Systems Analysis and Design with UML Version 2.0

Chapter 4 Project Management

Alan Dennis, Barbara Wixom, and David Tegarden

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Project Management

Chapter 4

Objectives

- Become familiar with estimation.
- Be able to create a project workplan.
- Understand why project teams use timeboxing.
- Become familiar with how to staff a project.
- Understand how computer-aided software engineering,

improve the efficiency of a project.

- Understand how to reduce risk on a project.

Key Definitions

- Project management is the process of planning and controlling the development of a system within a specified timeframe at a minimum cost with the right functionality.
- A project manager has the primary responsibility for managing the hundreds of tasks and roles that need to be carefully coordinated.

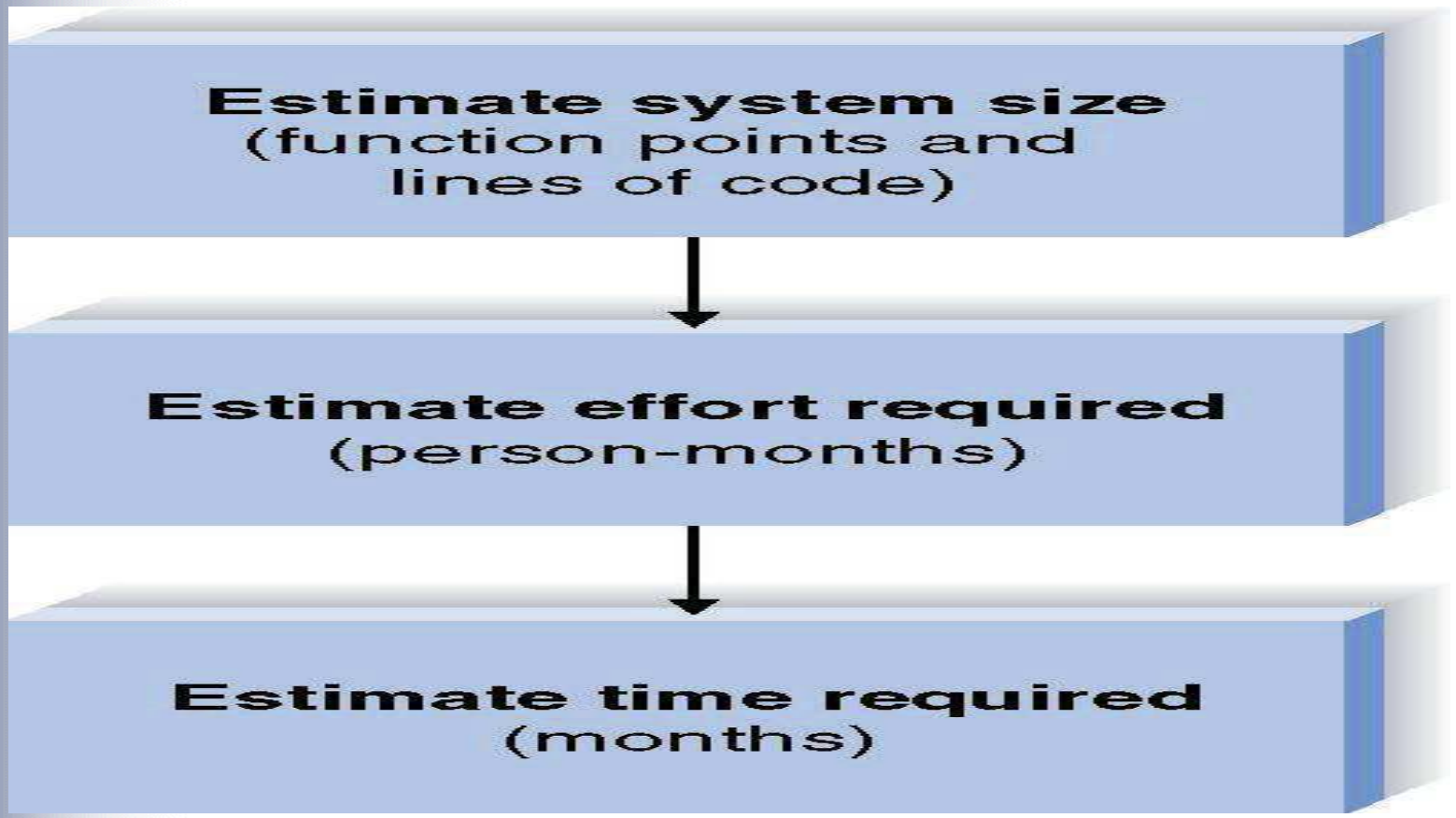
Estimating a Project Based on Industry Information

	Planning	Analysis	Design	Implementation
Industry Standard For Web Applications	15%	20%	35%	30%
Time Required in Person Months	4	5.33	9.33	8

Function Points

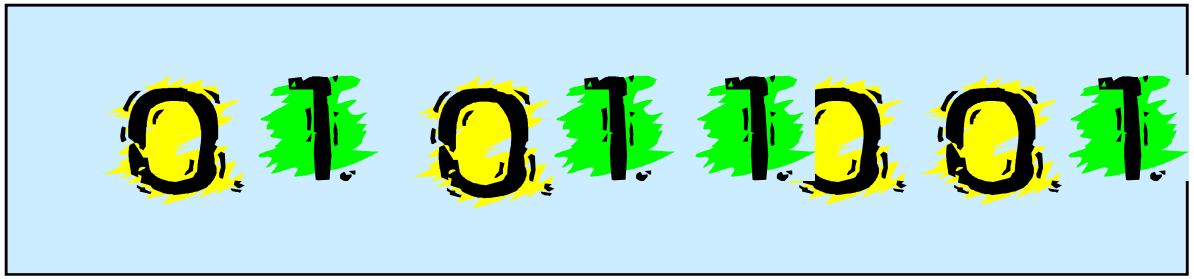
- **Estimate System Size**
  - A *function point* is a measure of program size that is based on the system's number and complexity of inputs, outputs, queries, files, and program interfaces
- **Estimate effort required**
  - Person Months
- **Estimate time required**
  - Months to complete

