
IT/Software Project Management Core Functions

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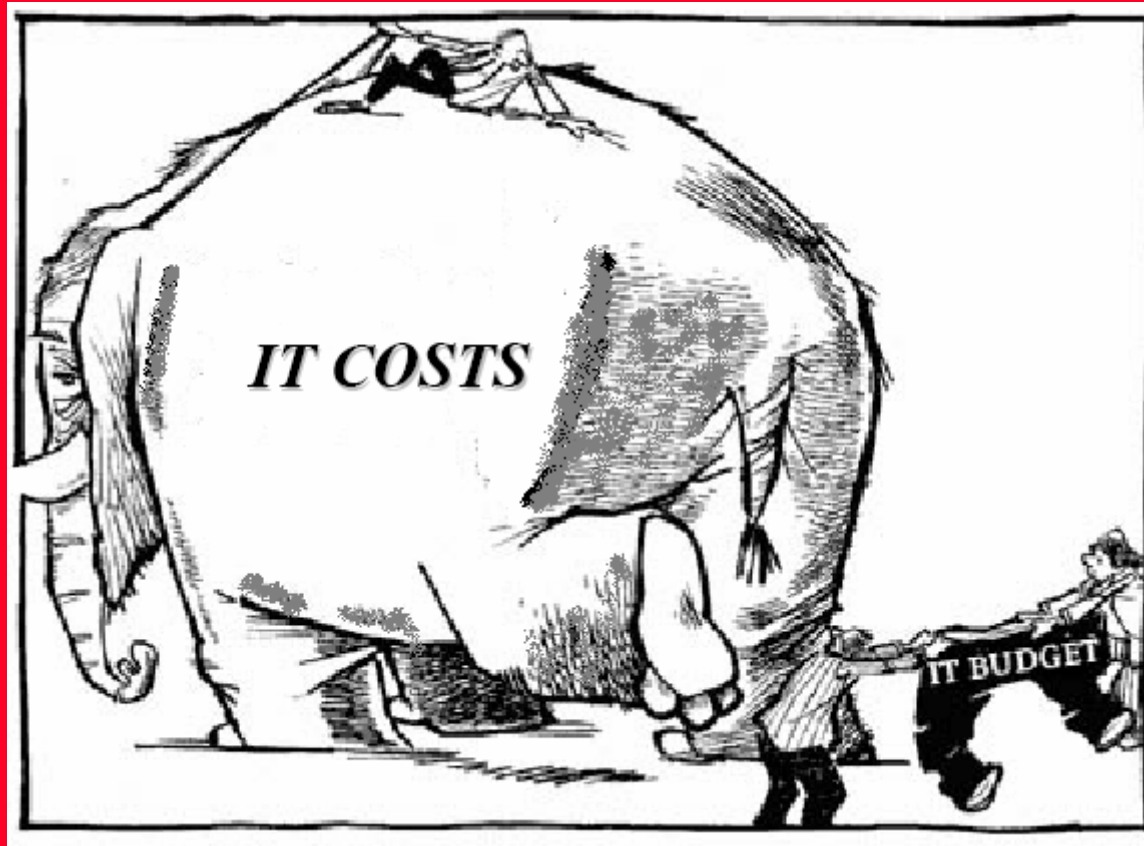
- The following references were mostly used in the preparation of the course; the order reflects the intensity of usage:
 - ✚ IT Project Management, Kathy Schwalbe, Course Technology, 2004.
 - ✚ Ghazy Assassa, Software Engineering Course notes, 2007.
 - ✚ Ian Sommerville: Software Engineering, 7th edition, Addison-Wesley, 2005.
 - ✚ PMBOK Guide, 2004
 - ✚ Roger Pressman: Software Engineering, McGraw-Hill, 2005.

- ✚ Some information were taken from the following sites:
 - The Institute of Electrical and Electronics Engineers (IEEE)
 - The International Organisation for Standardisation (ISO)
 - The Software Engineering Institute (SEI) at Carnegie Mellon University.

IT/Software Project Management Core Functions

An Overview

IT: Budget & Cost



Objectives

- Introduce the PM Field
- Describe the Role Of Project Manager
- Explain the Triple Constraint And Quality
- Discuss the Project Management Framework
- Discuss Project management software tools
- Introduce Strategic Planning and Project Selection
- Discuss Financial Analysis of projects
- Introduces Project Scope Management and Organizational Structures
- Review Project and Product Life Cycles
- Review System Development Life Cycle

The Project Management (PM) Field

- Professional Organizations
 - ✚ Project Management Institute (PMI) (<http://www.pmi.org>)
 - ✚ Software Engineering Institute (SEI)
 - ✚ IEEE: Software Engineering Group
- Certifications
 - ✚ PMI PMP
- The “PMBOK” – PMI Body of Knowledge

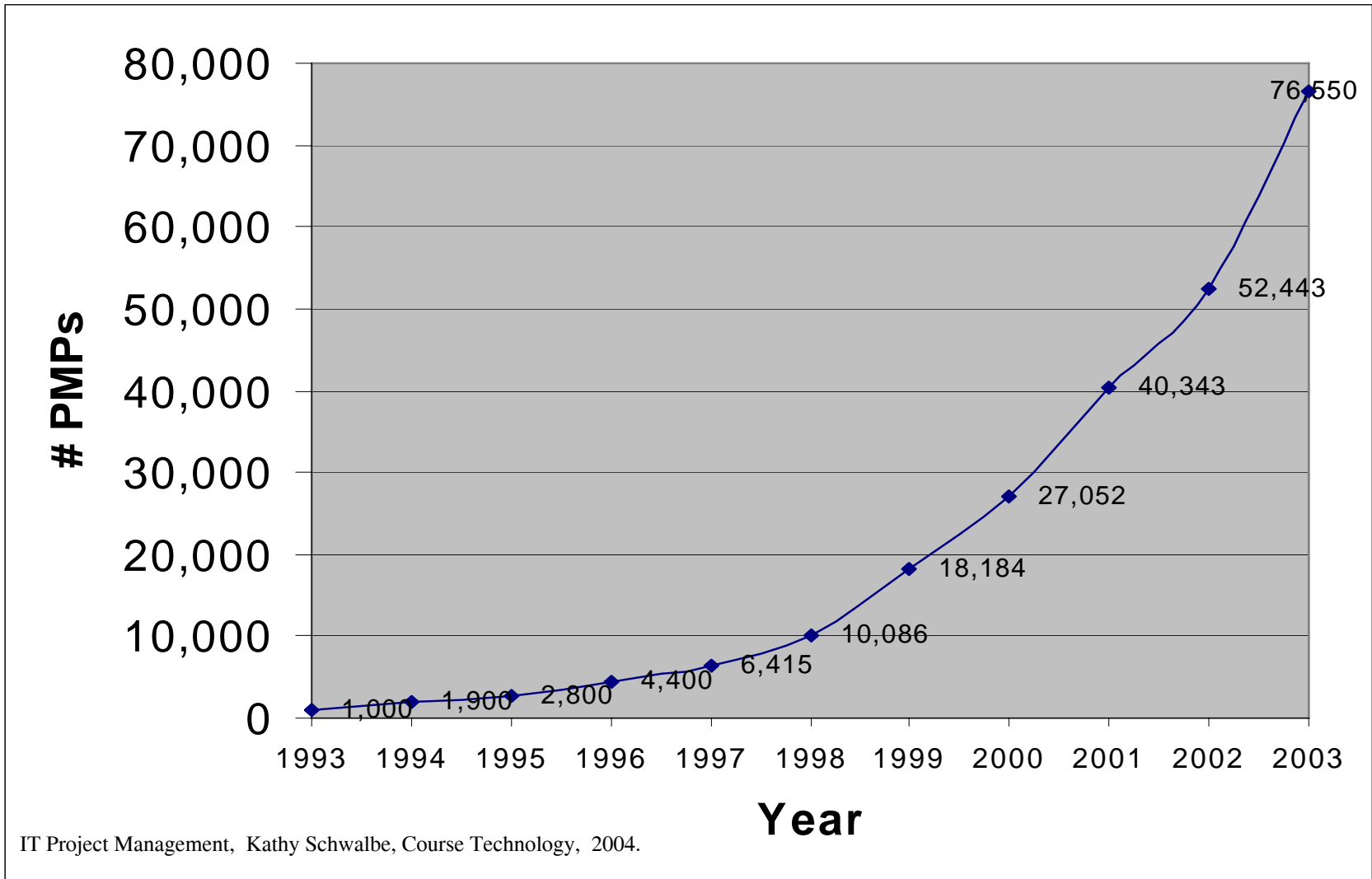
Project Management Body of Knowledge (PMBOK) Guide

- PMBOK Guide is
 - ✚ approved by the American National Standards Institute (ANSI),
 - ✚ recognized by the Institute of Electrical and Electronics Engineers (IEEE) as an IEEE standard,
 - ✚ used as an underlying reference in an International Organization for Standardization (ISO) Technical Report on managing software projects.
- PMBOK Guide is similar to the IEEE's "Guide to the Software Engineering Body of Knowledge (SWEBOK)," which focuses on the software engineering profession.

PM Certification

- In 2003, Average senior PM salary: \$90,000 per year !!
- **PMI certification** adds average 14% to salary
- Progress in PMI # of certs:
 - ✚ Year 1993: 1,000 certs
 - ✚ Year 2004: 81,913 certs

PMP Certification, 1993-2003



What Is a Project? *

- “a temporary endeavor undertaken to create a unique product, service, or result.”*
- **Temporary:** A project has a definite beginning and a definite end.
- The result (product or service) is **unique:** it is distinguishable from all other results.

*PMI, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (2004), p. 5.

What Is a Project?

- A project ends
 - ✚ when its objectives have been reached,
 - ✚ or the project has been terminated.
- Project's Results are **not** Temporary
 - ✚ The result of the project (product or service) may outlive the project.

Project Attributes

A project:

- Has a unique purpose.
- Is temporary.
- Is developed using progressive elaboration.
- Requires resources, often from various areas.
- Should have a primary customer or sponsor.
 - ✚ The **project sponsor** usually provides the direction and funding for the project.
- Involves uncertainty.

Failure Statistics of SW Projects

- Success



On-time,



On-budget,



and scope-coverage (with Most of the Features & Functions)

- Failed



Over-budget,



Over-time,



and/or with less scope (Fewer Features & Functions)

- Impaired

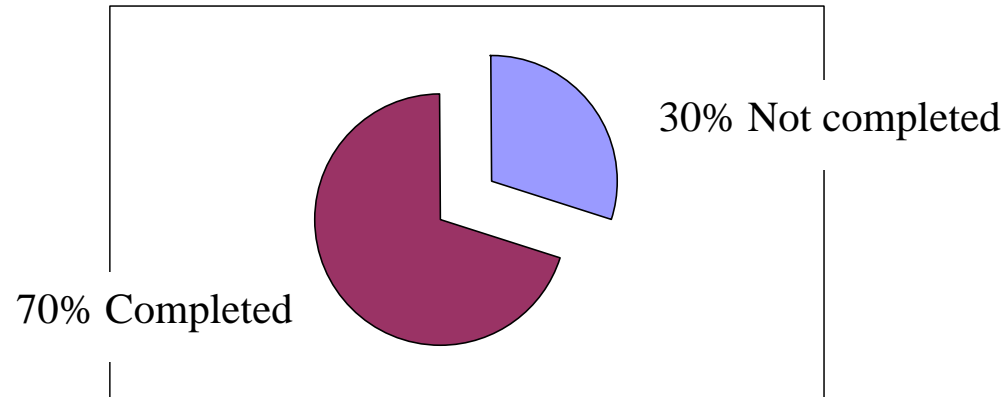


Cancelled & Unused

Why Projects Fail?

