



ROBUST
PROJECT
MANAGEMENT
– PART II

SCHEDULING, CONTROLLING,
CHANGING, AND CLOSING

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AS DISCUSSED LAST TIME, OUTPUT FROM THE PROJECT PLANNING PHASE IS...

- Project definition
- Project team
- Project plan

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PROJECT PLAN SUMMARY

The Project Plan should include:

1. Scope Baseline
 - a) Project Scope Statement
 - b) WBS
2. Project Schedule
3. Project Budget

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You can view the session on Planning
at...

<https://youtu.be/tlJoRbpFexE>

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THIS TIME, WE WILL TALK ABOUT EXECUTING THE PLAN

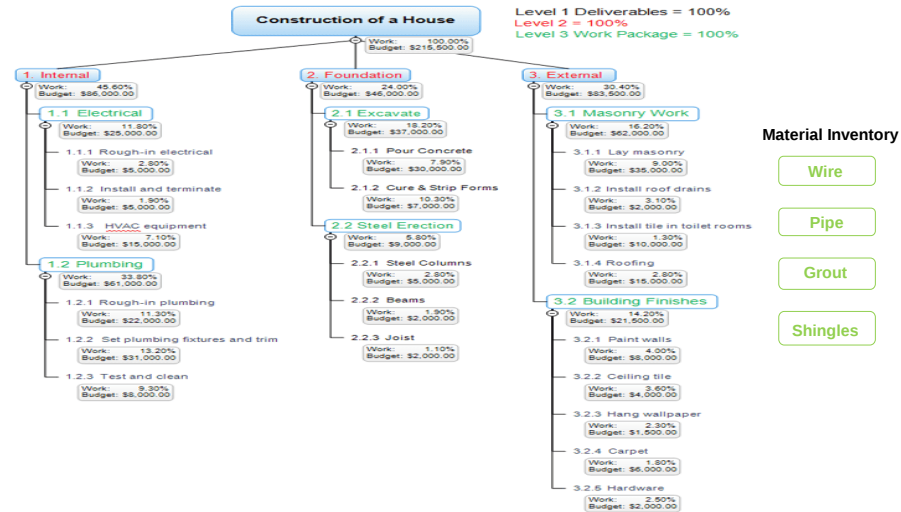
- Project...
 - Scheduling
 - Controlling
 - Closure
 - Changes

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EXAMPLE WBS FOR BUILDING A HOUSE



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SCHEDULING THE PLAN

- Choice of scheduling methods
- Project Budgeting
- Negotiation with stakeholders

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SCHEDULING METHODOLOGIES

Network Planning Methods

“...a generic term for techniques that are used to plan complex projects.”

...APICS Dictionary, 16th ED.