Time Estimation Using a More Complex Approach



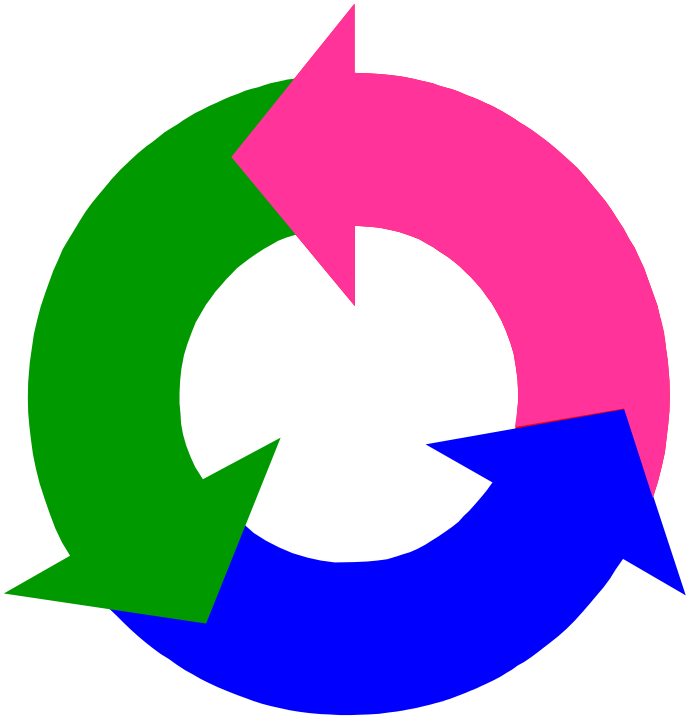
Getting the Right Numbers for Estimation

- Prior projects
  - Past experience
  - Industry standards
- Detailed analysis



Estimation Trade-offs

- Size
  - Function points
  - Lines of code
- Effort
  - Person-months
  - People available
- Time
  - Months



Calculate Function Points

- List major elements of system
- Determine total number of each element
- Specify complexity index of each component (low, med., high)
- Total index multiplied by number of components (TUFP)

Function Point Estimation -- Step One

	Complexity			
Description	Low	Medium	High	Total
Inputs	__x 3	__x 4	__x 6	____
Outputs	__x 4	__x 5	__x 7	____
Queries	__x 3	__x 4	__x 6	____
Files	__x 7	__x 10	__x 15	____
Program Interfaces	__x 5	__x 7	__x 10	____
		TOTAL UNADJUSTED FUNCTION POINTS		____

TUPF Example

Description		Complexity			
	Total Number	Low	Medium	High	Total
Inputs	6	3 × 3	2 × 4	1 × 6	23
Outputs	19	4 × 4	10 × 5	5 × 7	101
Queries	10	7 × 3	0 × 4	3 × 6	39
Files	15	0 × 7	15 × 10	0 × 15	150
Program Interfaces	3	1 × 5	0 × 7	2 × 10	25
Total Unadjusted Function Points (TUFP):					338

Adjusted Processing Complexity -- Step 2

Data communications	3
Heavy use configuration	0
Transaction rate	0
End-user efficiency	0
Complex processing	0
Installation ease	0
Multiple sites	0
Performance	0
Distributed functions	2
Online data entry	2
Online update	0
Reusability	0
Operational ease	0
Extensibility	0
Total Processing Complexity (PC):	7

Function Points Estimation -- Step Four

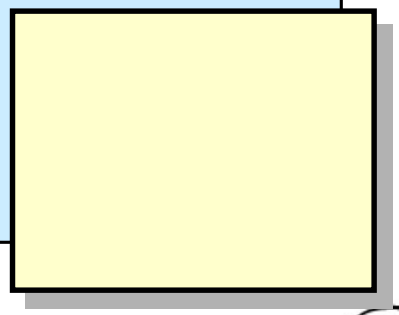
Adjusted Project Complexity

= .065 + (0.01 * Project Complexity)

Total Adjusted Function Points

=

Adjusted Project Complexity * TUFP →



Function Point Estimation

Processing Complexity (PC): 7
(From Step 2)

Adjusted Processing Complexity (PCA) = 0.65 + (0.001 * 7)

Total Adjusted Function Points: 0.72 * 338 = 243
(TUFP -- *From Step 1)*

Converting Function Points to Lines of Code

Language	LOC/Function Code Point
C	130
COBOL	110
JAVA	55
C++	50
Turbo Pascal	50
Visual Basic	30
PowerBuilder	15
HTML	15
Packages (e.g., Access, Excel)	10-40

Source: Capers Jones, Software Productivity Research

Final Step

- Multiply function points
- Approximate lines of code per function point in the chosen language
- If you chose C, then 243 function Points times 130 lines of code = 31,590 total lines of code

Estimating Effort

- Function of size and production rate
- COCOMO model
  - converts a lines-of-code estimate into a person-month estimate
  - For moderate-size projects multiply thousands of lines of code by 1.4 to get the number of people to assign to the project

