Project Planning

THIS IS THE BARE MINIMUM BUDGET I NEED FOR MY PROJECT.
scottadams@aol.com
www.dilbert.com
WHAT COULD YOU DO WITH HALF THIS AMOUNT?
FAIL.
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WHEN CAN YOU START?
I THINK I JUST DID.

Today’s Lecture

1. Intro to Software Engineering
2. Inexact quantities
3. Error propagation
4. Floating-point numbers
5. Design process
6. Teamwork - no web review
7. **Project planning** - no web review
8. “To Engineer is Human”
9. Professional Engineering
10. Software quality - no web review
11. Software safety
12. Intellectual property

Agenda

- Project Planning
- Cost Estimation
- Project Scheduling

Project Planning

The discipline of Software Engineering was founded to **predict and control** the

- Quality
- Development time
- Cost

of software systems.

Elements of a Project Plan

Deliverables - A description of program functionality and performance that has been promised, usually broken down into key milestones.

Project schedule - An estimate of the amount of time needed to complete the project’s activities and milestones.

Cost estimate - An estimate of the amount of effort and resources needed to complete the project.

Cost Estimation

Want/Need to provide cost estimates very early in project, often before solution is proposed or detailed.

Unfortunately, it is very difficult to estimate the cost and effort to build a project if we don’t know very much about that project (which is often the case with software)

Cost Estimation

We want to be able to estimate cost from information we have at the beginning of the project -- that is, from the project requirements.

1. Estimate the number of **function points** from the requirements

2. Estimate the **code size** from the function points

3. Estimate the **resources** required (time, personnel, money) from the code size.

1. Estimate Function Points

Idea: To predict the complexity of the system in terms of the various functions to write, without being as specific as lines of code.

$$FP = a_1P_1 + a_2P_2 + \ldots + a_nP_n$$

FP - number of function points

1, 2, n - types of functions

a_1, a_2, a_3 - empirically observed weightings per function type

P_1, P_2, P_n - # of instances per function type

2. Estimate Code Size

Projects and organizations collect data to determine the average number of statements needed to implement one function point.

Language	LOC/FP
Java	9
C++	12
C	15

LOC - Lines of code

3. Estimate Cost

Constructive **Co**st **Mo**del (COCOMO) - used to predict the cost of a project from an estimate of its size (LOC).

$$E = a \times KLOC^{b}$$

E is for Effort - estimated person-months

KLOC - estimated project size (thousand lines of code)

a, b - empirically observed weightings; depend on type of system being developed

3. Estimate Cost

$$E = a \times KLOC^{b}$$

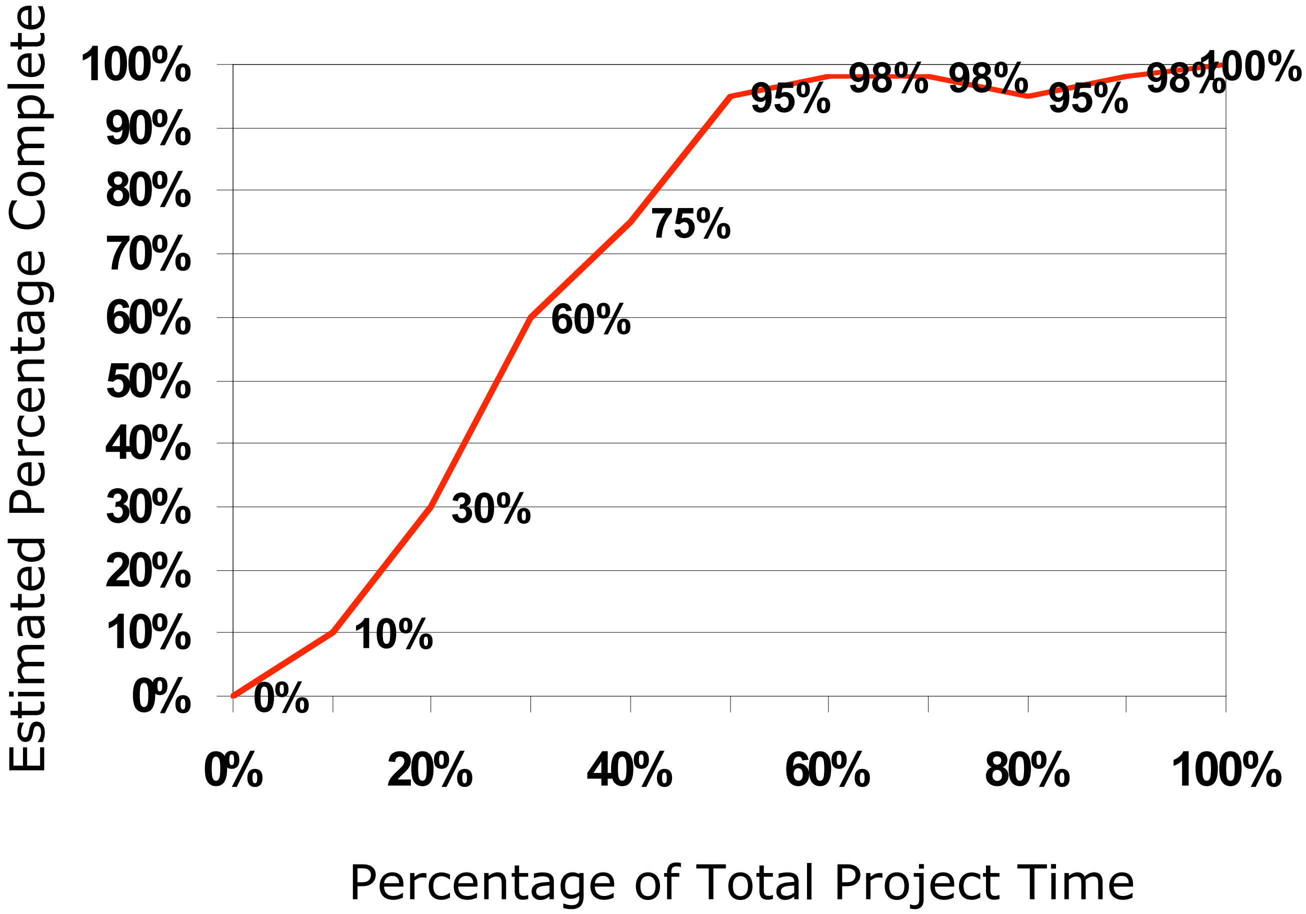
a, b - depend on type of system being developed:

