) of day 13, an early finish (EF) of day 9, and a late finish (LF) of day 19. The activity:

- A. Has a lag
- B. Is not on the critical path
- C. Is progressing well
- D. Is on the critical path

32. Which of the following BEST explains why the team needs to approve the final schedule?

- A. To improve communications
- B. To enhance team buy-in and loyalty
- C. To get a better cost estimate
- D. To ensure activities can be completed as scheduled

33. Your team is analyzing the project and comes up with the information in the chart. Which activities are on the critical path?

Activity	Float (months)
Start	
B	2
C	1
D	0
E	3
F	1
G	0
H	4
I	0
End	

- A. Activities D, G, I
- B. Activities B, C, I
- C. Activities B, C, E, F, H
- D. Not enough information

34. While evaluating the bar chart with your team, you determine the project is behind schedule. What should you do?

- A. Evaluate the alternatives with the customer
- B. Evaluate the alternatives with the team
- C. Obtain approval from the customer to slip the project
- D. Report findings to management

35. When would a milestone chart be used instead of a bar chart?

- A. Project planning
- B. Reporting to team members

C. Reporting to management

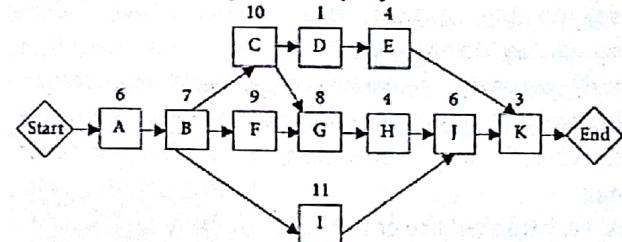
D. Risk analysis

36. In order to shorten the project duration, you look at fast tracking the project. Based on the chart, which activity(s) would you consider fast tracking?

Activity	Float (months)
Start	
B	2
C	1
D	0
E	3
F	1
G	0
H	4
I	0
End	

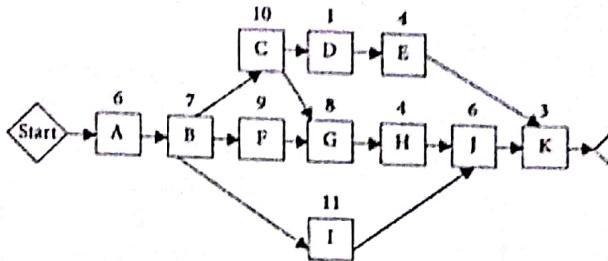
- A. Activity B or E
- B. Activity D or I
- C. Activity C or F
- D. Activity H

37. Using the chart, a new activity, (activity R) with the duration of 5 is added to this project. Activity R has a predecessor of activity A and a successor of activity B. How long will the project now take?



- A. 52
- B. 38
- C. 49
- D. 48

38. Based on the network diagram in the chart, you complete the initial schedule and find out that the scheduled completion date for activity G is after an imposed delivery date. In order to shorten the project length and meet that milestone, what should you do?



- A. Move more resources to activity B
- B. Decrease the work of activity E
- C. Outsource activity I
- D. Fast track activities H and J

39. Which of the following BEST describes comparing actual dates with planned dates?

- A. Variance analysis
- B. Develop Schedule
- C. Three-point estimating
- D. Resource leveling

40. A project manager received executive orders to deliver the project two weeks earlier than scheduled, doing whatever it takes. He decided that the least costly means would be to add resources to critical path activities in order to shorten the time of those activities. In this case, the project manager has:

- A. Fast tracked the critical path of project schedule
- B. Crashed the critical path
- C. Decomposed the critical path WBS
- D. Leveled resources

41. Total float is the amount of time an activity can be delayed without delaying the:

- A. Project
- B. Completion date required by the customer
- C. Early start of its successor
- D. Project completion date

42. Based on the chart, what is the duration of the critical path?

Activity	Preceding Activity	Estimate (months)
Start	None	0
A	Start	7
B	A	3
C	B	4
D	B	10
E	Start	40
F	D	5
G	C	6
I	E	6
End	I,F,G	0

- A. 23
- B. 30
- C. 49
- D. 46

43. Using the chart, the resource for activity A is assigned to an additional, more important project. As a result, the resource will not be able to devote as much time to your project. Activity A will now take 10 weeks. How does this affect the project?