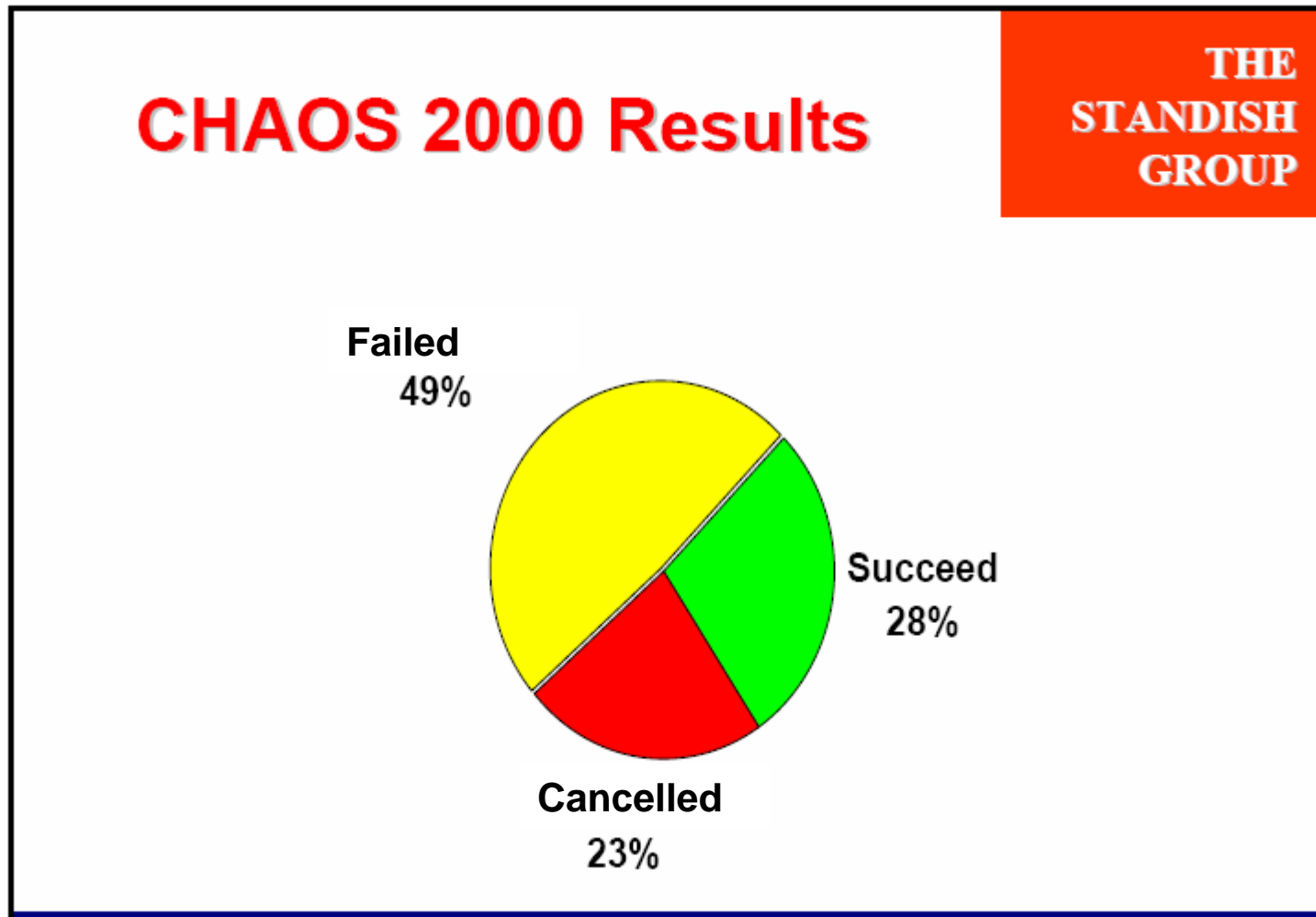
- an unrealistic **deadline** is established
- changing customer **requirements**
- an honest underestimate of **effort**
- predictable and/or unpredictable **risks**
- **technical** difficulties
- **miscommunication** among project staff
- failure in project **management**.

A S/W project is a *Risky Business*

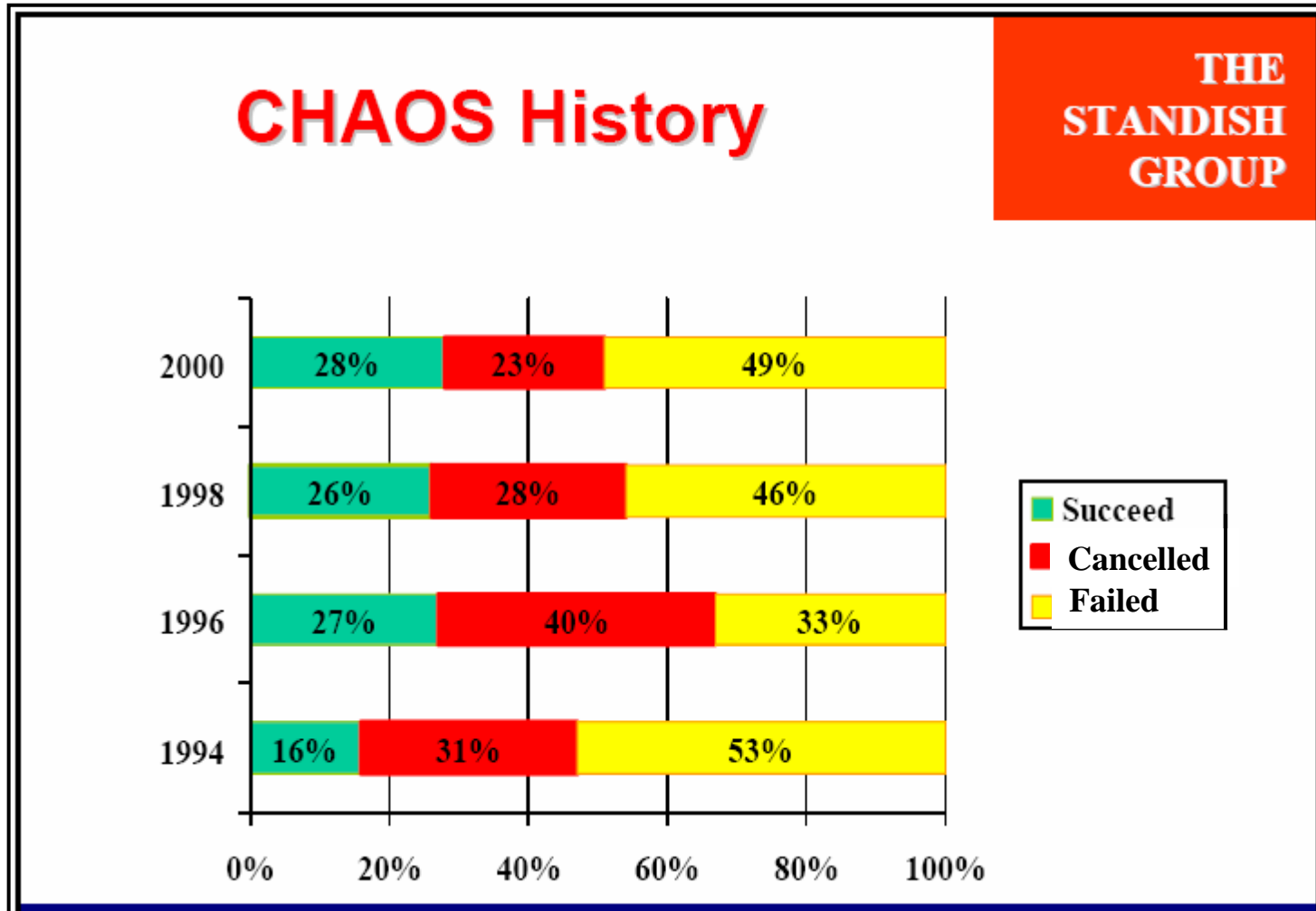


- All surveyed SW projects used **waterfall** lifecycle.
- 53% of projects cost almost 200% of original estimate.
- Estimated \$81 billion spent on failed U.S. projects in 1995.

Failure Statistics of SW Projects



Failure Statistics of SW Projects



Moving Target Problem

Changes are *inevitable*

- Growing companies are always in dynamic change
- Markets evolve, thus needs of people change
- Need to minimize the impact of changes

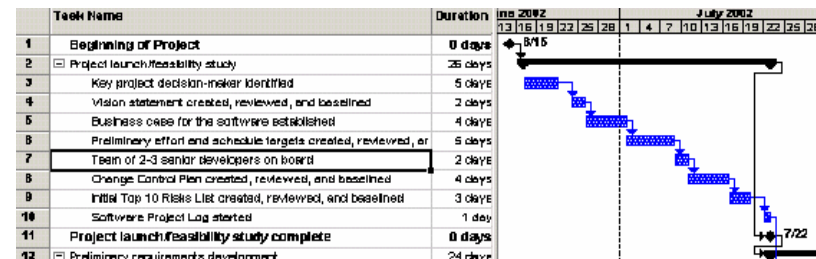
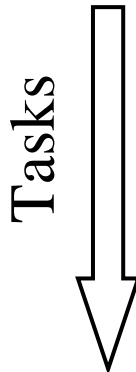
Advantages of Using Formal Project Management

- Better control of financial, physical, and human resources
- Improved customer relations
- Shorter development times
- Lower costs
- Higher quality and increased reliability
- Higher profit margins
- Improved productivity
- Better internal coordination
- Higher worker morale (less stress).