organic - Small projects, flexible requirements, experienced team

embedded - Tight constraints on hardware, software, environment.

semidetached - Medium size and complexity, mix of rigid and flexible requirements

Accuracy of estimations



Practice makes perfect

Software cost estimation is not unlike estimating how much pocket change there is in a room full of people.

- Your first attempt is way off, but you get better.
- You learn to account for different types of people.
- If the currency changes, you’ll have to learn how to estimate all over again.

Steve McConnell, *Code Complete*, Microsoft Press,

Agenda

- Project Planning
- Cost Estimation
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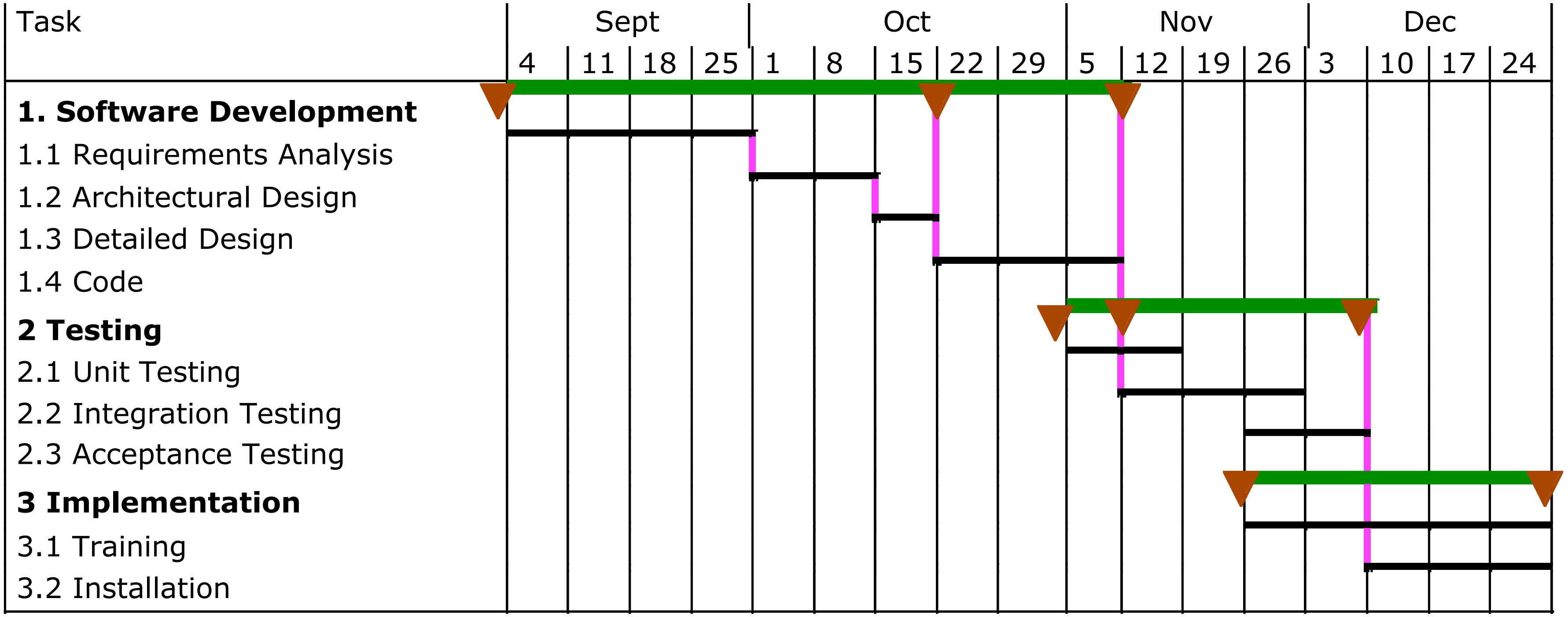
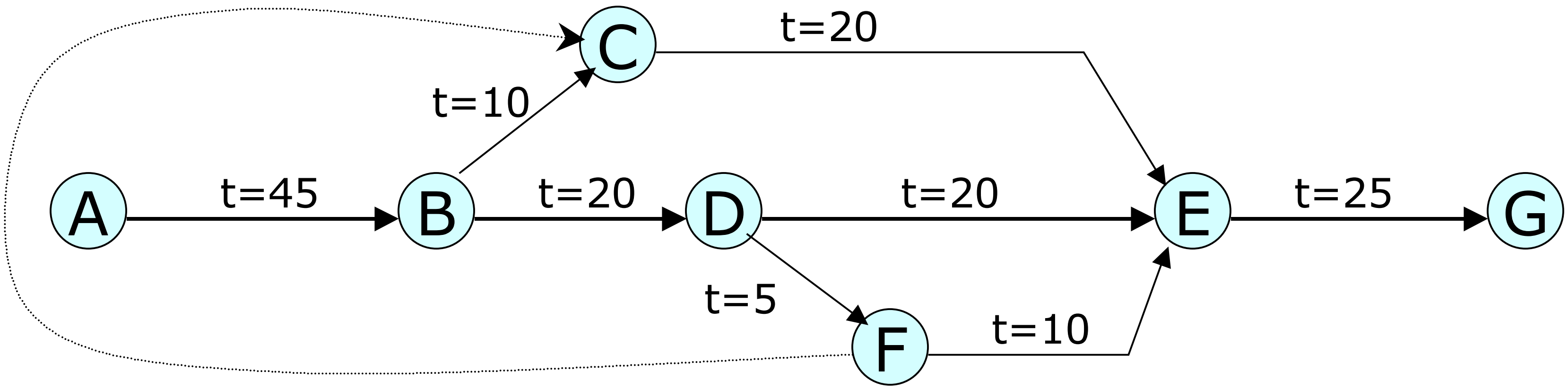
Scheduling - Gantt charts



Gantt Charts best for **displaying** project schedule

- Bars show duration of tasks
- Triangle show milestones
- Pink lines (usually dashed) show dependencies

Scheduling - PERT charts



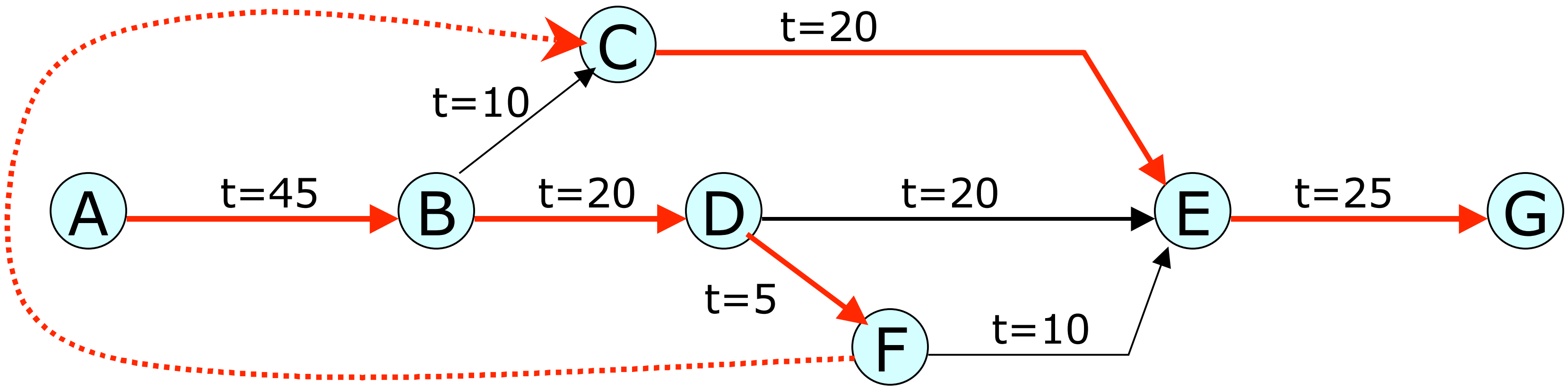
Notation

- Nodes indicate milestones
- Edges indicate activities, labelled with time to complete
- Dotted edges reflect dependencies (not activities, no time)