Activity	Preceding Activity	Estimate (weeks)
Start		0
C	Start	3
D	C	6
A	C	8
E	D	4
B	A,E	5
F	E	3
End	B,F	0

- A. The project will be delayed
- B. Activity D will be delayed
- C. The project is riskier
- D. There are three critical paths

44. What does "resource leveling" mean in project management?

- A. Making the most efficient use of the available resources
- B. Hiring contractors to fill in during "peak" times on the project schedule
- C. Reducing the project costs
- D. Shortening the time it takes to complete the project

45. Based on the chart, what is the lowest cost of crashing this project to save four weeks?

Activity	Baseline		Crash	
	Time	Cost	Time	Cost
A	10	\$4,000	8	\$6,000
B	2	\$6,000	2	\$6,000
C	14	\$22,000	12	\$26,000
D	6	\$9,000	5	\$10,000
E	9	\$14,000	7	\$19,000
F	8	\$18,000	4	\$36,000

- A. \$6,000
- B. \$9,000
- C. \$18,000
- D. \$7,000

46. Based on the chart, a resource on your project from the consumer affairs department comes to you to tell you that he is taking a two-week leave from work due to a family emergency. He is assigned to activity F, which is currently in progress. This is a problem because activity F has:

Activity	Preceding Activity	Estimate (months)
Start		
A	Start	3
B	Start	7
C	A	2
D	A	4
E	C, D	5
F	B	9
G	E, F	3
End	G	

- A. One-week float
- B. Two months of float
- C. No float
- D. One month of float

47. A team member wants to make a technical change to her activity that will add time to the activity estimate. What is the FIRST thing the project manager should do?

- A. Send a change request to the change control board
- B. Determine if the activity is on the critical path
- C. See if there is enough reserve to handle the change

D. See if there is any time available from another activity

48. Which of the following is NOT included in a schedule change control system?

- A. Tracking systems
- B. Limitations on the scope of changes
- C. Approval levels necessary for authorizing changes
- D. Paperwork necessary for making changes

49. Based on the chart, if the duration of activity F changes to 8, what is the effect on the project?

Activity	Preceding Activity	Estimate (weeks)
Start		0
C	Start	3
D	C	6
A	C	8
E	D	4
B	A, E	5
F	E	3
End	B, F	0

- A. The critical path changes
- B. The duration of the critical path becomes 16
- C. There is no effect on the critical path
- D. Activity A is now on the critical path

50. In order to handle some resource changes on your project, activity H is going to be done concurrently with activity G instead of after it. Based on the data in the chart, what impact will this have on the project?

Activity	Float (months)
Start	
B	2
C	1
D	0
E	3
F	1
G	0
H	4
I	0
End	

- A. It will cause the project to be completed four time periods sooner
- B. It will cause a decrease in project risk
- C. It will affect activity F
- D. It will have no effect on the critical path

# Project Schedule Management

## Xác định hoạt động

1. Mốc chuyển giao (Milestone) gần nhất của bạn là khi nào?
2. Bạn cần chuyển giao gì ở milestone đấy?
  - Gợi ý: *Liệt kê các deliverables ở milestone đấy. Deliverables phụ thuộc vào phương pháp phát triển và vòng đời dự án*
3. Với mỗi 1 deliverable, xác định các hoạt động cần thiết để sản xuất và chuyển giao các deliverable đấy?
  - Gợi ý: *hãy tham khảo thông tin từ phía những người làm trực tiếp hoặc ý kiến chuyên gia*

## Tuần tự hoạt động

1. Hãy sắp xếp tuần tự các hoạt động. Xác định phụ thuộc giữa các hoạt động, các phụ thuộc đấy là **Bắt buộc (Mandatory)** hay **Tuỳ ý (Discretionary)**?
  - Gợi ý:
    - **Bắt buộc (Mandatory):** Quy định bởi đặc tính kỹ thuật, hoặc luật pháp
    - **Tuỳ ý (Discretionary):** Theo kinh nghiệm chủ quan
2. Mỗi quan hệ giữa các hoạt động thuộc loại nào trong 4 loại sau: **Finish-Start (FS)**, **Finish – Finish (FF)**, **Start – Finish (SF)**, **Start – Start (SS)**?
3. Có cần thiết phải bổ sung Lead và Lag giữa các hoạt động không?

## Ước lượng thời gian thực hiện

1. Cần bao nhiêu thời gian để thực hiện từng hoạt động? Bạn sử dụng kỹ thuật nào để ước lượng?
  - Gợi ý: *Thời gian thực hiện phụ thuộc vào nguồn lực bạn có. Trước khi trả lời thời gian, cần xác định nguồn lực cần thiết cho các hoạt động đó.*
2. Các hoạt động có cần thời gian dự phòng không? Bạn dự phòng cho rủi ro nào?

## Xây dựng lịch trình thực hiện

1. Sử dụng phần mềm để mô hình hóa sơ đồ mạng (Schedule network diagram). Đâu là đường Critical Path trên sơ đồ mạng?
2. Với thời gian thực hiện bằng độ dài của đường Critical Path, bạn có kịp chuyển giao ở milestone dự kiến không?
3. Trong trường hợp không kịp, bạn có thể nén tiến độ (schedule compression) ở những hoạt động nào?