GEPM-375

Project Planning and Construction Management

Project Scheduling

What we are going to discuss today?

- Sequencing Activities?
- Estimate Activities Resources.
- Estimate Activities Durations.
- Develop schedule.

Previous class:

- Scheduling
- Plan Schedule Management
- Define Activities

Steps 3: Sequence Activities

Process of identifying and documenting relationships among the project activities.

•After the project has been **divided into tasks/activities** the **relationships between tasks/activities must be determined**.

•Most of the time; **a task starts when the previous one finishes**, but not all the time.

*Defines the **logical sequence of work** to **obtain** the **greatest efficiency** given all project constraints.*

Task Dependencies

Four types of dependencies:

- **Finish to Start (FS):** **Most common** dependency. When tasks A and B have an "FS relationship," task B cannot start until task A finishes

- **Finish to Finish (FF):** When tasks A and B have an FF relationship, task B cannot finish until task A finishes.

- **Start to Start (SS):** When tasks A and B have an SS relationship, task B cannot start until task A starts.

- **Start to Finish (SF):** When tasks A and B have an SF relationship, task B cannot finish until task A starts.

Leads and Lags : Specify an offset from the start or finish point of a task.

- **Lead:** Amount of time whereby a **successor activity can be advanced with respect to a predecessor activity**.

  Example: If tasks A and B have an **FS relationship with a lead of 5 days,** task B cannot start until 5 days after task A has finished.

- **Lag:** Amount of time whereby a successor activity **will be delayed** with respect to a predecessor activity.

Example: If tasks **A and B have an FS relationship with a lag of 5 days**, task B cannot start until 5 days before task A has finished.

Steps 3: Sequence Activities

Task List		
Task ID	Name	Dependencies (FS relationship)
110	Excavation	
120	Pour Foundation	110
210	Wood work	120
310	Electrical & Plumbing	210
320	Flooring	**210**
330	Finishing	**210, 310**
410	Landscaping	120

Steps 4: Estimate Activities Resources

Estimate Activity Resources:

- **Process of identifying and determining** the specific types and quantities of **human resources, equipment, materials, and other assets** needed to complete **each individual task** within a project.

- **Identifies** the **type, quantity, and characteristics** of resources required to complete the activity which **allows more accurate cost and duration estimates.**

Major types of **resources:**

- Labor
- Tools and equipment
- Facilities
- Fixed cost items like subcontracting, etc.
- Other resources include financing costs, contingencies, overtime pay, and so forth.

- **Example**: To **build the log house**, need to look at each individual task and determine the resources that are required. We would build a table that looks something like this:

110 – Excavation		
Type	**Average Use**	**Total**
Excavation Contractor	**30 hrs @ $180/hr**	**$5,400**
Mr. Bob	**10 hrs @ $45/hr**	**$450**
	TOTAL	**$5,850**

Points to Note/Consider in Estimating Activities Resources

- Just because a **resource is necessary, doesn't mean it's available.**
- To determine the availability of resources, a **PM consults a document** called a ***resource calendar*.**
- This document **states the availability of a resource**, for example, "**Pervez is at jobsite X from Sep. 1 to Sep 30.**"
- Obviously, the new project being planned **cannot use this worker at that time** (unless arrangements are made with the other project manager, I suppose).

Step-5 Estimate Activity Durations:

- Process of **estimating the number of work periods needed** to **complete individual activities with estimated resources.**

- Provides the **amount of time** each activity will take to complete, which is a **major input** into the **Develop Schedule process.**

Method of Estimating Duration

Analogous Estimating Method:

- In this method one **consult the actual data** from a previous or related project.

- Even **if it has some differences** to the current project, one can **analyze** those differences and **apply a correction factor**.

Parametric Estimating Method:

In this method you **break down the project into its fundamental units** that have well known and **understood unit time**.

- For example, the **square footage** of a house.

Three Point Estimating Method:

- When **no real good data are available**, one can estimate the **highest possible** number (**optimistic**), and the **lowest** (pessimistic) as well as the **most likely**.
- **Average** them, or use a **beta distribution**.
  - ***Normal Distribution:*** *Estimate = (Optimistic + Most Likely + Pessimistic) / 3*
  - ***Beta Distribution:*** *Estimate = (Optimistic + 4 x Most Likely + Pessimistic) / 6*

Example. To build the log home, we would **inspect each resource table** from the previous step and **determine the amount of time** required.

Task ID	Name	Durations	Cost
110	Excavation	6 days	$5,850
120	Pour Foundation	10 days	$4,700
210	Wood work	20 days	$60,850
310	Electrical & Plumbing	10 days	$20,260
320	Flooring	8 days	$18,760
330	Finishing	12 days	$16,760
410	Landscaping	14 days	$7,620
	TOTAL	80 days	$134,800

- Total of **80 days** **is not the final project duration** because we **haven't accounted for the project resources yet.**

- If the **resources are not available** **at the right time**, or more resources are required than available **at a given time**, the **project schedule will need to be adjusted**.

Steps 6: Develop Schedule

- In this step, **the most efficient schedule** for the project will be developed.

- **Defined** as producing the **official start and end dates for each task**

- Used **to direct subcontractors** as to when
  -to **schedule** the work,
  -to **order equipment**, and
  -to **prioritize internal resources**.

- Uses the **CPM to determine** the **shortest possible project completion date** and **which tasks directly affect it**.

- **Issues that arise within those tasks** can then be **dealt with on a priority basis**.

Develop Schedule:

- Process of **analyzing** **activity sequences**, **durations**, **resource requirements**, and **schedule constraints** to create the project schedule model.