PERT – Program Evaluation and Review Technique

CPM – Critical Path Method

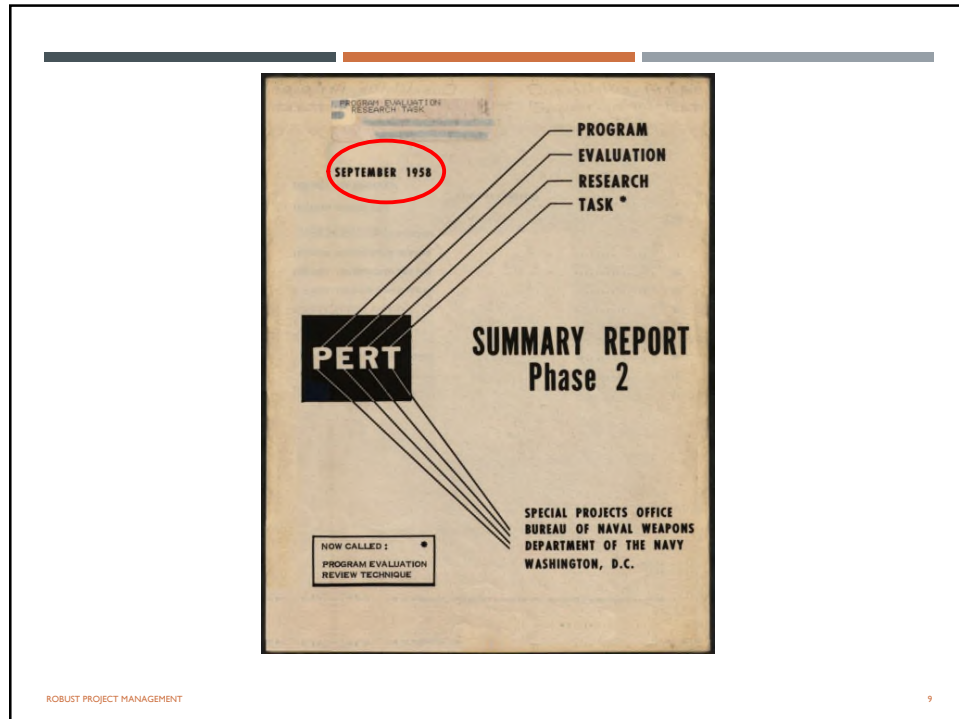
GANTT Chart

Does anyone have a guess as to how old these techniques are?

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SCHEDULING METHODOLOGIES: PERT

Each activity is assigned a pessimistic, most likely, and optimistic estimate of its duration.

Pessimistic - The activity cost/duration based on an analysis of the worst-case scenario for the activity.

Most Likely - The cost/duration of the activity, based on a realistic effort assessment for the required work and any predicted expenses.

Optimistic - The activity cost/duration based on an analysis of the best-case scenario for the activity.

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SCHEDULING METHODOLOGIES: PERT

Each activity is assigned a pessimistic, most likely, and optimistic estimate of its duration.

Expected time is:

$$\frac{\text{Most Optimistic} + [4 \times \text{Most Likely}] + \text{Most Pessimistic}}{6}$$



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SCHEDULING METHODOLOGIES: PERT



If a project manager gathers three estimates for how long a task will take and is told 8, 12, and 9 days, what is the expected time using PERT?

$$\frac{\text{Most Optimistic} + [4 \times \text{Most Likely}] + \text{Most Pessimistic}}{6}$$

The expected time is:

- A. 8.8 Days
- B. 10.8 Days
- C. 9.6 Days
- D. 9.3 Days

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SCHEDULING METHODOLOGIES: PERT



If a project manager gathers three estimates for how long a task will take and is told 8, 12, and 9 days, what is the expected time using PERT?

Expected time = $\frac{\text{Most Optimistic} + [4 \times \text{Most Likely}] + \text{Most Pessimistic}}{6}$

$$\begin{aligned}
 &= [8 + (4 * 9) + 12] / 6 \\
 &= 56 / 6 \\
 &= 9.3 \text{ days (D)}
 \end{aligned}$$

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CPM – Critical Path Method

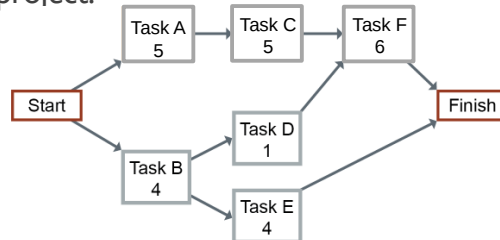
- The “Critical Path” is defined as “...the path which identifies those elements that actually constrain the total time for the project...”.

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CPM – Critical Path Method

- Based on the following chart, determine the “Critical Path” for the project.



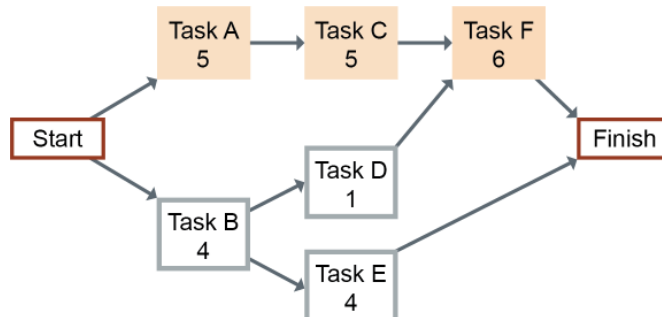
Note: Numbers under tasks represent duration in days.

