

## Defining the Project

- Step 1: Define the project scope
- Step 2: Establishing project priorities
- Step 3: Create the work breakdown structure
- Step 4: Code the WBS for the information system
- Step 5: Develop activities, cost, and schedule

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## Step 1: Define the project scope

- Project Scope
  - A definition of the end result or mission of the project—a product or service for the client/customer—in specific, tangible, and measurable terms.
- Purpose of the Scope Statement
  - To clearly define the deliverable(s) for the end user.
  - To focus the project on successful completion of its goals.
  - To be used by the project owner and participants as a planning tool and for measuring project success.

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## Project scope: Terms and definitions

- Scope Statements
  - Also called statements of work (SOW)
- Project Charter
  - Can contain an expanded version of scope statement
  - A document authorizing the project manager to initiate and lead the project.
- Scope Creep
  - The tendency for the project scope to expand over time due to changing requirements, specifications, and priorities.

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## Step 2: Establish project priorities

- Causes of Project Trade-offs
  - Shifts in the relative importance of criterions related to cost, time, and performance parameters
    - Budget–Cost
    - Schedule–Time
    - Performance–Scope
- Managing the Priorities of Project Trade-offs
  - Constrain: a parameter is a fixed requirement.
  - Enhance: optimizing a parameter over others.
  - Accept: reducing (or not meeting) a parameter requirement.

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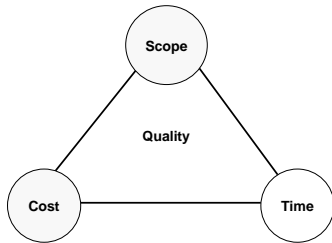
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## Project management trade-offs



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## Project priority matrix

	Time	Performance	Cost
Constrain			
Enhance			
Accept			

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### Step 3: Creating the work breakdown structure

- Work Breakdown Structure (WBS)
  - A hierarchical outline (map) that identifies the products and work elements involved in a project
  - Defines the relationship of the final deliverable (the project) to its subdeliverables, and in turn, their relationships to work packages
  - Best suited for design and build projects that have tangible outcomes rather than process-oriented projects

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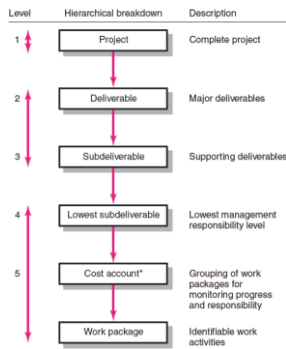
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### Hierarchical breakdown of the WBS



from: Gray & Larson (2008). *Project management: the managerial process (4th ed.)* McGraw-Hill Irwin.

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### How does the WBS help the PM?

- Facilitates evaluation of cost, time, and technical performance of the organization on a project
- Provides management with information appropriate to each organizational level
- Helps in the development of the organization breakdown structure (OBS), which assigns project responsibilities to organizational units and individuals
- Helps manage plan, schedule, and budget
- Defines communication channels and assists in coordinating the various project elements

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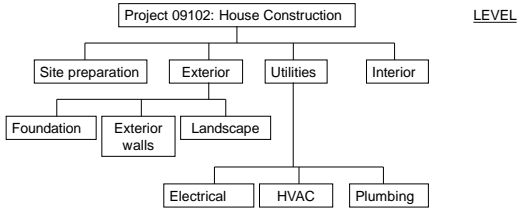
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## An Example ...



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## Work packages

- A work package is the lowest level of the WBS.
  - It is output-oriented in that it:
    - Defines work (what)
    - Identifies time to complete a work package (how long)
    - Identifies a time-phased budget to complete a work package (cost)
    - Identifies resources needed to complete a work package (how much)
    - Identifies a single person responsible for units of work (who)

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## Step 4: Coding the WBS

- WBS Coding System
  - Defines:
    - Levels and elements of the WBS
    - Organization elements
    - Work packages
    - Budget and cost information
  - Allows reports to be consolidated at any level in the organization structure.

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## WBS coding

- 09102: House Construction
  - 09102.1 Site preparation
  - 09102.2 Exterior
    - 09102.2.1 Foundation
    - 09102.2.2 Exterior walls
  - 09102.2.3 Landscape
  - 09102.3 Utilities
    - 09102.3.1 Electrical
    - 09102.3.2 HVAC
    - 09102.3.3 Plumbing
- etc.

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## Your turn ...