Shows critical path

- Longest path from start to finish
- Any slippage on the critical path will delay project

Scheduling - PERT charts



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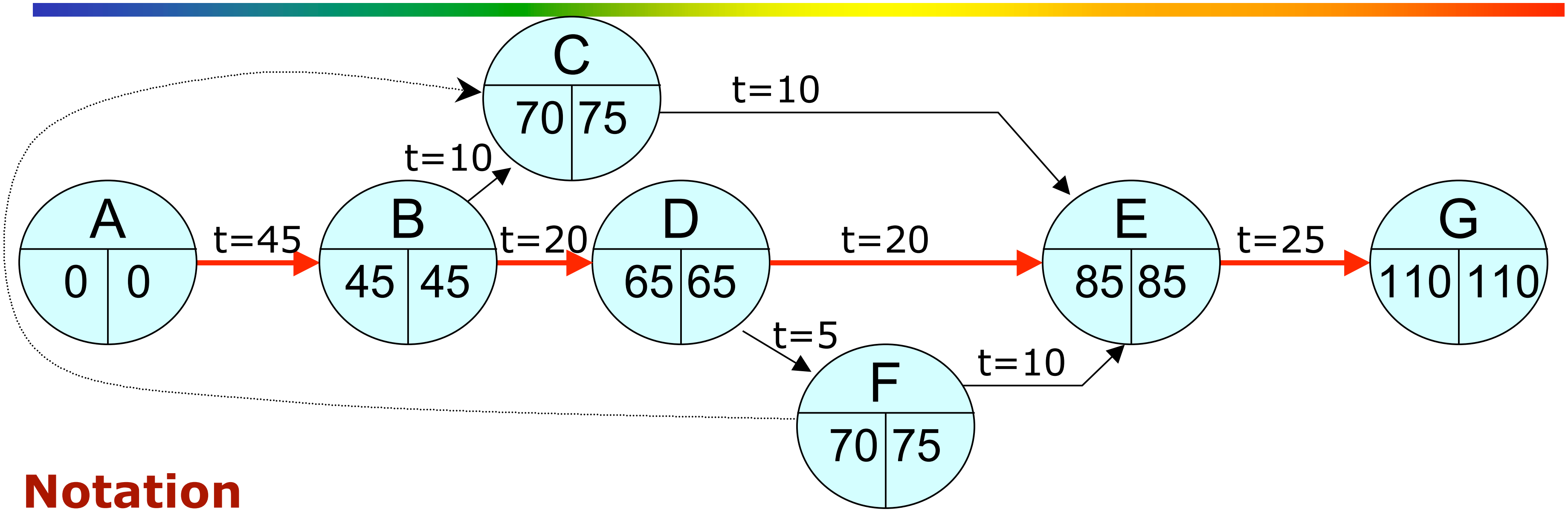
Scheduling - Critical-Path Method



Notation

- Nodes indicate milestones
- Edges indicate activities, labelled with time to complete

Earliest event time (EE) =
length of longest path from start to node

Latest event time (LE) =
EE of end point - length of longest path from node to end

Summary

You cannot control what you cannot measure. You need this information to negotiate cost of project and to plan project. Poor estimates may be better than no estimates.

Your ability improves with experience. Accurate cost estimations require engineering judgement, which comes with experience.

Web Review #4

Readings for **next week’s web review**:

Project planning: IPE Ch. 18

Word ordering: Dupré 5,18,38,60,105,142

Quiz #2

- **In-lab quiz on Thursday November 4**
  - 45 min, starts at 10:30 sharp
  - 10% of your course mark
  - Closed book, closed notes
  - Math Faculty calculator allowed only

- **Old quizzes and explanations for some review answers are available on the SE101 web page**

Quiz #2

Covers

- Floating point numbers (Overton 3, lecture)
  Precision of number systems
- Engineering design (IPE 15, lecture)
- Teamwork (lecture)
- Project planning (IPE 18, lecture)
- Petroski film (lecture)

- Word order (Dupré 5,18,38,60,105,142)

Quiz #2

Grammar question

Option 1:

1 paragraph on word order

Dupré 5,18,38,60,105,142

Option 2:

2 paragraphs on all grammar

Word order 5,18,38,60,105,142

Punctuation 15,23,29,80,93,139

Sentence structure 1,7,8,79,85,97

Quiz #1 mark for grammar question is the best of the two questions’ marks.

Announcements

No office hours next week.