The correct Critical Path is:

- Start-A-C-F-Finish
- Start-B-D-F-Finish
- Start-B-E-Finish
- Two or more are the same

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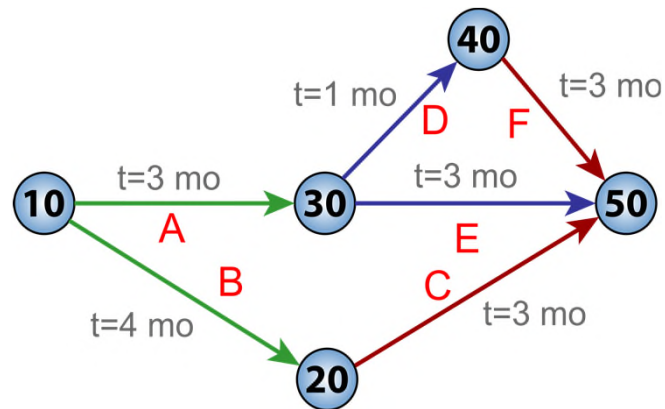
Note: Numbers under tasks represent duration in days.

The time constraint—the longest path from start to finish

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Combined PERT & CPM



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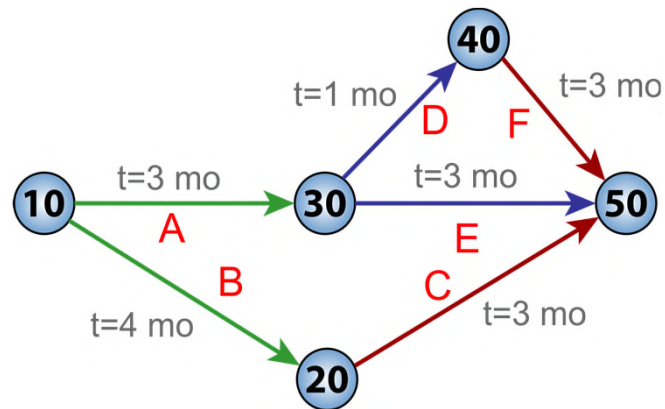
DID ANYONE NOTICE ANYTHING
INTERESTING ABOUT THE PRIOR
SLIDE?

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Combined PERT & CPM



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Combined PERT & CPM

10 → 30 → 40 → 50 = 7 Months
 10 → 30 → 50 = 6 Months
 10 → 20 → 50 = 7 Months

Dual Critical Paths

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SCHEDULING METHODOLOGIES: PERT

Comments on PERT Time Estimates:

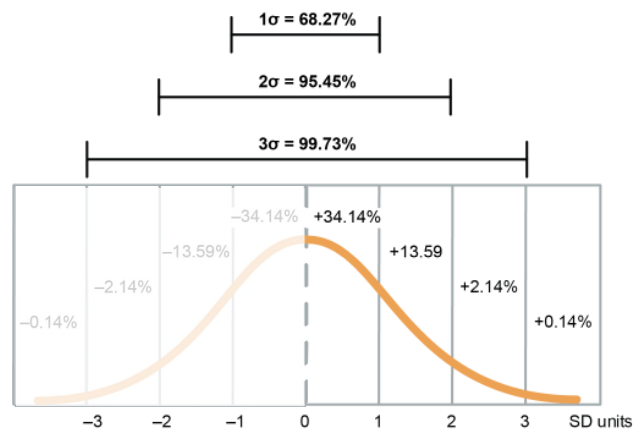
1. The Pessimistic, Optimistic, and Most Likely estimates should be based on the WBS, so they should be fairly good.
2. The estimates are only **crucial** along the *Critical Path*.
3. There is no penalty for being done early.
4. You can use the *normal distribution* to validate the numbers.

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SCHEDULING METHODOLOGIES: PERT

STANDARD DEVIATIONS (Σ) IN A NORMAL DISTRIBUTION



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SCHEDULING METHODOLOGIES: PERT

Validating the 9.3-day PERT Estimate...

1. Standard Distribution Table

# Standard Deviations	Area Less than Mean	Greater than Mean	% of Population
1	50%	34.14%	84.14%
2	50%	47.73%	97.73%
3	50%	49.87%	99.87%

2. PERT Estimate = 9.3

3. $1 \sigma (SD) = (12 - 8)/6 = .67$

4. So...

- you can be 84% confident that the task will take less than 10 days.
- and you can be 98% confident that it will take less than 11 days

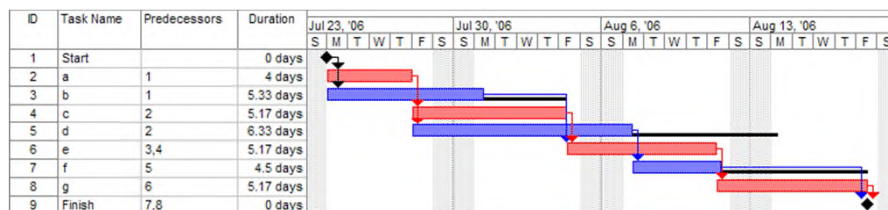
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GANTT Chart – Best-Known Planning Chart