PM History

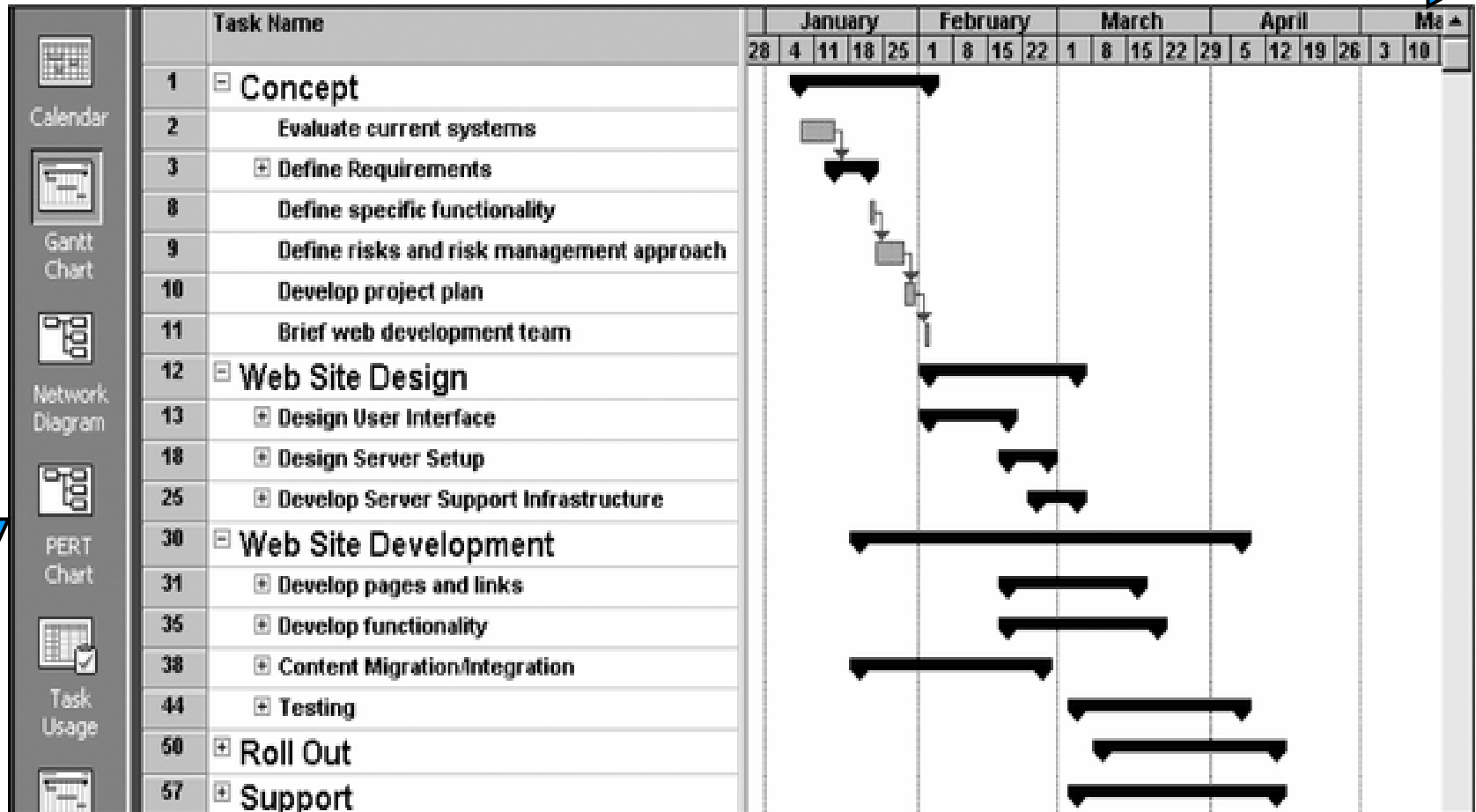
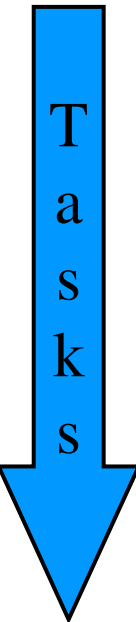
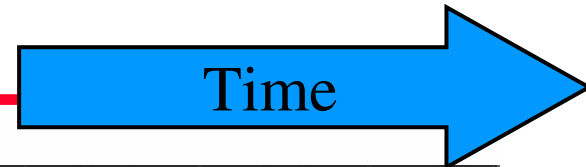
- Old PM: 5000 B.C ‘The Egyptian Pyramids’
- Birth of modern PM: Manhattan Project (military)
‘development of the atomic bomb’
- 1917: **Henry Gantt ‘Gantt chart’**

Gantt chart
for
scheduling



PM History - Gantt chart Example

Web-Software development



PM History

1970's

- Use of PM software:
 - ✚ military, defense,
 - ✚ construction industries,
 - ✚ Aircraft construction

1990's: large shift to PM-based models

- 1985: TQM 'Total Quality Management'
- 1990-93: Re-engineering
- 1996-99: Risk management, project management offices (PMO)

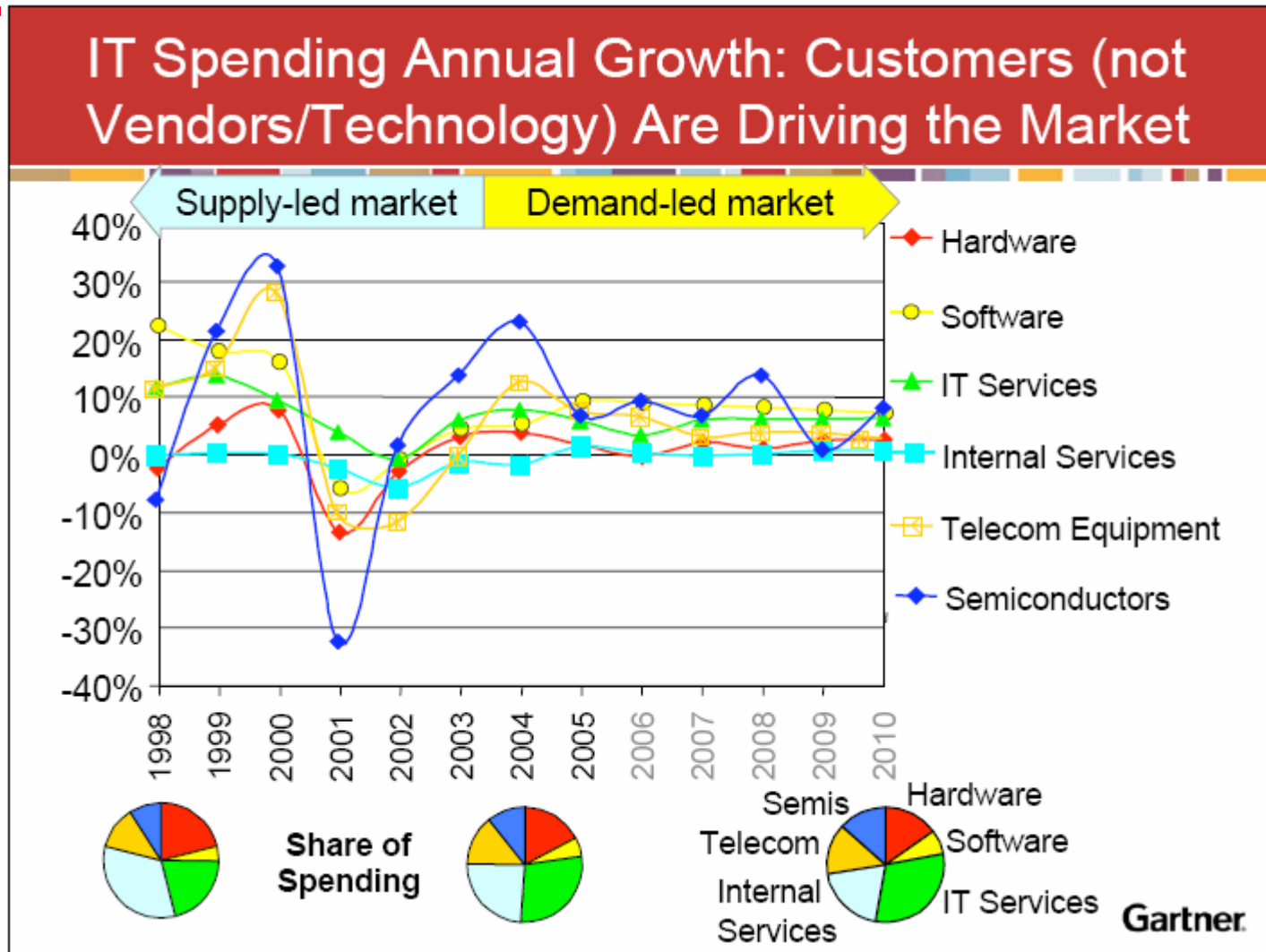
Project Management Offices (PMO)

- An organizational group responsible for coordinating the project management function throughout an organization.
- Possible goals of PMO:
 - ✚ Collect, organize, and integrate project data
 - ✚ Develop and maintain templates for project documentation
 - ✚ Develop and coordinate training needs
 - ✚ Provide project management consulting services

IT Projects: Statistics

- Worldwide IT spending continues to grow
- **Predictions: U.S. IT** spending is currently growing by another 5.7 %
 - ✚ IT spending 2005 prediction: \$795 billion.

IT Spending Annual Growth



Cost of Software Customization

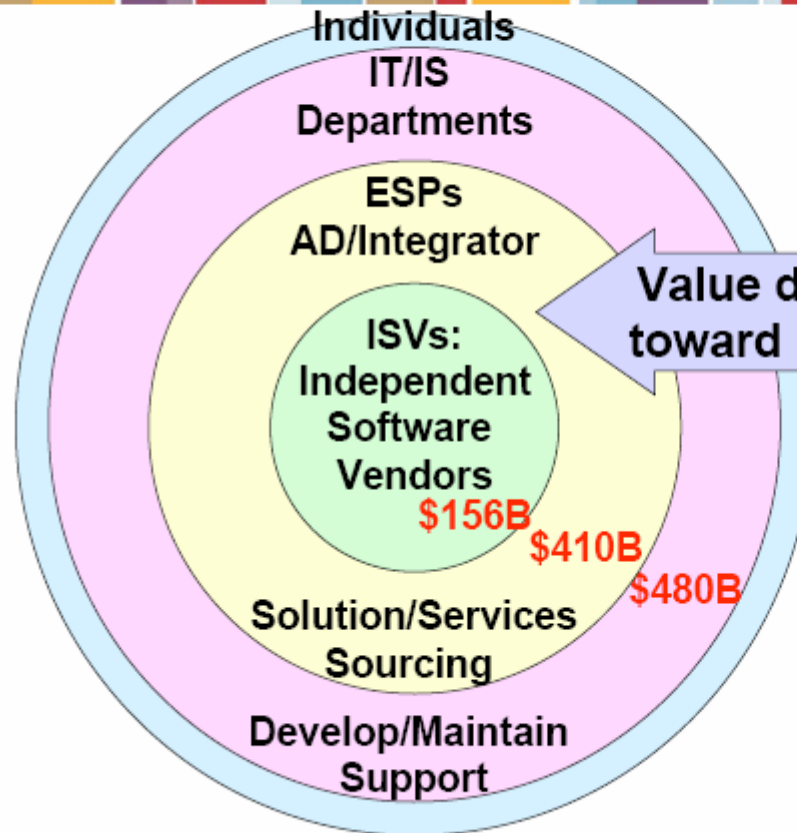
Enterprise Buyers Imperative: Cut the Total Cost of Customization

ISV: Independent Software Vendors

ESP: External Service Providers

AD: Application Development

TCO: Total cost of ownership



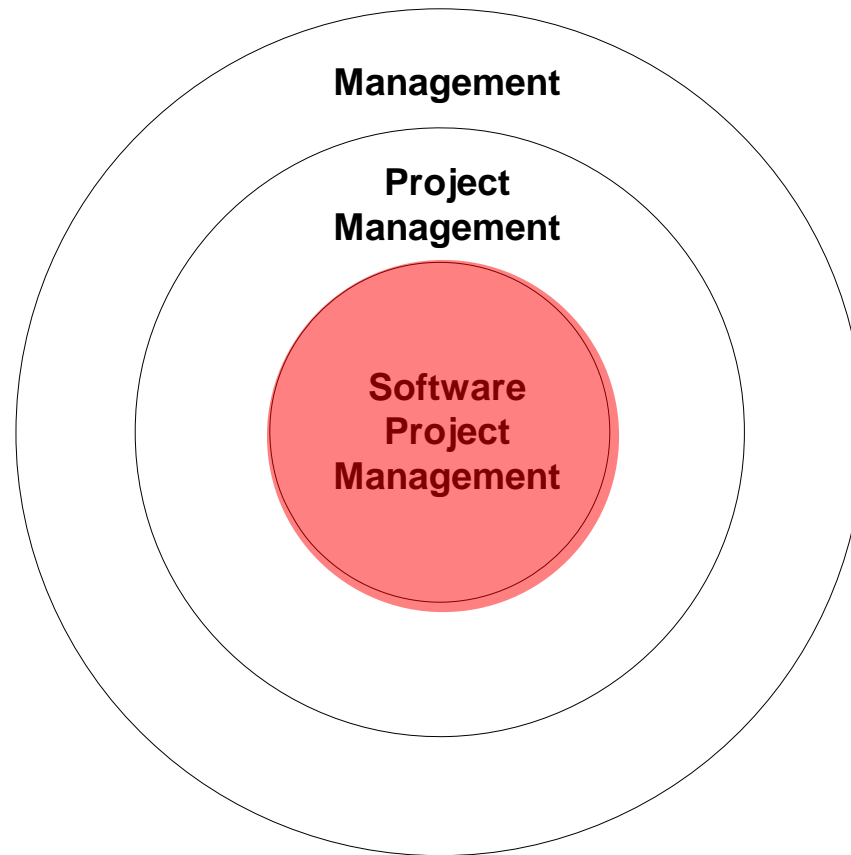
- ISVs – seek to reduce demand for customization and operations services

Value demand drives spending toward more adaptive solutions

- ESPs – seek to replace demand for internal IT skills with external skills
- IT/IS – seek to retain control of software standards and lower IT TCO

Gartner.