COCOMO Estimation Calculation

Effort (in Person-Months)	=	1.4 * thousands-of-lines-of-code

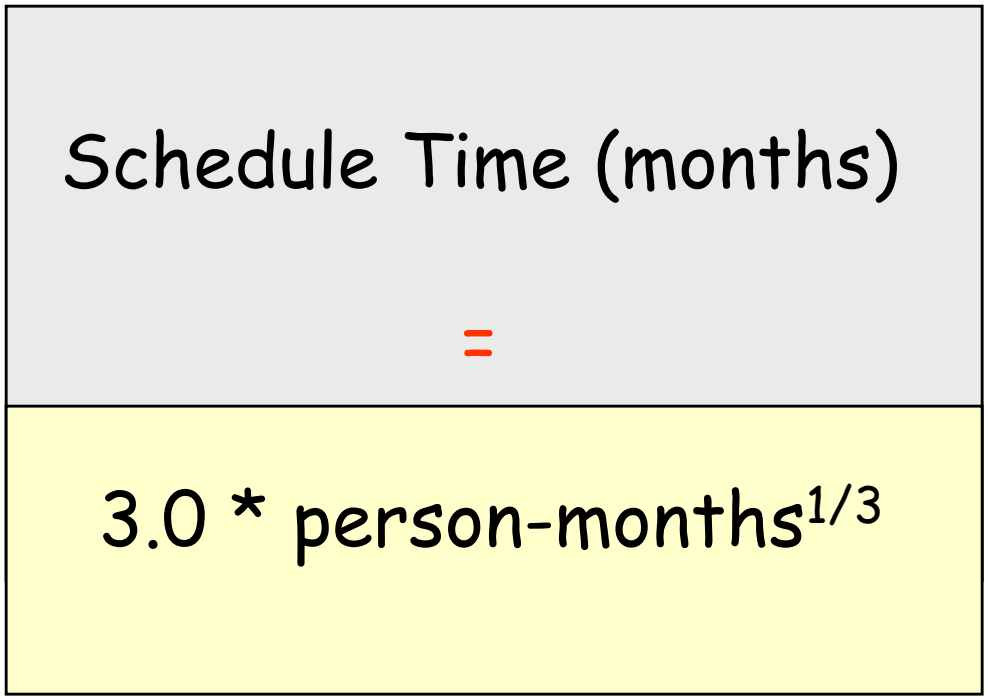
Example:

If LOC = 2000 Then…

*Effort = (1.4 * 2000) = 28 Person Months*

Estimating Schedule Time

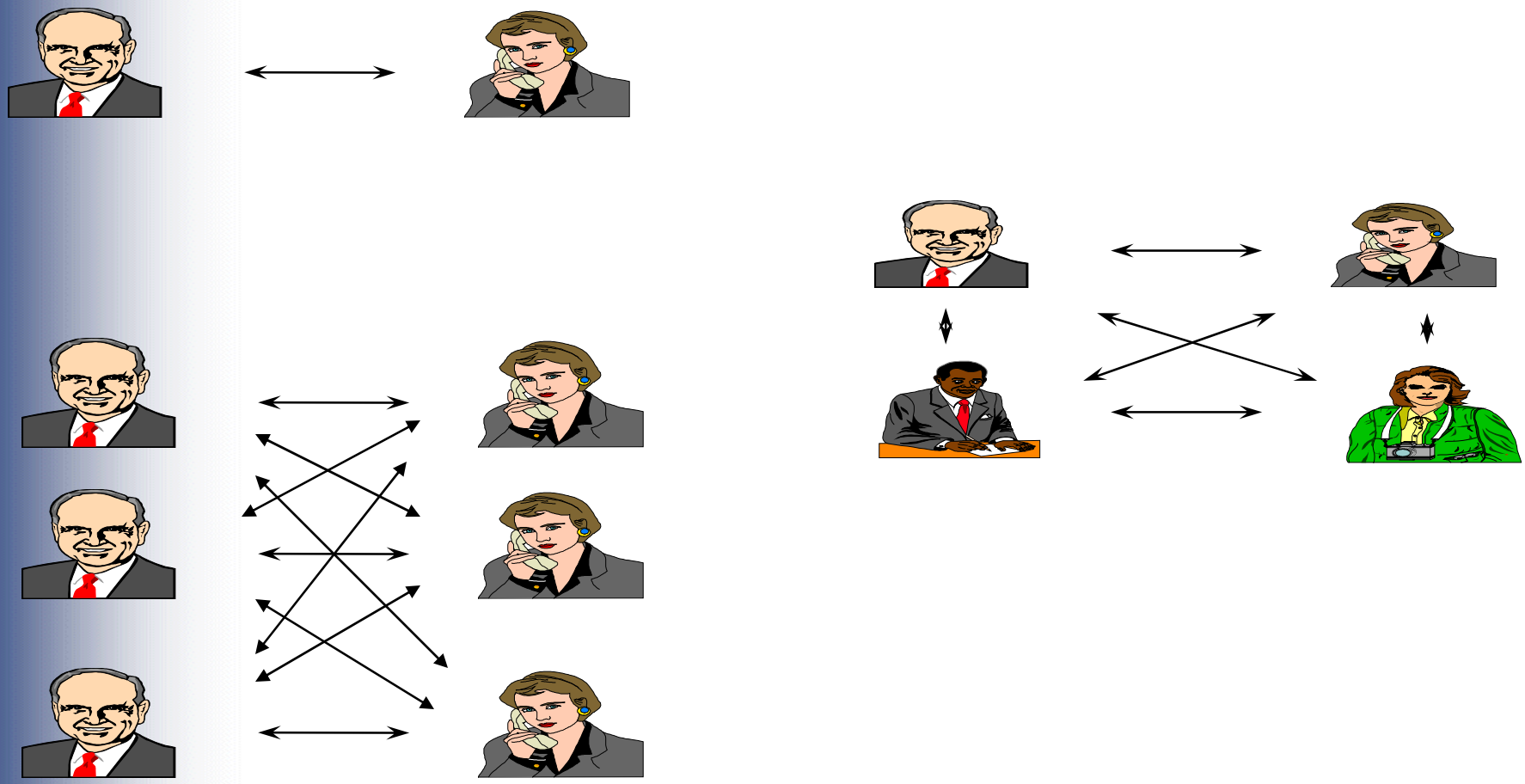
- Rule of thumb for estimation



Staffing Attributes

- Staffing levels will change over a project's lifetime
- Adding staff may add more overhead than additional labor
- Using teams of 8-10 reporting in a hierarchical structure can reduce complexity