Planning and control tool

- Visualize conflicts and simulate alternatives
- Control project work against the schedule

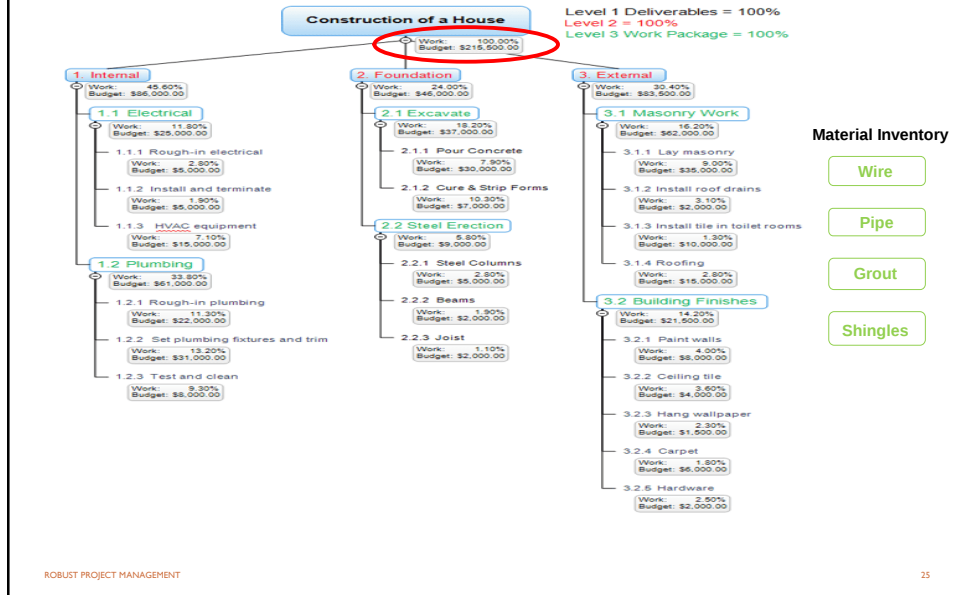


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EXAMPLE WBS FOR BUILDING A HOUSE



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So, let's say that it takes 9 months to build a house

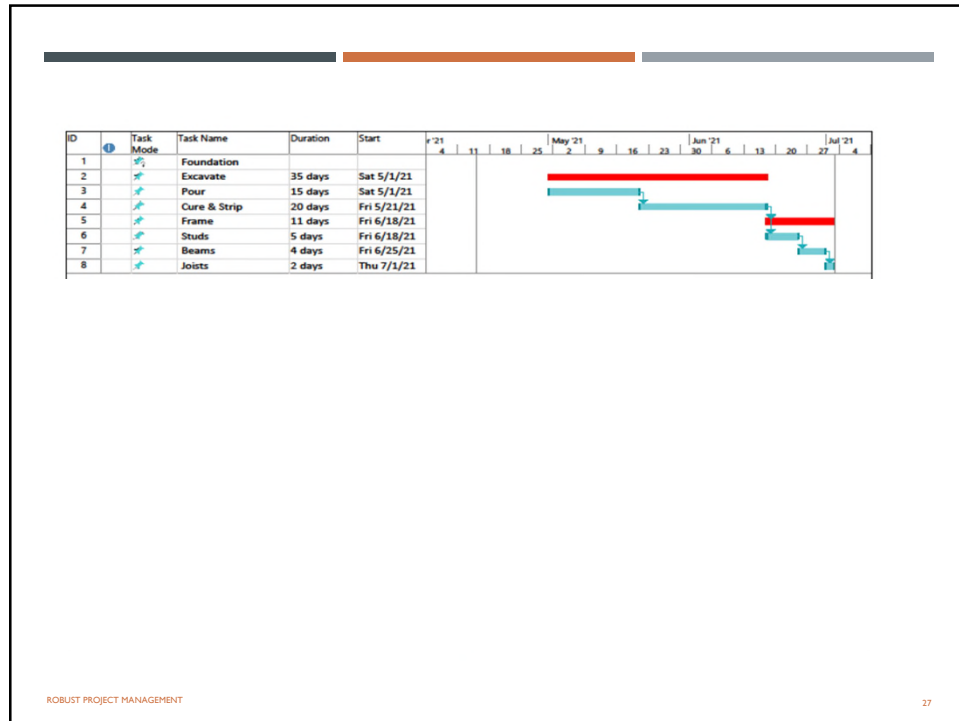
9-Months = 39 Weeks
39 Weeks = 195 Days
Less 5 holidays = 190 Days