Management, PM & Software PM



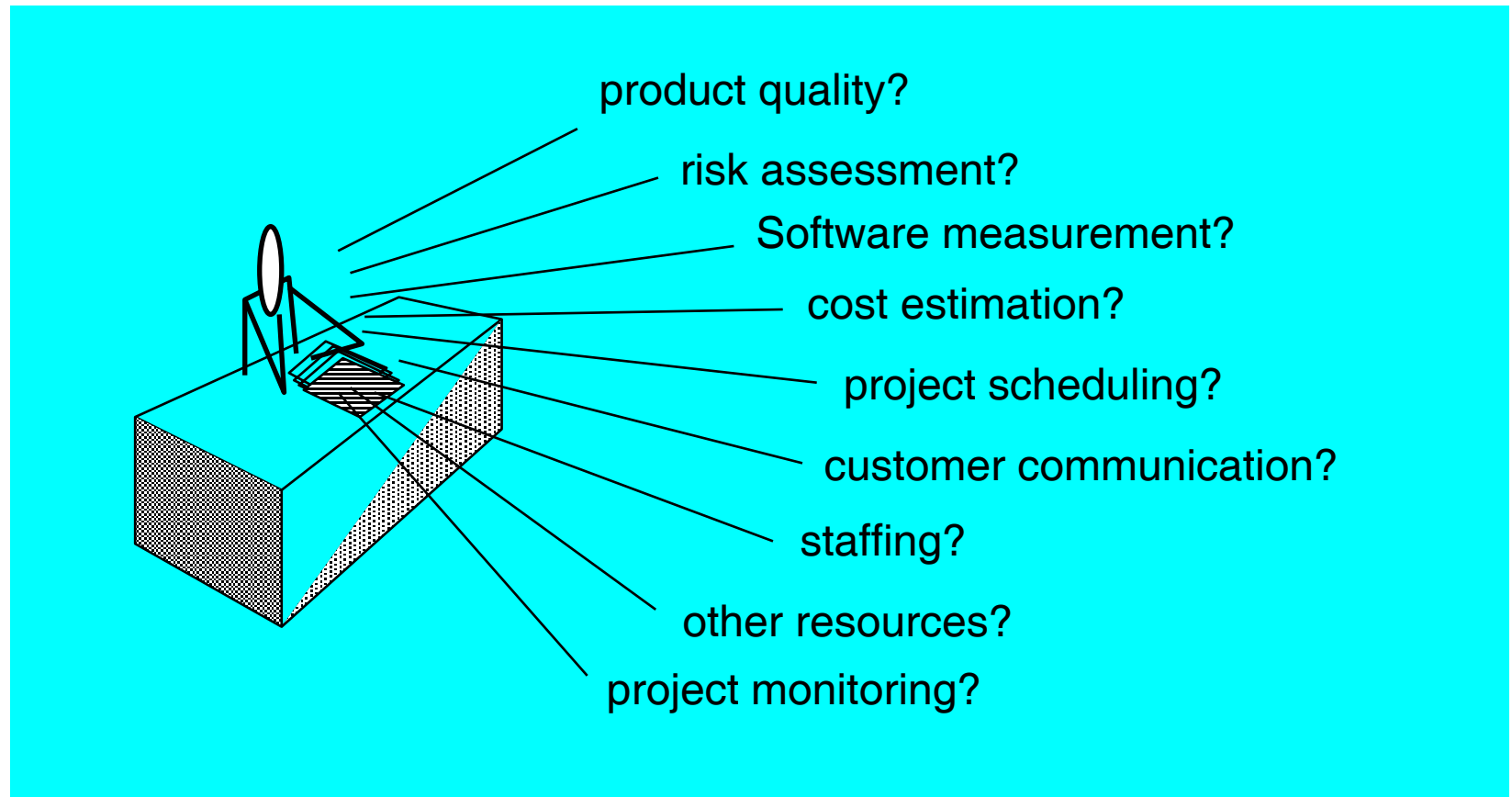
Difference between manufacturing and the software industries

- Manufacturing industry is able to **stick to schedules** (most of the time).
- Software development schedules are so **unpredictable**.
- Reason
 - ✚ not because workers in software industry are lazy or incompetent.
- To estimate the time make a product from scratch, and in many cases, without prior experience of the technology is no mean feat. However, conventional estimation techniques address only the development effort that goes into it.

S/W Management Activities

- S/W manager responsibilities include:
 - ✚ **Proposal writing:** Objectives, methodology, deliverables, cost & schedule estimates
 - ✚ **Project planning and scheduling:** Goals, activities, resources, milestones
 - ✚ **Project costing:** Resources needed for activities
 - ✚ **Project monitoring and reviews:** Track actual versus planned cost and time
 - ✚ **Personnel selection and evaluation**
 - ✚ **Report writing and presentations**

S/W Project Management Concerns



The Triple Constraint

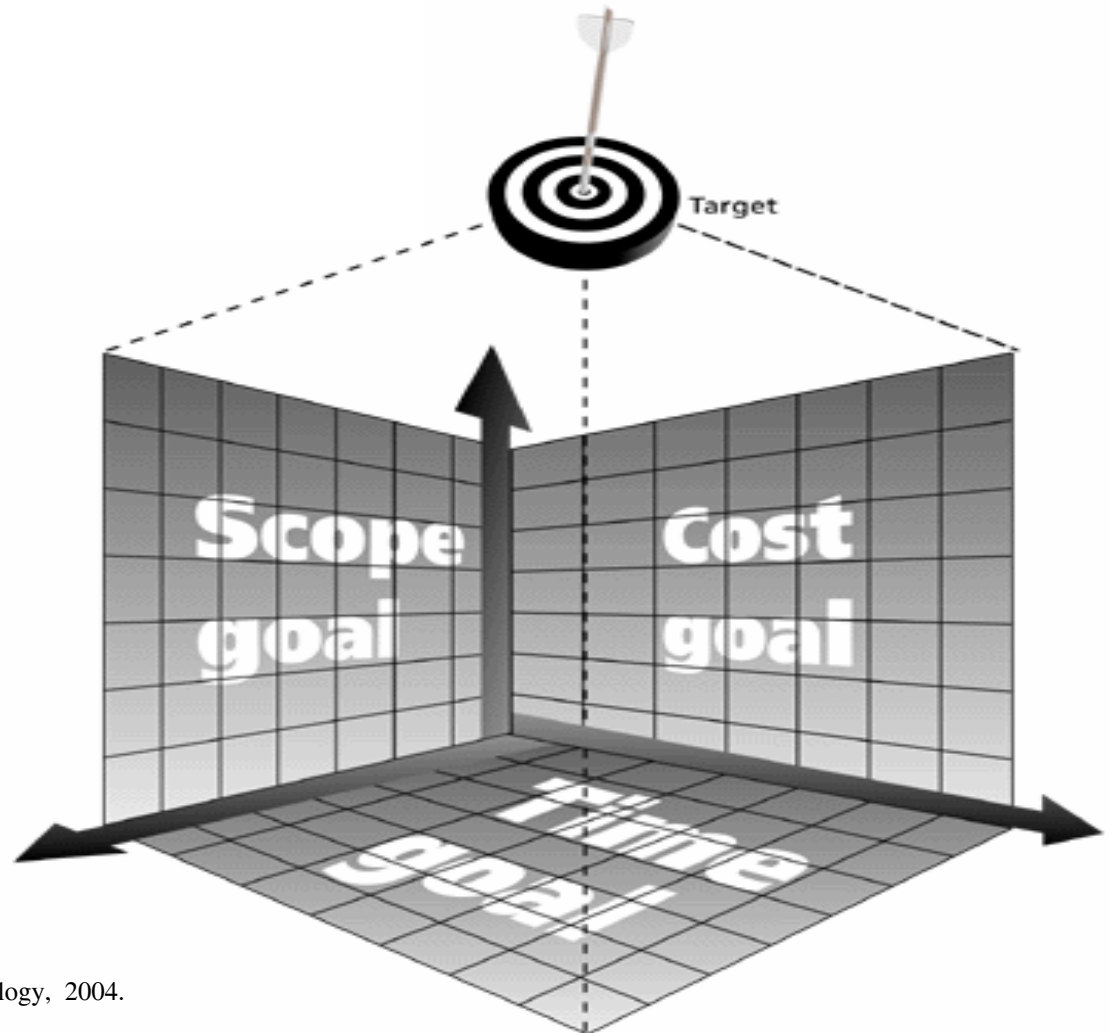
- Every project has 3 constraints
 - ✚ **Scope** goals: What work will be done?
 - ✚ **Time** goals: How long should it take to complete?
 - ✚ **Cost** goals: What should it cost?
- It is the project manager's duty to balance these three often-competing goals.

The Triple Constraint of Project Management

Successful Software Project Management: satisfying 3 goals:

- **scope** 'requirements'
- **time**
- **cost**

• Think of quality !!