Increasing Complexity with Larger Teams



CREATING THE WORK PLAN

Developing a WorkPlan

- Identify tasks in the project
- Estimate task length
- Determine task dependencies
- Specify to whom task will be assigned
- List deliverables

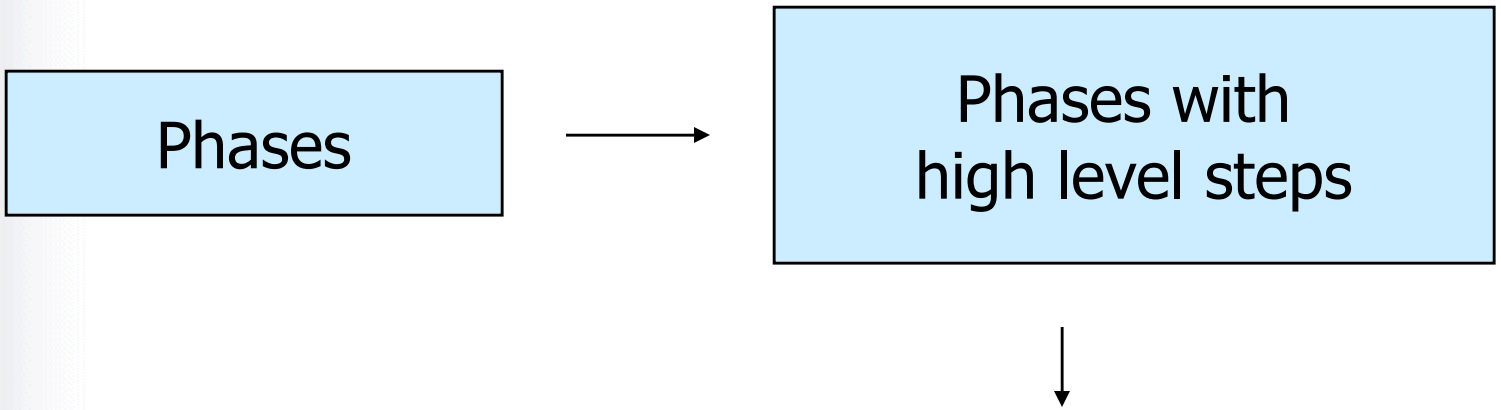
A Workplan Example

Work Plan Information	Example
Name of task	Perform economic feasibility
Start date	Jan 05, 2001
Completion date	Jan 19, 2001
Person assigned	Mary Smith, sponsor
Deliverable(s)	Cost-benefit analysis
Completion status	Open
Priority	High
Resources needed	Spreadsheet
Estimated time	16 hours
Actual time	14.5 hours

Identifying Tasks

- Top-down approach
  - Identify highest level tasks as phases in the project
  - Break them into increasingly smaller units
- Methodology
  - Using standard list of tasks
  - Similar previous projects

Top Down Task Identification



Work Plan	Deliverables	Estimated hours	Assigned To
*			
*			
*			
*			

Work Breakdown Structure

- Specify high level tasks
- Break down each step into smaller tasks and number them in a hierarchical fashion
- WBS can be done in two ways
  - SDLC phase
  - Product

WBS Problems

- *They tend to be specific to the design of the information system being developed*
- *Too many levels of detail too early on in the SDLC for large projects or too few for small projects.*
- *Since they are project specific, they are very difficult to compare across projects.*

Evolutionary WBS

- organize in a standard manner across all projects
- create in an incremental and iterative manner
  - first evolutionary WBS done with initial aspects of the project
  - Later on more details are added to the WBS.
- Comparable to earlier projects based on cost and schedule estimation

Project WorkPlan

Task Number	Task Name	Duration (in weeks)	Dependency	Status
1	Identify vendors	2		Complete
2	Review training materials	6	1	Complete
3	Compare vendors	2	2	In Progress
4	Negotiate with vendors	3	3	Open
5	Develop communications information	4	1	In Progress
6	Disseminate information	2	5	Open
7	Create and administer survey	4	6	Open
7.1	Create initial survey	1		Open
7.2	Review initial survey	1	7.1	Open
7.2.1	Review by Director of IT Training	1		Open
7.2.2	Review by Project Sponsor	1		Open
7.2.3	Review by Representative Trainee	1		Open
7.3	Pilot test initial survey	1	7.1	Open
7.4	Incorporate survey changes	1	7.2, 7.3	Open
7.5	Create distribution list	0.5		Open
7.6	Send survey to distribution list	0.5	7.4, 7.5	Open
7.7	Send follow-up message	0.5	7.6	Open
7.8	Collect completed surveys	1	7.6	Open
8	Analyze results and choose vendor	2	4, 7	Open
9	Build new classrooms	11	1	In Progress
10	Develop course options	3	8, 9	Open

STAFFING THE PROJECT

Key Definitions

- The *staffing plan* describes the kinds of people working on the project
- The *project charter* describes the project's objectives and rules
- A *functional lead* manages a group of analysts
- A *technical lead* oversees progress of programmers and technical staff members