WBS Task	WBS Sub-Task	Sub-sub Task	Title	% Total Time	Days
1.0			Internal	45.60%	87
	1.1		Electrical	11.80%	23
	1.2		Plumbing	13.80%	27
2.0			Foundation	24.00%	46
	2.1		Excavate	18.20%	35
		2.1.1	Pour	7.90%	15
		2.1.2	Cure & Strip	10.30%	20
	2.2		Frame	5.80%	11
		2.2.1	Studs	2.80%	5
		2.2.2	Beams	1.90%	4
		2.2.3	Joists	1.10%	2
3			External	30.40%	58
	3.1		Masonry	16.20%	31
	3.2		Finishing	14.20%	27
Total Time					191
Total Work Days =					190

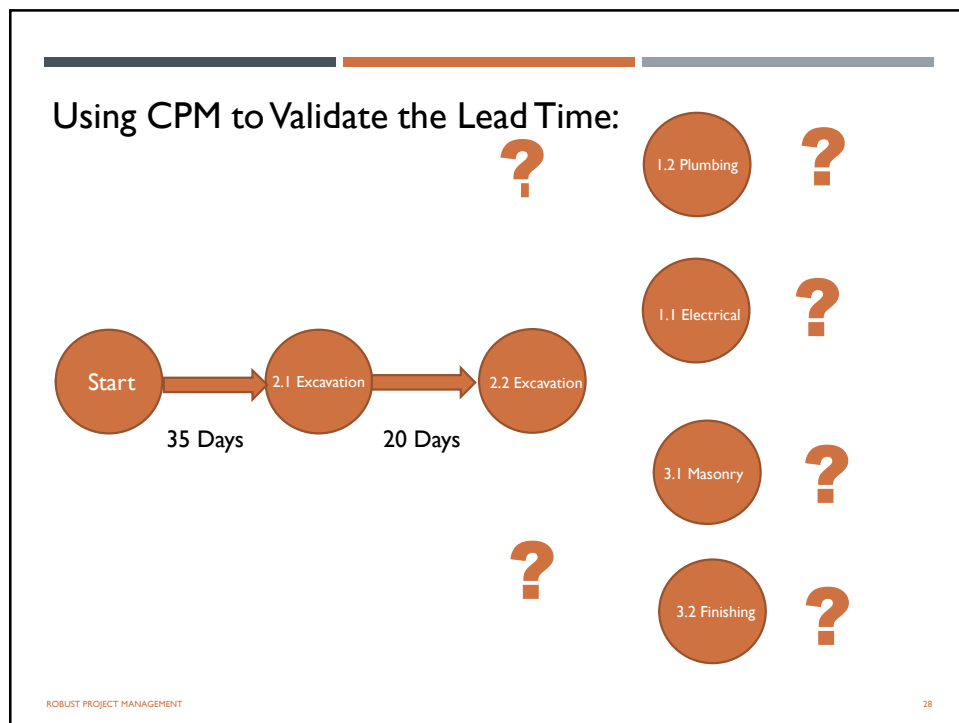
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AT WHAT POINT IN TIME SHOULD WE DEVELOP THE PROJECT SCHEDULE?

- A. Before producing the WBS
- B. After producing the WBS
- C. It depends

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AT WHAT POINT IN TIME SHOULD WE DEVELOP THE PROJECT SCHEDULE?

- A. Before producing the WBS
- B. After producing the WBS
- C. It depends**

If the project is for something brand new, or significantly different than something you've previously done, you should use PERT/CPM as a part of producing the WBS!

Remember that during the Project Planning process, you must develop a lead time for the project.

If the project produces something you have experience doing (like building a house from a standard design), "A" is OK in that it drives the schedule, but not the estimated project time.