The Triple Constraint –An Example

An IT project having:

- **Scope:** Identify 30 potential IT projects (ending with a report & a presentation)
- Initial **Time:** 2 months
- Initial **Cost:** \$ 60,000

Quality & The Triple constraint



What is Project Management? *

- **Project management** is “the application of

- ✚ knowledge,

- ✚ skills,

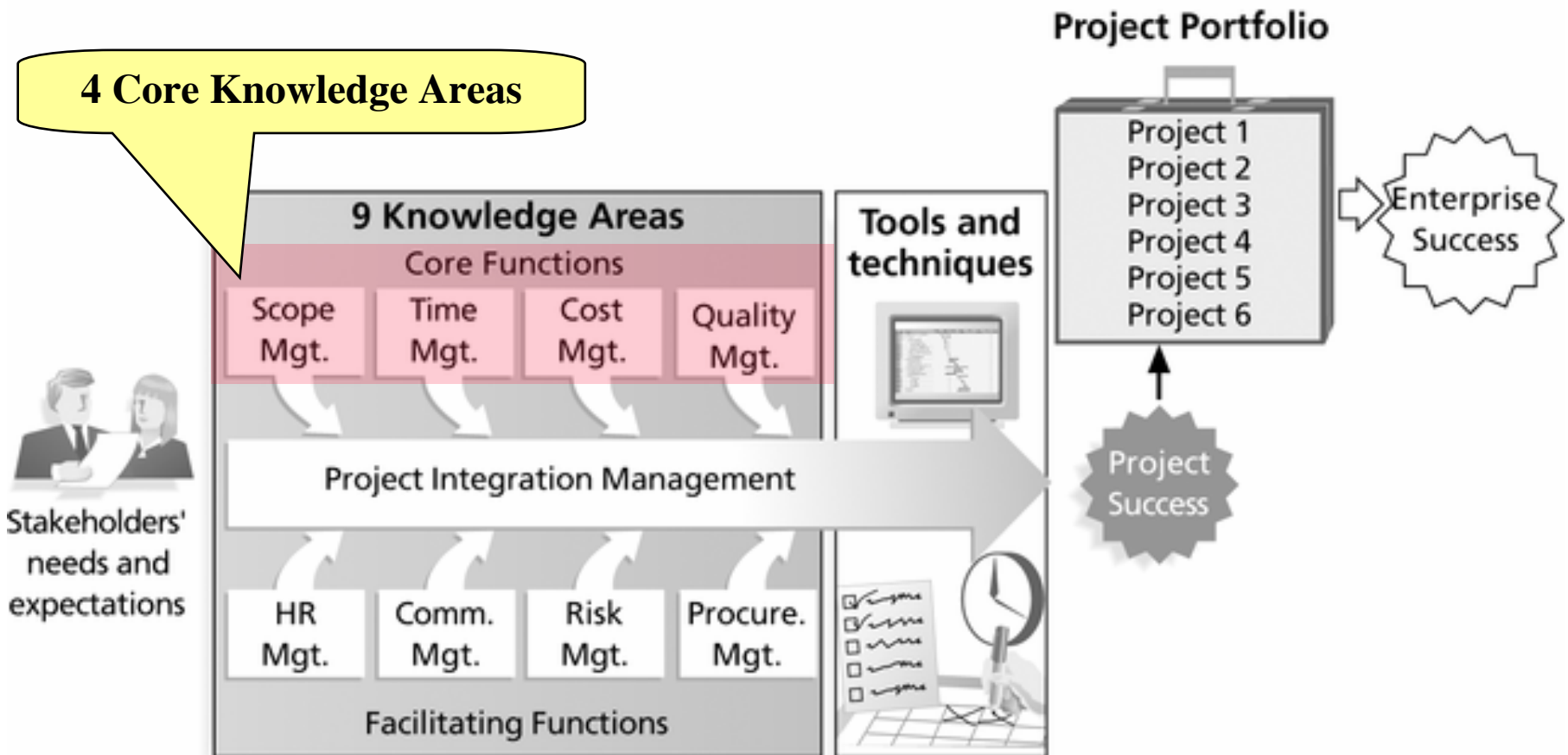
- ✚ tools

- ✚ and techniques

to project activities to meet project requirements.”*

*PMI, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (2004), p. 8.

Project Management Framework



IT Project Management, Kathy Schwalbe, Course Technology, 2004.

Project Stakeholders

- **Stakeholders** are the people involved in or affected by project activities.

- Stakeholders include:

- ✚ Project sponsor
- ✚ Project manager
- ✚ Project team
- ✚ Support staff
- ✚ Customers
- ✚ Users
- ✚ Suppliers
- ✚ Opponents to the project.

Nine Project Management Knowledge Areas

- Knowledge areas describe the key competencies that project managers must develop.
- **Four core knowledge areas**
- **Four facilitating knowledge areas**
- Plus one knowledge area: “project integration management”
- All knowledge areas are important!

Nine Project Management Knowledge Areas

- Four core knowledge areas lead to specific project objectives
 - ✚ (scope, time, cost, and quality).
- Four facilitating knowledge areas are the means through which the project objectives are achieved
 - ✚ (human resources, communication, risk, and procurement management).
- One knowledge area
 - ✚ (project integration management) affects and is affected by all of the other knowledge areas.

CMM

Capability Maturity Model

“for Software Projects”

Application of Total Quality Management to
software engineering projects

CMM

SEI's Vision:

To bring engineering discipline to the development and maintenance of software products

Desired Result:

Higher quality -- better products for a better price
Predictability -- function/quality, on time, within budget

Methodology to Achieve that Desired Result:

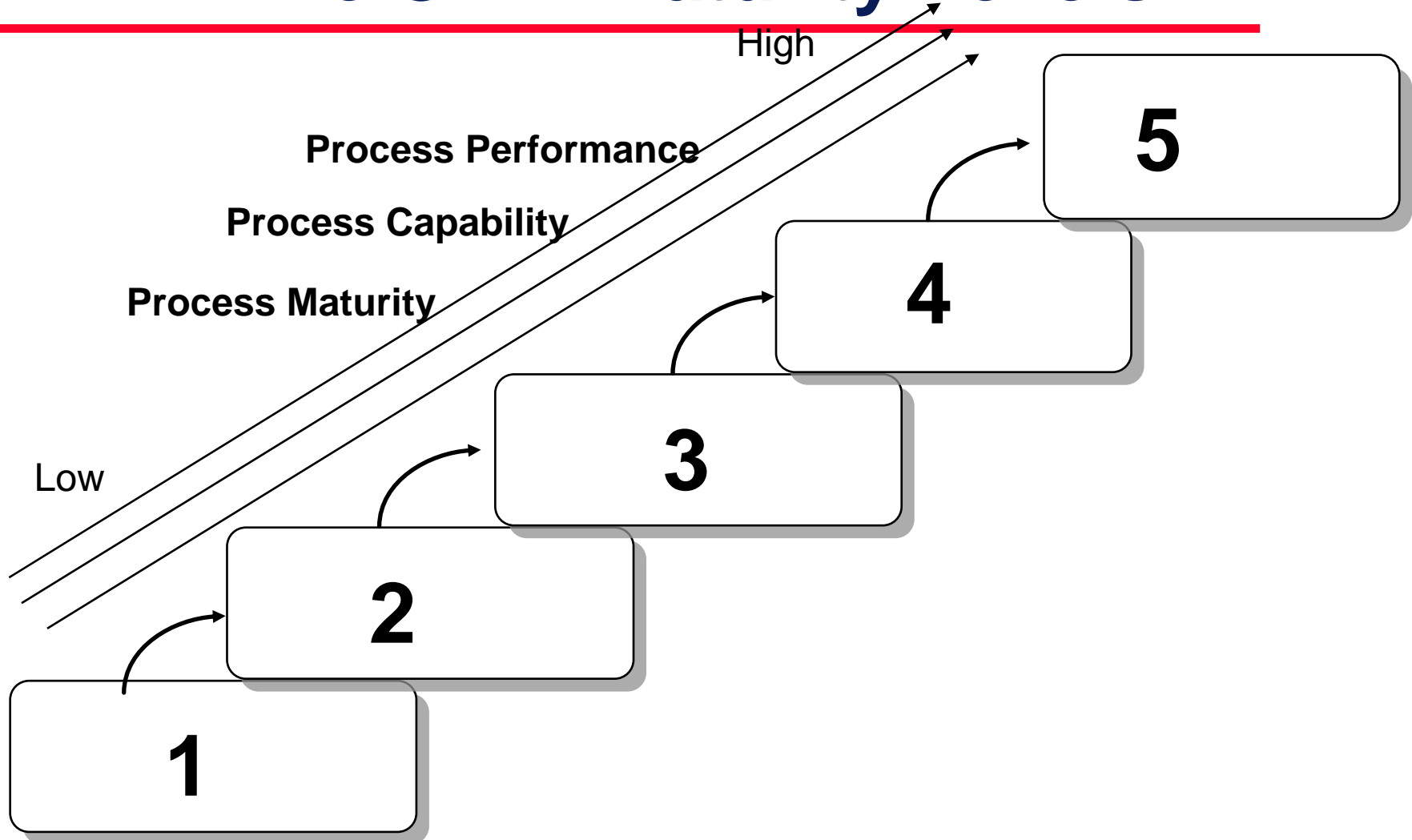
1. Identify Current State:
Know your current
Capability Maturity Level

2. Identify Desired State:
Understand the description
of the next Level

3. Reduce the Gap:
Plan, implement, and institutionalize
the key practices of the next Level.
Repeat until continuous optimization is part of the culture.

Part 1.

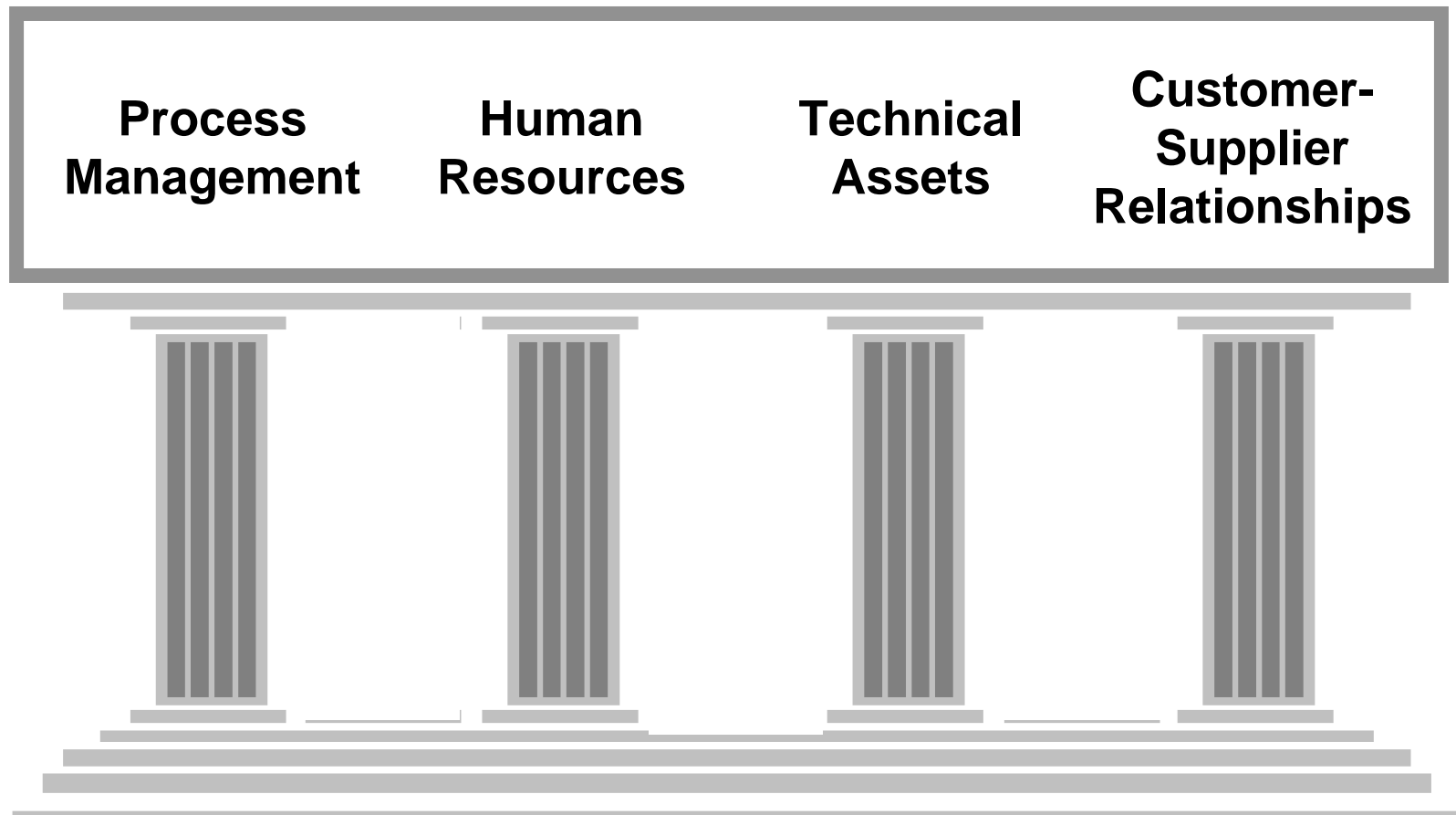
The CMM Maturity Levels



What is the CMM?