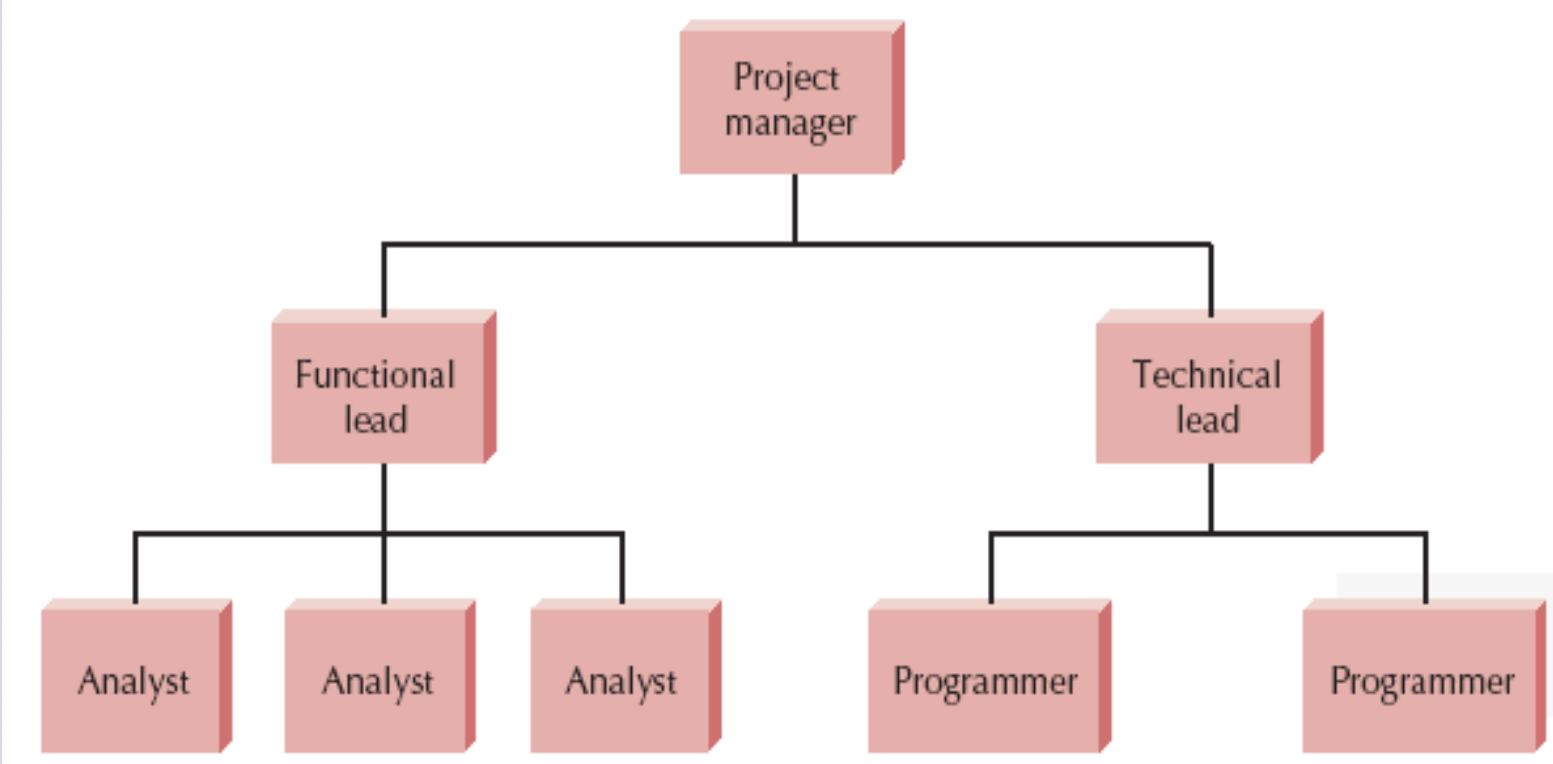
Motivation

- Use monetary rewards cautiously
- Use intrinsic rewards
  - Recognition
  - Achievement
  - The work itself
  - Responsibility
  - Advancement
  - Chance to learn new skills

Conflict Avoidance Strategies

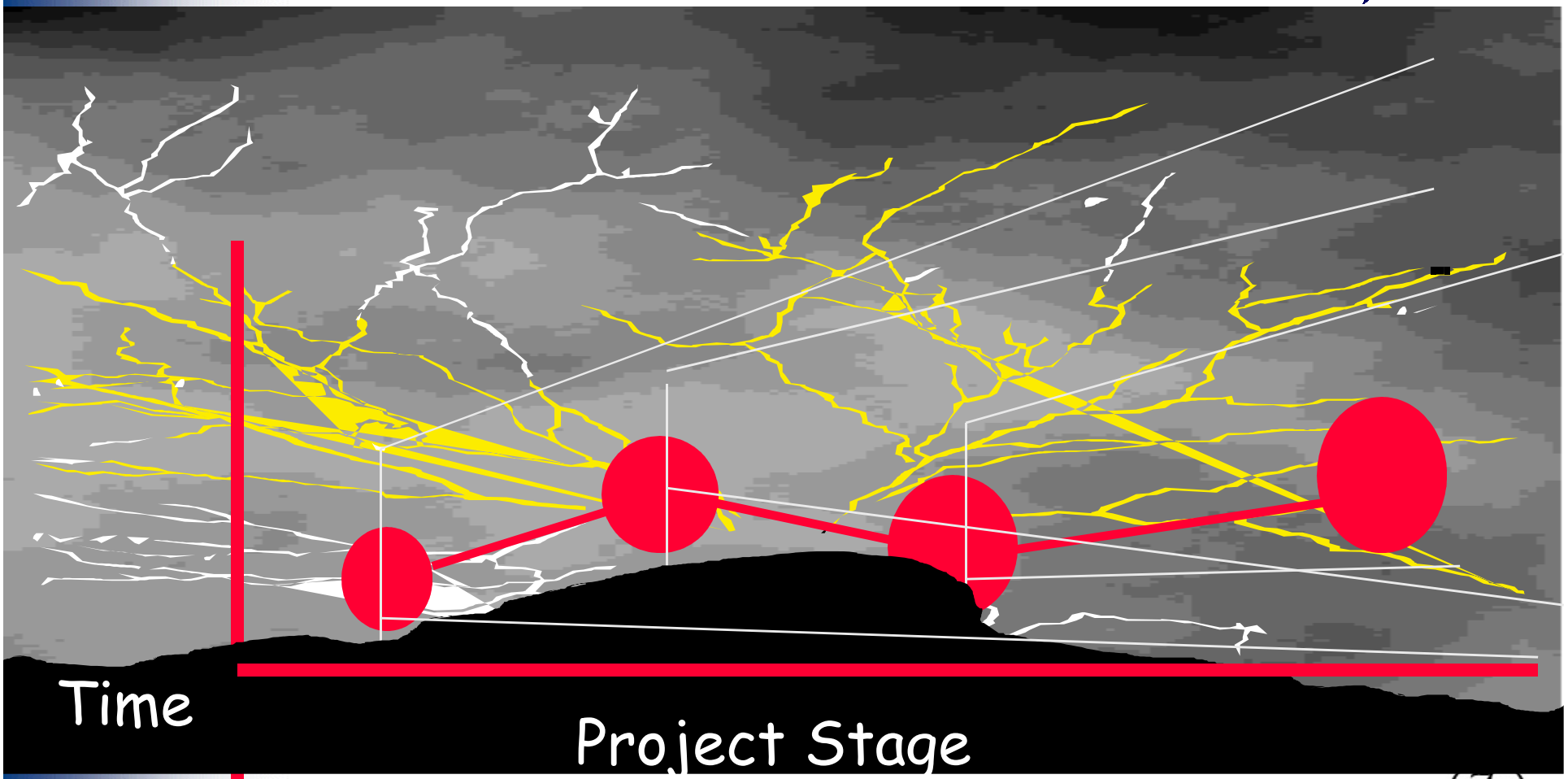
- Clearly define roles and project plans
- Hold individuals accountable
- Project charter listing norms and groundrules
- Develop schedule commitments ahead of time
- Forecast other priorities and their possible impact on the project