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PROJECT COST AND CONTROL

Budgeting Methodologies



- Historical information from similar projects
- Parametric estimates—a rule of thumb based on experience
- Bottom-up budgeting from lowest to highest task
- Reserves to be used to implement risk strategies or provide cushion against unforeseen risks

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3RD STEP: EXECUTING THE PLAN

- Execute plan
- Resolve issues
- Negotiate with stakeholders

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SCHEDULING CHALLENGES

- Unrealistic estimates of task and resource requirements
- Imbalances in resource requirements
- Continuous changes to scope
- Unanticipated events that create bottlenecks on the critical path



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TOOLS TO MANAGE SCHEDULING CHALLENGES

Critical chain	Buffers lengthen critical path
Resource smoothing	Not always enough slack in the schedule
Resource leveling	Extends end date if task is on the critical path
Crashing	Increases cost, may increase risks
Fast tracking	Increases risk, especially risks to quality

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CHANGE CONTROL

POSSIBLE CHANGES TO PROJECT SCOPE

■ Scope Creep

“The informal addition of unfunded features and services to a project. Scope creep is closely monitored and controlled to ensure that agreed-upon output of a project can be achieved within the budgeted timeline and costs.”

■ Scope Change

“In project management, a change to a project’s scope, usually requiring an adjustment to the project’s budget and schedule.”

...APICS Dictionary, 16th Ed

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Controlling Changes in Scope

Scope creep

The informal addition of unfunded features and services

Sample change control process

1. Change request made.
2. Project manager reviews, documents, and forwards the request for analysis.
3. Change control analyzes the request.
4. A decision is issued and customer agreement confirmed.
5. Changes to project docs are made.

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4TH STEP: MONITORING AND CONTROLLING

- Execute plan
- Resolve issues
- Negotiate with stakeholders



- Monitor and control activities against scope, schedule, and budget
- Manage changes to baselines

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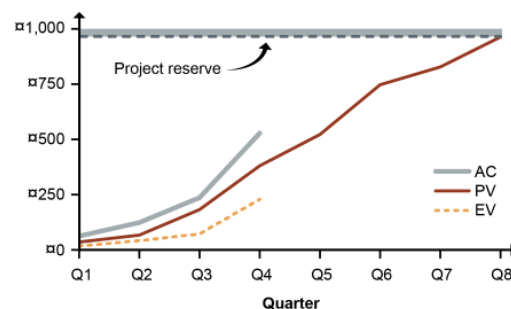
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Controlling Project Performance

Variance analysis

- Compares actual to planned performance (budget and schedule)
- Provides warning so that project can get back on track
- Requires truthful status reports



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I. How do you explain $AC > PV$ and $EV < PV$

Possible explanations:

Project has hit a snag...people working more hours but not getting much done.

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I. How do you explain $AC > PV$ and $EV < PV$

2. Can $EV = PV$ and $AC >$ either?

Possible explanations:

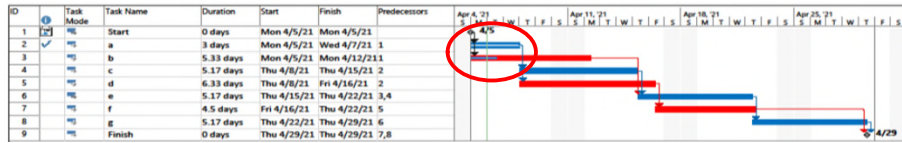
Using more expensive resource than planned

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GANTT Chart – Progress Reporting



Actual work completion, both dates and % complete, can be reported in Project

This data can support the AC/PV/EA calculations

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5TH STEP: CLOSING THE PLAN

- Execute plan
- Resolve issues
- Negotiate with stakeholders
- Monitor and control activities against scope, schedule, and budget
- Manage changes to baselines
- Obtain customer signoff on deliverables
- Close and document activities
- Support organizational learning



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CLOSING THE PLAN

- Closing includes contractual and administrative closure.
 - Contractual closure involves obtaining client sign off on all deliverables.
 - Administrative closure refers to completing and archiving project-related documentation.
- Supplier contracts will be closed and the relationships assessed.
- Audits of required processes and documentation may be performed.
- Team debriefs are held to improve processes and future work.

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CONCLUSION

- Project...
 - Scheduling
 - Controlling
 - Closure
 - Changes

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CONCLUSIONS

- As we said the last time...
- Having robust project management won't guarantee project success

BUT

- Not having it will guarantee project failure

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QUESTIONS?

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