- **Concept: The application of process management and quality improvement concepts to software development and maintenance**
- **Model: A model for organizational improvement**
- **Guidelines: A guide for evolving toward a culture of engineering excellence**
- **Basis for Measurement: The underlying structure for reliable and consistent software process assessments, software capability evaluations, and interim profiles**

Process Management and the CMM in Context

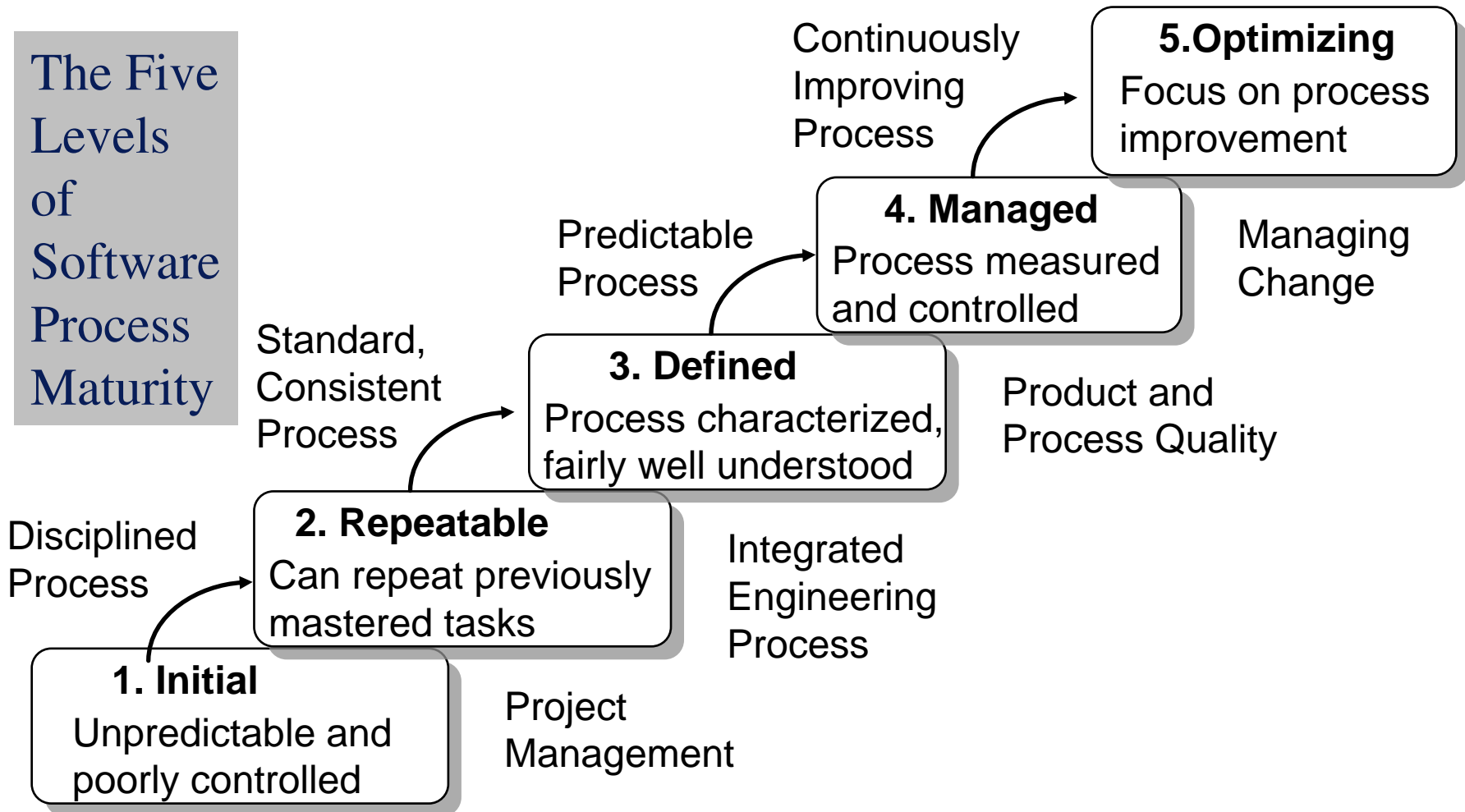


CMM and Business Context

- The CMM is an application of Total Quality Management principles to software engineering.
- Emphasis should be on customer satisfaction.
- The result should be higher quality software products produced by more competitive companies.

Levels/ Process Categories	Management	Organizational	Engineering
5 Optimizing		Technology Change Management Process Change Management	Defect Prevention
4 Managed	Quantitative Software Management		Software Quality Management
3 Defined	Integrated Software Management Intergroup Coordination	Organization Process Focus Organization Process Definition Training Program	Software Product Engineering Peer Reviews
2 Repeatable	Requirements Management Software Project Planning Software Project Tracking and Oversight Software Subcontract Management Software Quality Assurance Software Configuration Management		
1 Initial	Ad Hoc Processes		

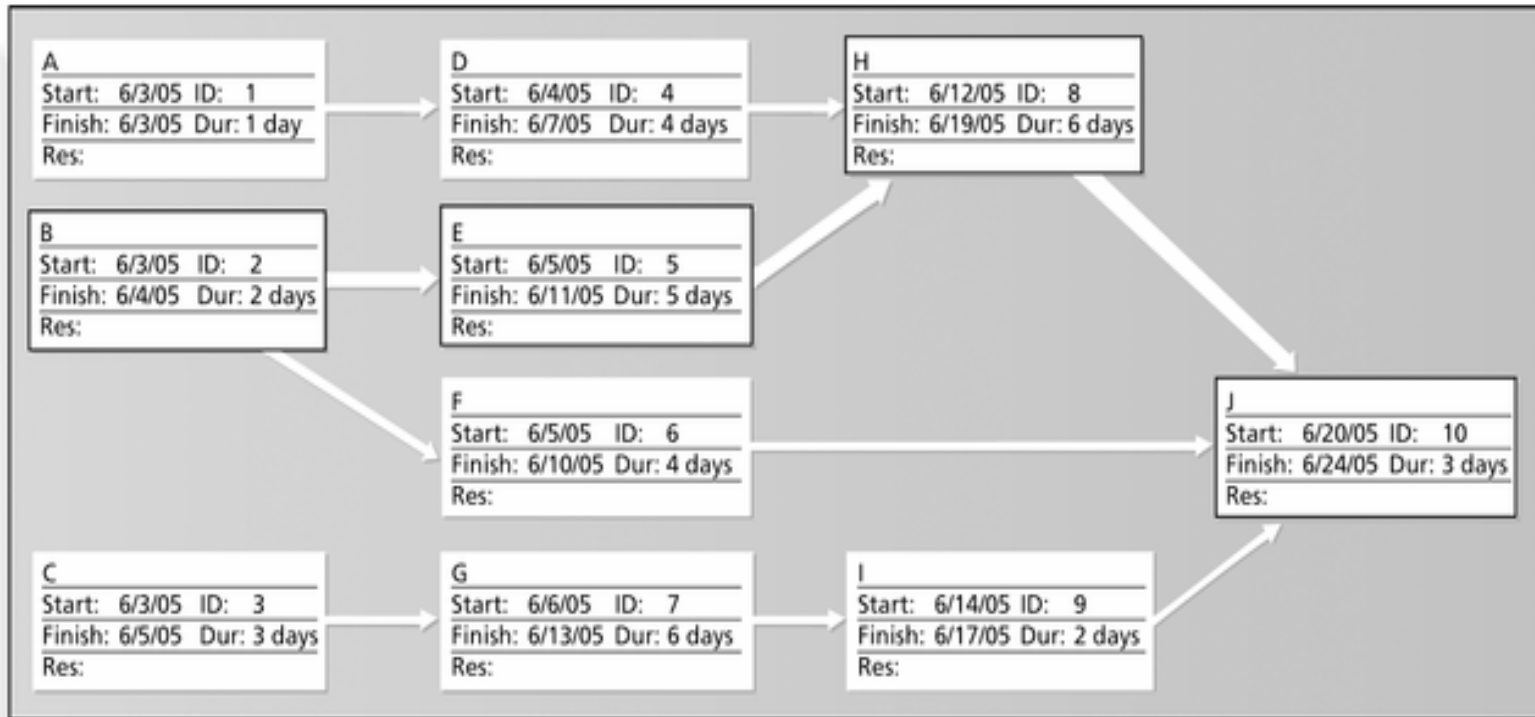
CMM Capability Maturity Model “for Software Projects”



Project Management Tools and Techniques

- Project management tools and techniques assist project managers and their teams in various aspects of project management.
- Specific tools and techniques include:
 - ✚ Project charters, scope statements, and WBS (scope).
 - ✚ Gantt charts, network diagrams, critical path analyses, critical chain scheduling (time).
 - ✚ Cost estimates (cost).