Possible Reporting Structure



CONTROLLING AND DIRECTING THE PROJECT

The Hurricane Model

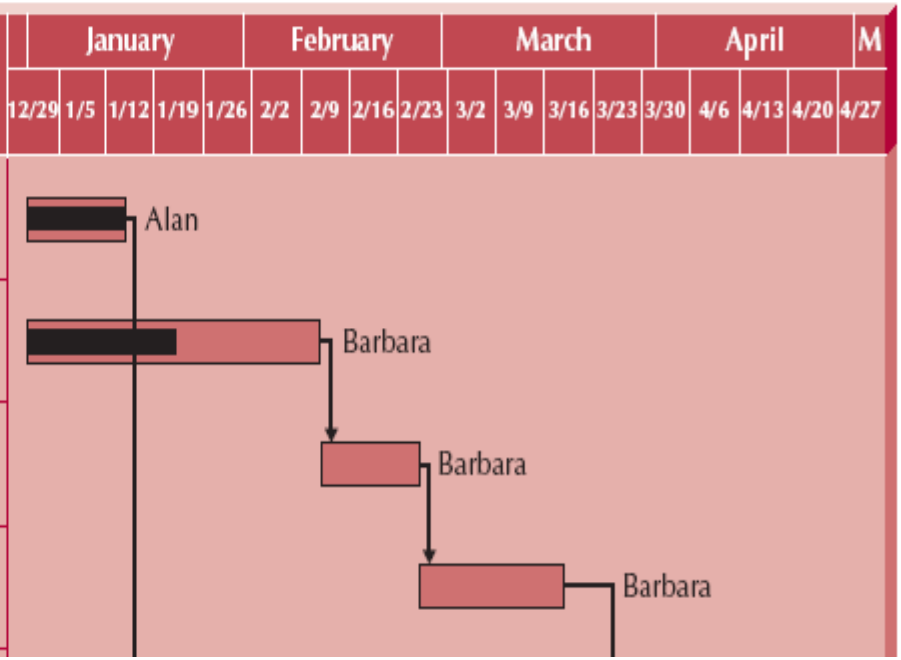


Margins of Error in Cost and Time Estimates

		Typical margins of Error for Well-done Estimates	
Phase	Deliverable	Cost (%)	time (%)
Planning	System Request Project Plan	400 100	60 25
Analysis	System Proposal	50	15
Design	System Specification	25	10
Source: Boehm et al. (1995)			

Gantt Chart

ID	Task Name	Duration	Start	Finish	Prede
1	Identify vendors	2 wks	Wed 1/1/03	Tue 1/14/03	
2	Review training materials	6 wks	Wed 1/1/03	Tue 2/11/03	
3	Compare vendors	2 wks	Wed 2/12/03	Tue 2/25/03	2
4	Negotiate with vendors	3 wks	Wed 2/26/03	Tue 3/18/03	3



PERT Charts

- Project Evaluation and Review Technique (PERT)
- PERT uses three time stimates:
  - Optimistic, O
  - Most likely, M
  - Pessimistic, P
- Time Estimate = O + 4 * M + P