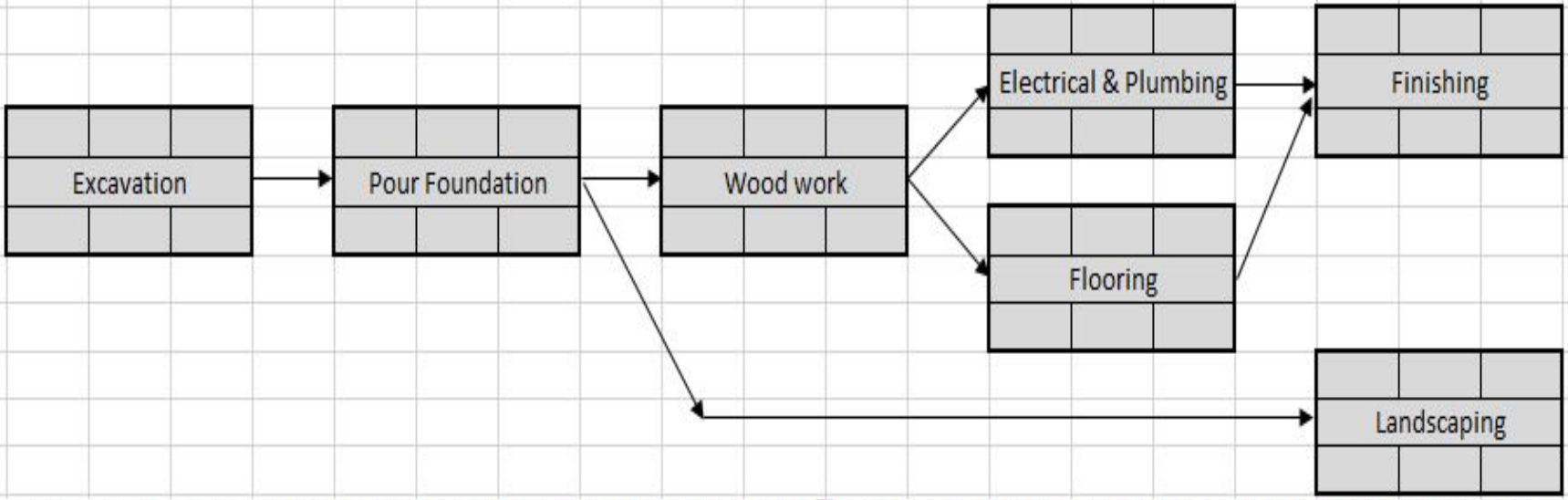
- By **entering** schedule activities, durations, resources, resource availabilities, and **logical relationships** into the scheduling tool.

- To **develop the schedule**, the **critical path method** is used.

- Final step of drawing the **graphical bar chart**, also known as a **Gantt Chart**.

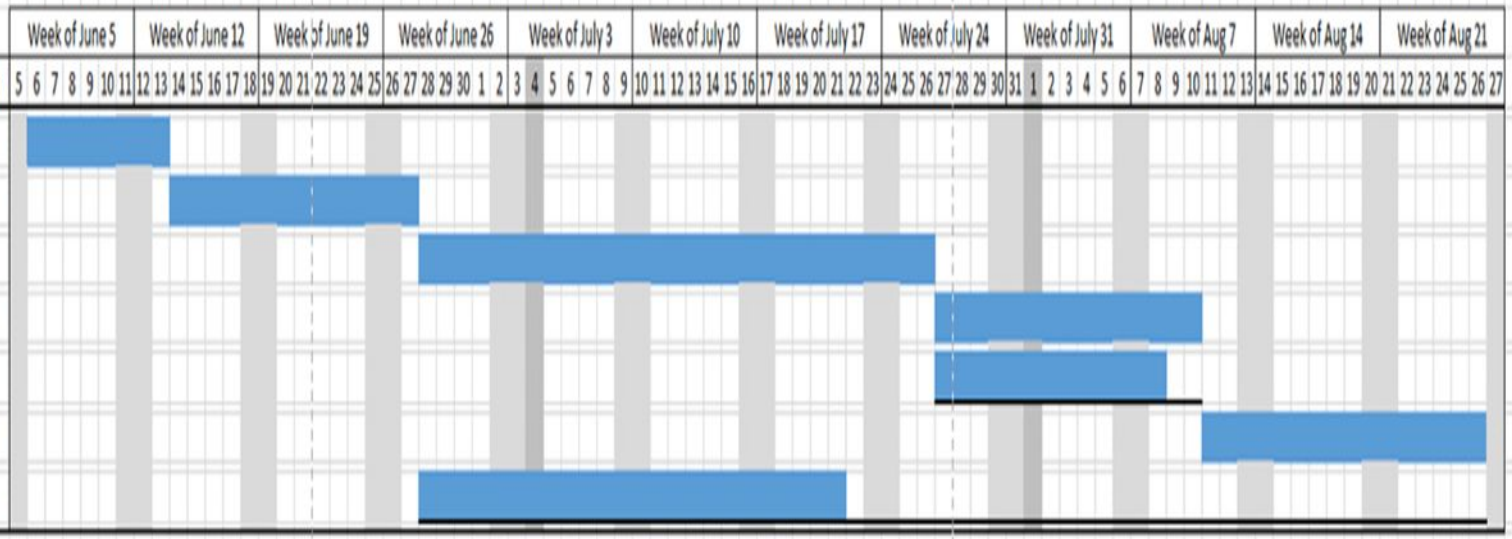
- **Resource leveling** **is done to "smooth"** the overall use of project resources

Original Network



Initial Schedule

Activity	Start	Duration	End	Float
Excavation	1	6	6	0
Pour Foundation	7	10	16	0
Wood work	17	20	36	0
Electrical & Plumbing	37	10	46	0
Flooring	37	8	44	2
Finishing	47	12	58	0
Landscaping	17	14	30	28



Thank You