Network Diagram



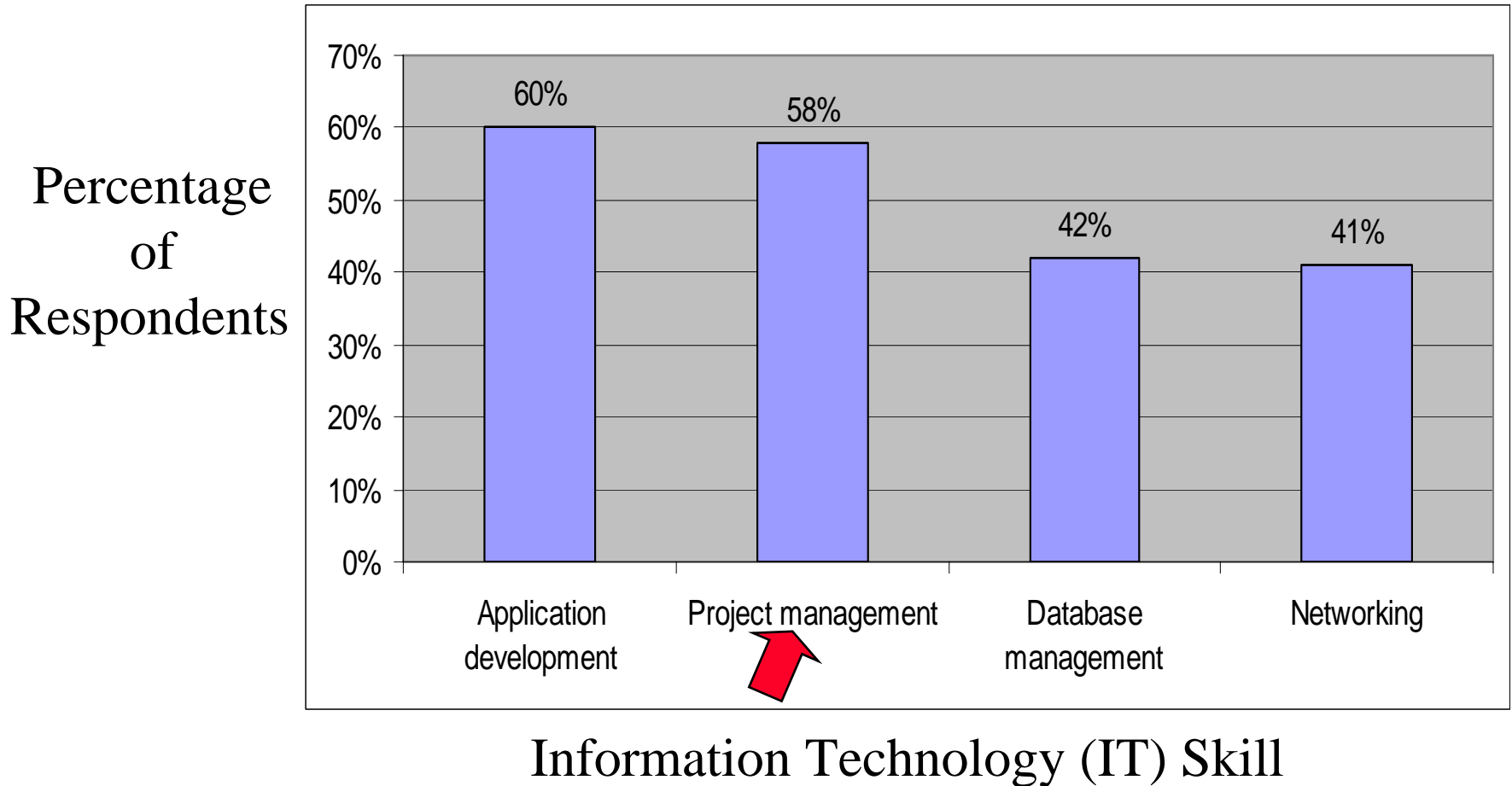
Each box is a project task from the WBS. Arrows show dependencies between tasks. The bolded tasks are on the critical path. If any task on the critical path takes longer to complete than planned, the whole project will slip unless something is done. Network diagrams were first used in 1958 on the Navy Polaris project before project management software was available

Top Ten Most In-Demand IT Skills

Rank	IT Skill/Job	Average Annual Salary
1	SQL Database Analyst	\$80,664
2	Oracle Database Analyst	\$87,144
3	C/C++ Programmer	\$95,829
4	Visual Basic Programmer	\$76,903
5	E-commerce/Java Developer	\$89,163
6	Windows NT/2000 Expert	\$80,639
7	Windows/Java Developert	\$93,785
8	Security Architect	\$86,881
9	Project Manager	\$95,719
10	Network Engineer	\$82,906

Paul Ziv, "The Top 10 IT Skills in Demand," Global Knowledge Webcast (www.globalknowledge.com) (11/20/2002).

Top Information Technology Skills



Cosgrove, Lorraine, "January 2004 IT Staffing Update," *CIO Research Reports* (February 3, 2004).

Software PM Tools and Resources

- PM software survey ‘1999’:
 - ✚ Describes & compares more than 200 software tools
- PM resources:
 - ✚ See ‘www.allpm.com/links/products’
- Software Tools
 - ✚ MS Project, Time Line, Primavera, ...

PM Tools: Software

Three main categories of PM tools:

- Low-end
- Mid-range
- High-end

PM Tools: Software

Low-end PM tools

- Basic features, tasks management, charting
- Gantt chart
- Handle single or small projects
- Cost under \$200 per user.
 - ✚ Milestones Simplicity by KIDASA software (\$49 per user)
 - ✚ Productivity S/W (MS Excel or MS Access) + add-on features.

PM Tools: Software

Midrange PM tools

- Handle larger projects, multiple projects, analysis tools
- Provide: Gantt chart, project network diagrams, critical path, resource allocation, project tracking
- \$200-500 per user
- MS Project: approx. 50% of market (includes an enterprise version)
- Primavera, Plan View, Artemis, Welcome, ...

PM Tools: Software

High-end PM tools - Features

- Also called **enterprise** PM software;
- Very large projects, specialized needs,
- Enterprise functions that combine many projects to show enterprise view of all running projects
- Often licensed on a per-user basis;
- Can be **integrated with enterprise Database Management software (DBMS)**
- Accessible via the **internet**.

PM Tools: Software

High-end PM tools - Products

- MS Enterprise Project Management
- Inexpensive enterprise tool: VPMi Enterprise Online (www.vcsonline.com) @ \$12 per user per month
- AMS Realtime
- Primavera Project Manager
- Other enterprise tools on the Project Management Center Web site: www.infogoal.com/pmc.

Why S/W Project Management ?

- Because S/W development includes *many activities* that need management
- Project management activities
 - ✚ Organising
 - ✚ Planning
 - ✚ Scheduling
 - ✚ Monitoring
 - ✚ Controlling

Project Management Software

- Enterprise PM software integrates information from multiple projects to show the status of active, approved, and future projects across an entire organization.
- It also provides links to more detailed information on each project.
- Many managers like to see status in color – red, yellow, and green.

Sample Enterprise Project Management Tool

Company ABC Project Portfolio				
Project Name	Scope	Schedule	Budget	Links
Active Projects				
Project 1	○	●	●	
Project 2	●	●	●	
Project 3	○	○	○	
Project 4	○	●	●	
Approved Projects				
Project 10	○	○	○	
Project 11	○	○	○	
Project 12	○	○	○	
Project 13	○	○	○	
Project 14	○	○	○	
Opportunities				
Project 100				
Project 200				
○	White = going well			
●	Gray = some problems			
●	Black = major problems			



Strategic Planning and Project Selection

- **Strategic planning** involves
 - + determining long-term objectives,
 - + predicting future trends,
 - + and projecting the need for new products and services.

SWOT Analysis & Strategic Planning

- Organizations often perform a **SWOT analysis**:
 - ✚ Strengths,
 - ✚ Weaknesses,
 - ✚ Opportunities,
 - ✚ and Threats
- As part of strategic planning, organizations should:
 - ✚ Identify potential projects.
 - ✚ Use realistic methods to select which projects to work on.

Brainstorming Exercise

- Perform SWOT analysis on one of the following organization:
 -  The university
 -  An organization that you know

Identifying Potential Projects

- It's crucial to **align** IT projects with business strategy.

Methods for Selecting Projects

- There is usually not enough time or resources to implement all projects.
- Methods for selecting projects include:
 - + Focusing on broad organizational **needs**.
 - + **Categorizing** information technology projects.
 - + Performing net present value or other **financial analyses**.
 - + Using a **weighted** scoring model.
 - + Implementing a **balanced scorecard**.

Financial Analysis of Projects

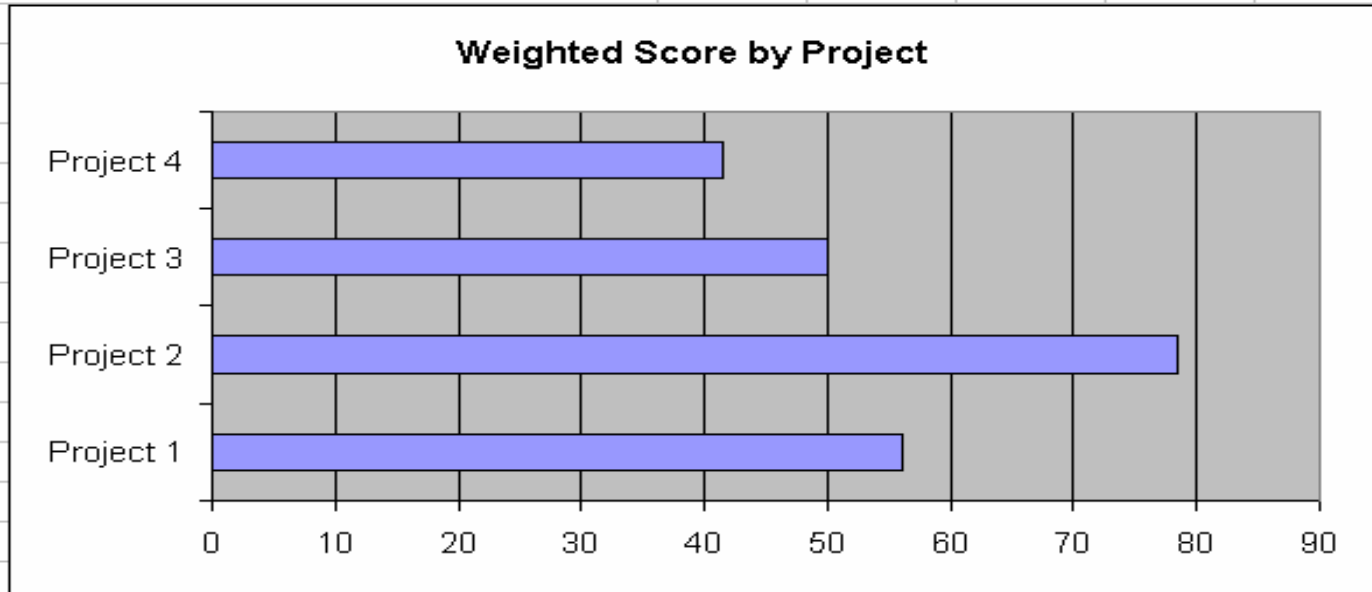
- Financial considerations are often an **important aspect** of the project selection process.
- **Three** primary methods for determining the projected financial value of projects:
 - ✚ Net present value (NPV) analysis
 - ✚ Return on investment (ROI)
 - ✚ Payback analysis

Weighted Scoring Model

- A weighted scoring model is a tool that provides a systematic process for selecting projects based on many criteria.
- Steps in identifying a weighted scoring model:
 1. Identify criteria important to the project selection process.
 2. Assign weights (percentages) to each criterion so they add up to 100 percent.
 3. Assign scores to each criterion for each project.
 4. Multiply the scores by the weights to get the total weighted scores.
- The higher the weighted score, the better.

Sample Weighted Scoring Model for Project Selection

	A	B	C	D	E	F
1	Criteria	Weight	Project 1	Project 2	Project 3	Project 4
2	Supports key business objectives	25%	90	90	50	20
3	Has strong internal sponsor	15%	70	90	50	20
4	Has strong customer support	15%	50	90	50	20
5	Realistic level of technology	10%	25	90	50	70
6	Can be implemented in one year or less	5%	20	20	50	90
7	Provides positive NPV	20%	50	70	50	50
8	Has low risk in meeting scope, time, and cost goals	10%	20	50	50	90
9	Weighted Project Scores	100%	56	78.5	50	41.5
10						



Implementing a Balanced Scorecard

- Drs. Robert Kaplan and David Norton developed this approach to help select and manage projects that align with business strategy.
- A **balanced scorecard** is a methodology that converts an organization's value drivers, such as **customer service, innovation, operational efficiency, and financial performance**, to a series of defined metrics.
- See www.balancedscorecard.org for more information.

