

Comparison of Basic Formulae

	Halstead	Boehm	Walston-Felix
KLOC	$E=0.7 \text{ KLOC}^{1.50}$	$E=2.4 \text{ KLOC}^{1.05}$	$E=5.2 \text{ KLOC}^{0.91}$
1	0.7	2.4	5.2
10	22.1	26.9	42.3
50	247.5	145.9	182.8
100	700.0	302.1	343.6
1000	22135.9	3390.1	2792.6

- Coefficients derived using actual project data
 - Variability in project characteristics
- At best, yield estimates that are at most 25% off, 75% of the time, *for projects used to derive the model.*

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From Estimation to Planning

- Estimation and planning usually happen in tandem
 - Itemize tasks and subtasks (planning)
 - Create sizes for tasks and subtasks (estimation)
 - Identify dependencies (planning)
 - Schedule and assign resources (planning)
 - Repeat as necessary
- There are methods and tools to help
 - van Vliet, section 8.4
 - Pressman, section 24.5

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Project Planning

- Project planning involves scheduling all activities such that the constraints are satisfied and resource limits are not exceeded.

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Activities...

- Have a beginning and end
 - Often marked by milestones
 - A milestone is a scheduled event for which some person is held accountable and which is used to measure and control progress.
- Consume resources
 - e.g. people and computer time
- Have dependencies
 - e.g. Can't code before we have a specification
 - Expressed as constraints, a.k.a. precedence relations
 - Usually temporal, but sometimes deliverables

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Representing Activities

- Work Breakdown Structure (WBS)
 - Graphical representation of a project and constituent activities
 - Can be abstract or highly detailed
 - Different types exist

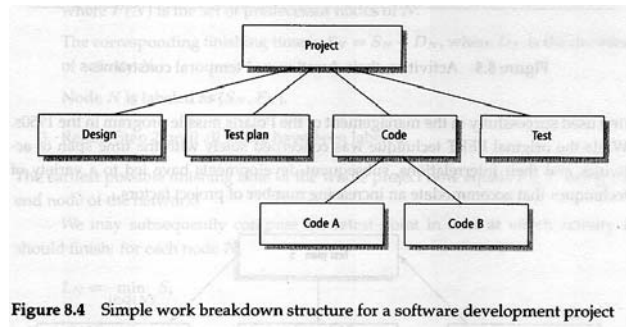


Figure 8.4 Simple work breakdown structure for a software development project

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PERT Charts

- PERT = Program Evaluation and Review Technique
 - First used in 1950s on Polaris missile program
- Most useful for finding dependencies and minimum schedule time

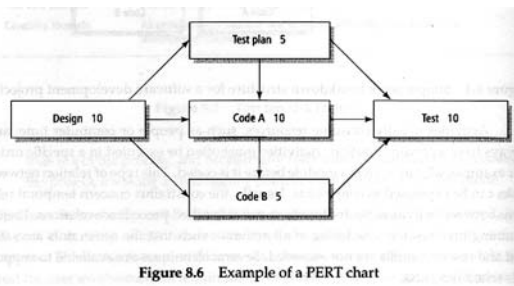


Figure 8.6 Example of a PERT chart

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Critical Path

- A **critical path** is a sequence of activities without slack time. If activities on a critical path are delayed, the total project is delayed as well.
- Found by performing a breadth-first search while tracking the duration

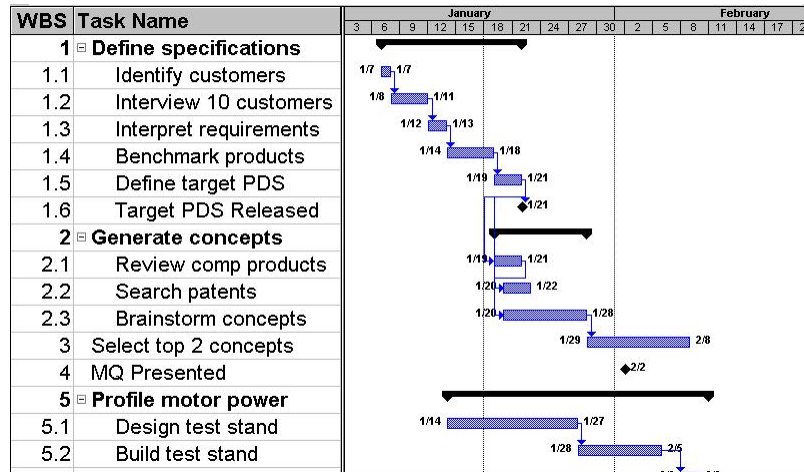
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Gantt Chart

- Invented by Henry Gantt in 1910
 - Engineer and management scientist
 - Used on Hoover dam project
- Like a bar chart version of PERT chart with extra features
 - Shows activities on a calendar
 - Depicts additional temporal dependencies
 - Start activity after the start of...
 - Start activity before the end of...
 - Allocate resources to tasks
 - Budgeting
 - Can ask what-if questions about allocations

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Gantt chart



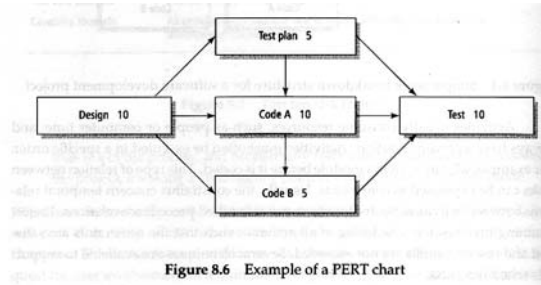
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Project Tracking

- Effort
 - Individuals record how much time is spent on various tasks
 - Cumulative data can be compared to the plan
- Progress
 - Milestones
 - Reports
- Schedule slippage
 - Monitor closely on critical path
- Changes in activities
 - Need to re-plan (and re-schedule?)

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Follow-Up



- Vertical dependency arrows are incorrect
 - Inconsistent with Figures 8.5, 8.7, and 8.8
 - Critical path should be 30 (With extra edges is 40)