- To start your project, you should define the WBS
  - What are the deliverables, subdeliverables, and work packages required to deconstruct Ware Hall?
- We will discuss these in class on Thursday.

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## Step 5: Develop activities, cost, & schedule

- Activities developed from work packages
  - Identify distinct, separable tasks that have to be done to complete the work package
  - Associate a duration with each task
  - Identify resources required
    - People
    - Equipment
    - Facilities
  - Identify "precedence"
    - What has to happen before this task can be started?

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## Recall our house example ...

- Tasks that need to be completed for each work package, e.g.
  - Electrical utilities are installed in two main tasks
    - Rough in electrical (and, after drywall is installed)
    - Finish electrical
  - Other work packages are similarly decomposed into activities, as shown on the next slide

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## Our example ...

### Task Definition:

Description	Duration(days)	Precedence
Step A: Prepare site.	5	-
Step B: Build foundation.	8	A
Step C: Frame walls and roof.	15	B
Step D: Rough in Plumbing	12	C
Step E: Rough in Electrical	10	C
Step F: HVAC Venting	8	C
Step G: Drywall	11	D,E,F
Step H: Finish Electrical	5	G
Step I: Finish Plumbing	4	G
Step J: Finish HVAC	2	H
Step K: Install Kitchen	8	H,I
Step L: Install Baths	14	H,I
Step M: Paint	5	J,K,L
Step N: Landscape	5	J,K,L

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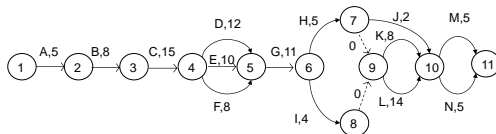
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## Project Management

### Precedence Diagram

Tasks must sometimes be performed in series, or may at times be performed in parallel.

For the house example, let each arc represent a project task/job.



Each arc is identified by a job letter and duration. Note the dummy jobs indicating precedence that jobs H and I must complete before K or L begins.

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## Project Management

### Timing – Gantt Chart

- Tasks and task durations are often represented as Gantt Charts.
- Task precedence knowledge is shown graphically on the time line.

Task Name	Duration	Nov 6, 06				Nov 13, 06					
		M	T	W	T	F	M	T	W	T	F

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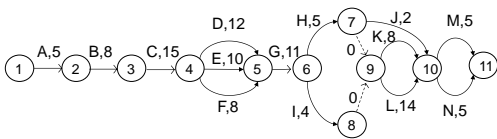
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## Project Management

### Critical Path



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## Expediting/Crashing

### CPM – Critical Path Method

- Can normal task times be reduced?
- Is there an increase in direct costs?
  - Additional manpower
  - Additional machines
  - Overtime, etc...
- Can there be a reduction in indirect costs?
  - Less overhead costs
  - Less daily rental charges
  - Bonus for early completion
  - Avoid penalties for running late
  - Avoid cost of late startup
- CPM addresses these cost trade-offs.

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## CPM – Critical Path Method

Example:

Job	Predecessors	Normal Time (days)	Crash Time (days)	Cost of Crashing per Day (\$)
A	-	10	7	4
B	-	5	4	2
C	B	3	2	2
D	A,C	4	3	3
E	A,C	5	3	3
F	D	6	3	5
G	E	5	2	1
H	F,G	5	4	4

Overhead cost = \$5/day

Step 1. Draw the precedence diagram

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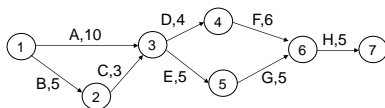
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## CPM – Critical Path Method

Precedence diagram & critical path



Enumerative Approach:

Reduce job H by 1 day: Total cost improves by \_\_\_\_\_

Reduce job A by 2 days: Total cost improves by \_\_\_\_\_

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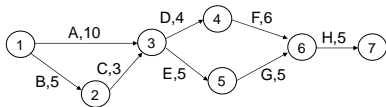
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## CPM – Critical Path Method (cont.)



Reduce job A by an additional day and job B by 1 day?:

Total cost improves by \_\_\_\_\_

Reduce job A by an additional day and job C by 1 day?:

Total cost improves by \_\_\_\_\_

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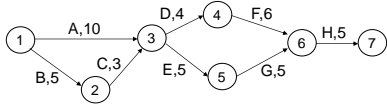
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### CPM – Critical Path Method (cont.)



Evaluate combinations of reducing path 3-4-6 and 3-5-6 by one day.

Overall improvement = \_\_\_\_\_

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