Pert Chart

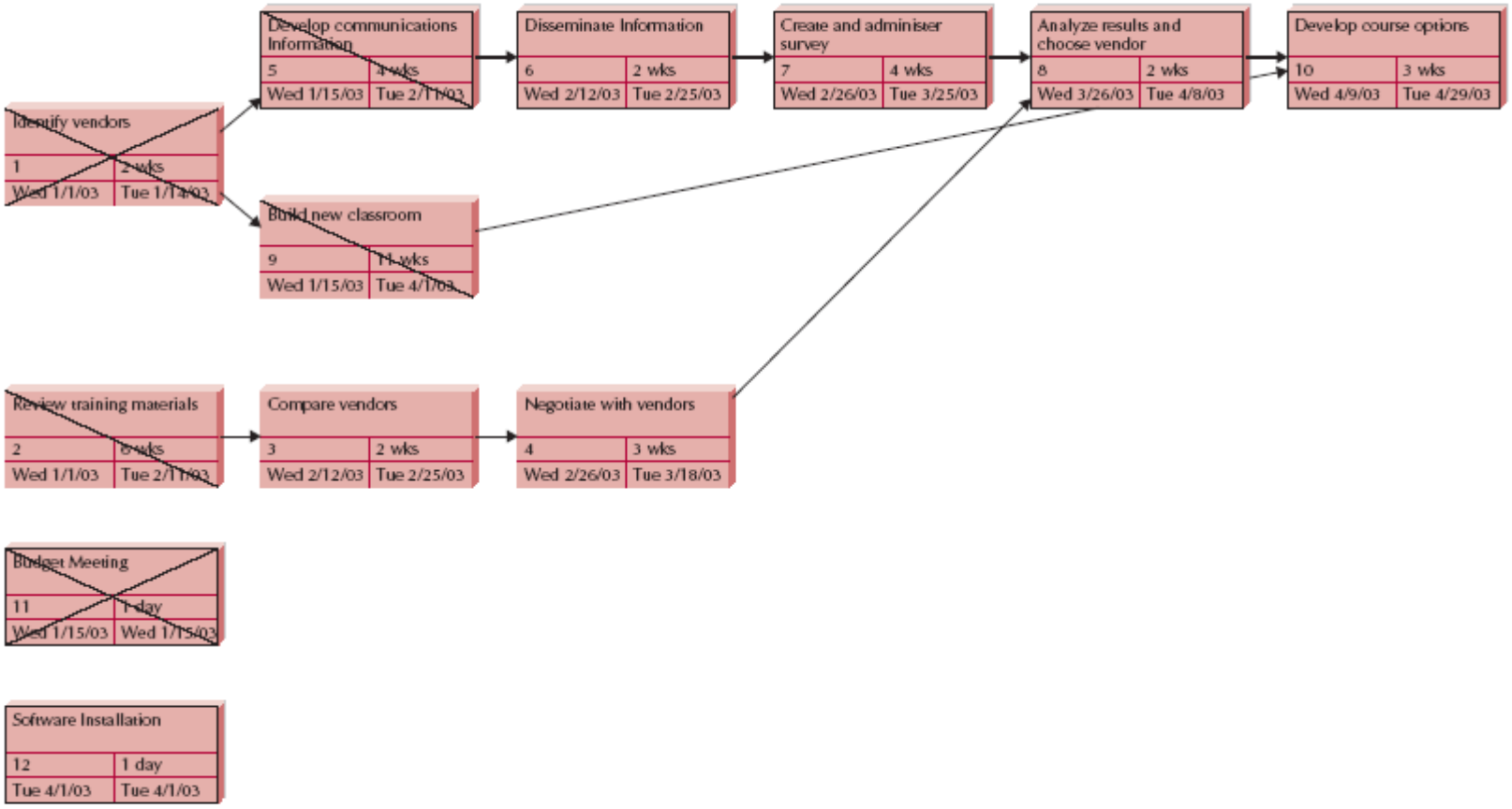


FIGURE 4-8 PERT Chart

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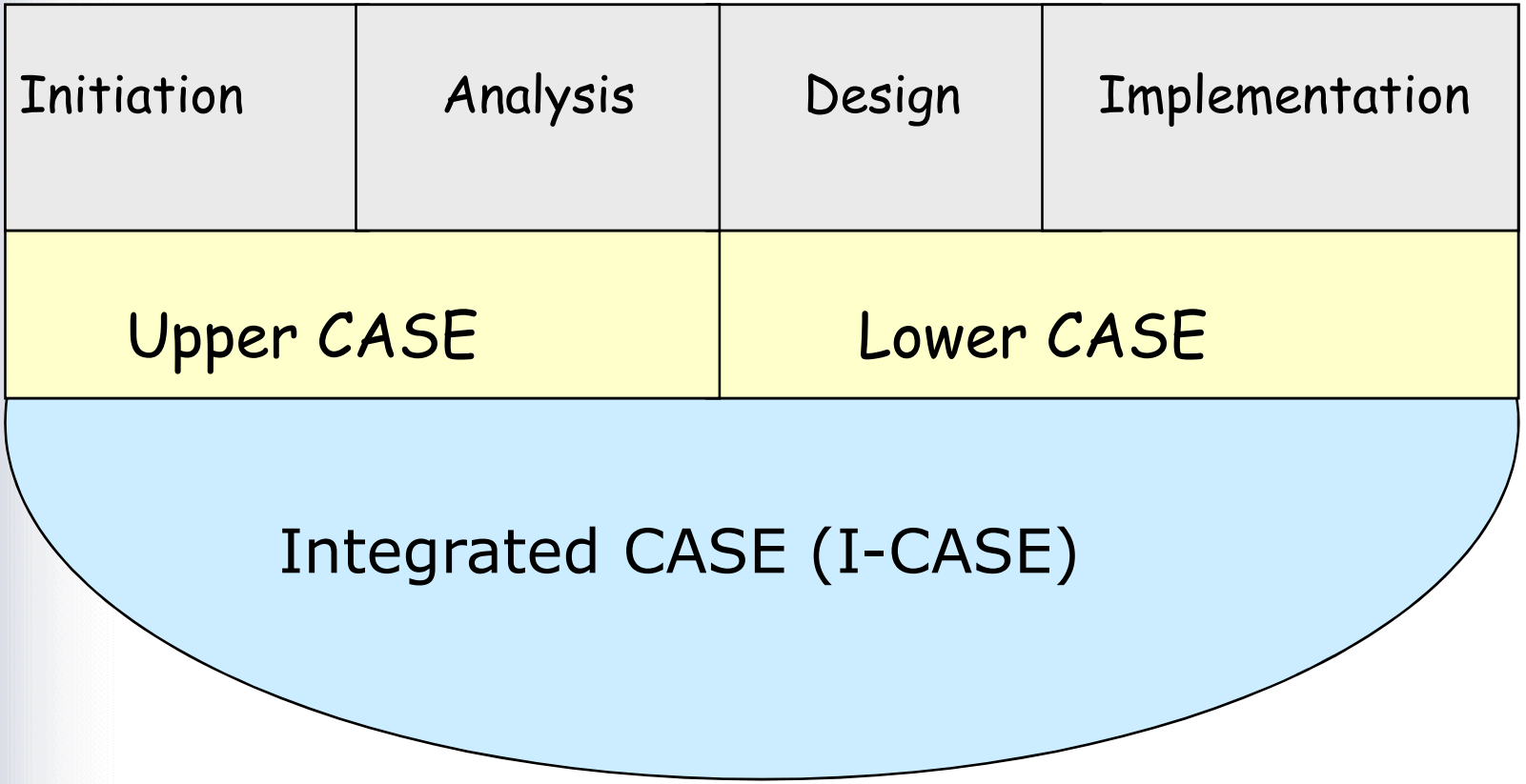
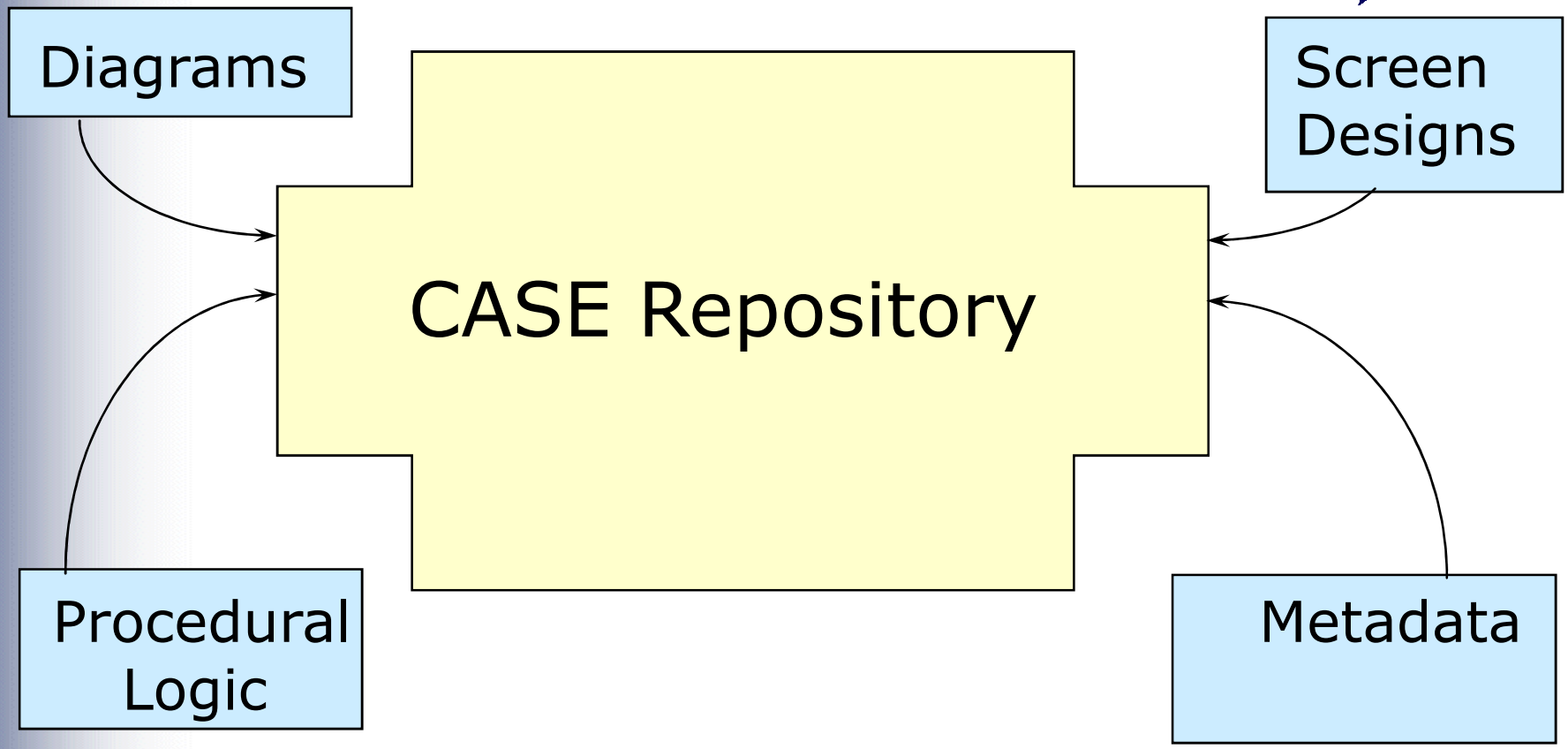
CASE Tools



CASE Components



Standards

- *Examples*
  - Formal rules for naming files
  - Forms indicating goals reached
  - Programming guidelines
    - Can you think of more examples?

Documentation

- Project binder
- Table of contents
- Continual updating

Managing Scope

- Scope creep -- a major cause of development problems
  - JAD and prototyping
  - Formal change approval
  - Charging for changes

Timeboxing

- Fixed deadline
  - Make deadline possible
  - Set by development group
- Reduced functionality, if necessary
- Fewer "finishing touches"

Timeboxing Steps

1. Set the date for system delivery.
2. Prioritize the functionality that needs to be included in the system.
3. Build the core of the system (the functionality ranked as most important).
4. Postpone functionality that cannot be provided within the time frame.
5. Deliver the system with core functionality.
6. Repeat steps 3 through 5, to add refinements and enhancements.

Managing Risk

- Risk assessment
- Actions to reduce risk
- Revised assessment

Classic Mistakes

- Overly optimistic schedule
- Failing to monitor schedule
- Failing to update schedule
- Adding people to a late project

Summary

- Project management is critical to successful development of new systems
- Project management involves planning, controlling and reporting on time, labor, and costs.

Expanding the Domain

- For more detail on project management, visit the project management institute and its special interest group on information systems:
  - www.pmi.org
  - www.pmi-issig.org