Project Scope Management

What is Project Scope Management?

- Project scope management includes the processes required to ensure that the project addresses all the work required—and only the work required—to complete the project successfully.

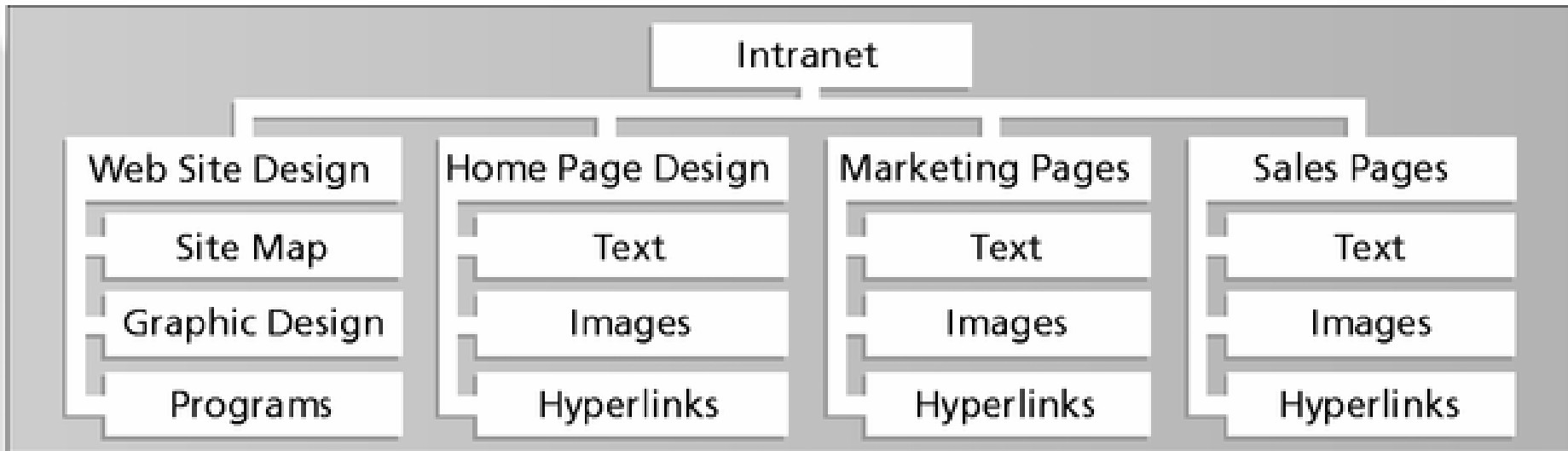
Project Scope Management Processes

- **Scope planning:** Deciding how the scope will be defined, verified, and controlled.
- **Scope definition:** Reviewing the project charter and preliminary scope statement and adding more information as requirements are developed and change requests are approved.
- **Creating the WBS:** Subdividing the major project deliverables into smaller, more manageable components.
- **Scope verification:** Formalizing acceptance of the project scope.
- **Scope control:** Controlling changes to project scope.

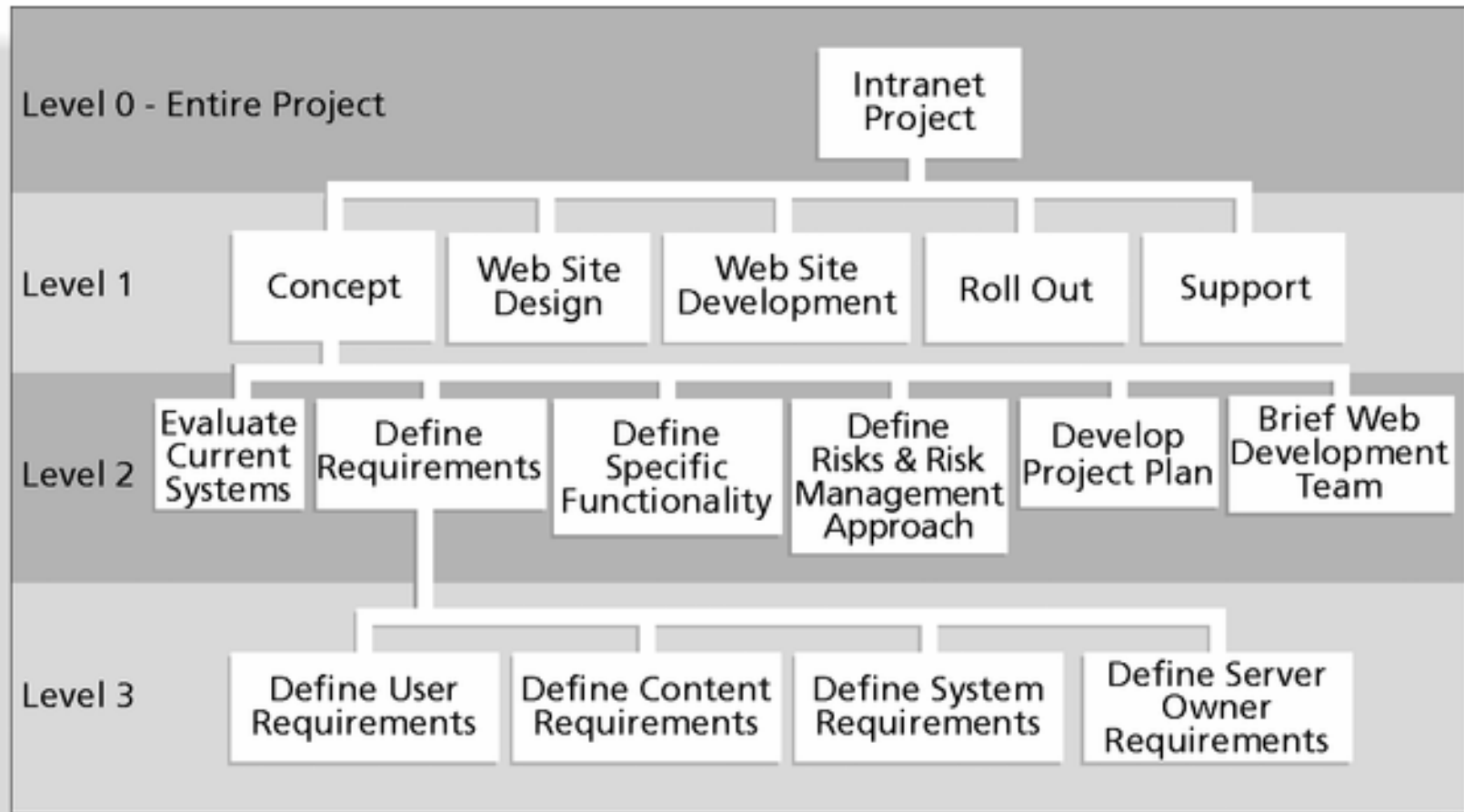
Creating the Work Breakdown Structure (WBS)

- **A WBS**
 - ✚ defines the total scope of the project.
 - ✚ provides the basis for planning and managing project schedules, costs, resources, and changes.
- **Decomposition** is subdividing project deliverables into smaller pieces.

Sample Intranet WBS Organized by Product



Sample Intranet WBS Organized by Phase



Intranet WBS in Tabular Form

1.0 Concept

1.1 Evaluate current systems

1.2 Define requirements

1.2.1 Define user requirements

1.2.2 Define content requirements

1.2.3 Define system requirements

1.2.4 Define server owner requirements

1.3 Define specific functionality

1.4 Define risks and risk management approach

1.5 Develop project plan

1.6 Brief Web development team

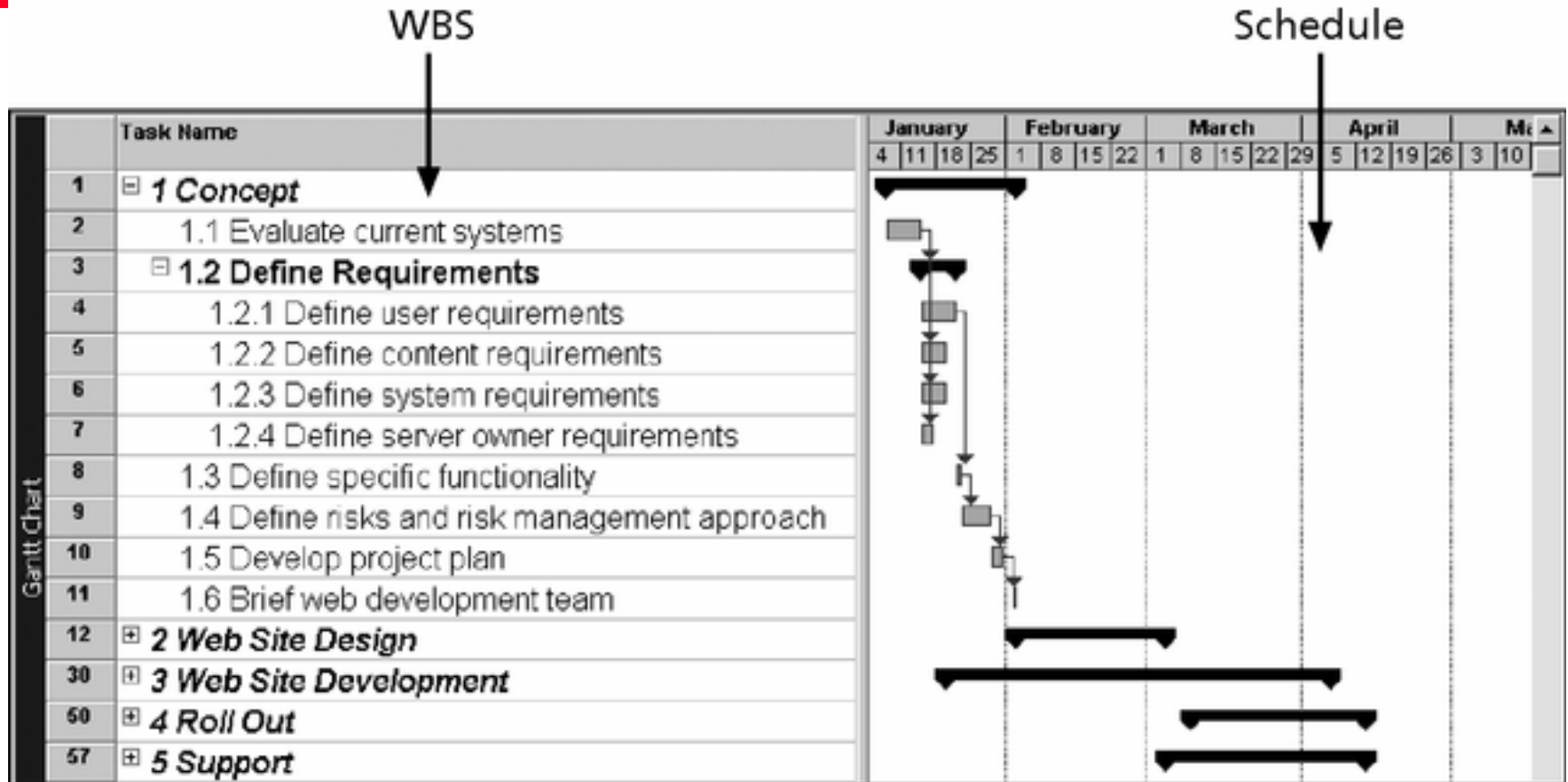
2.0 Web Site Design

3.0 Web Site Development

4.0 Roll Out

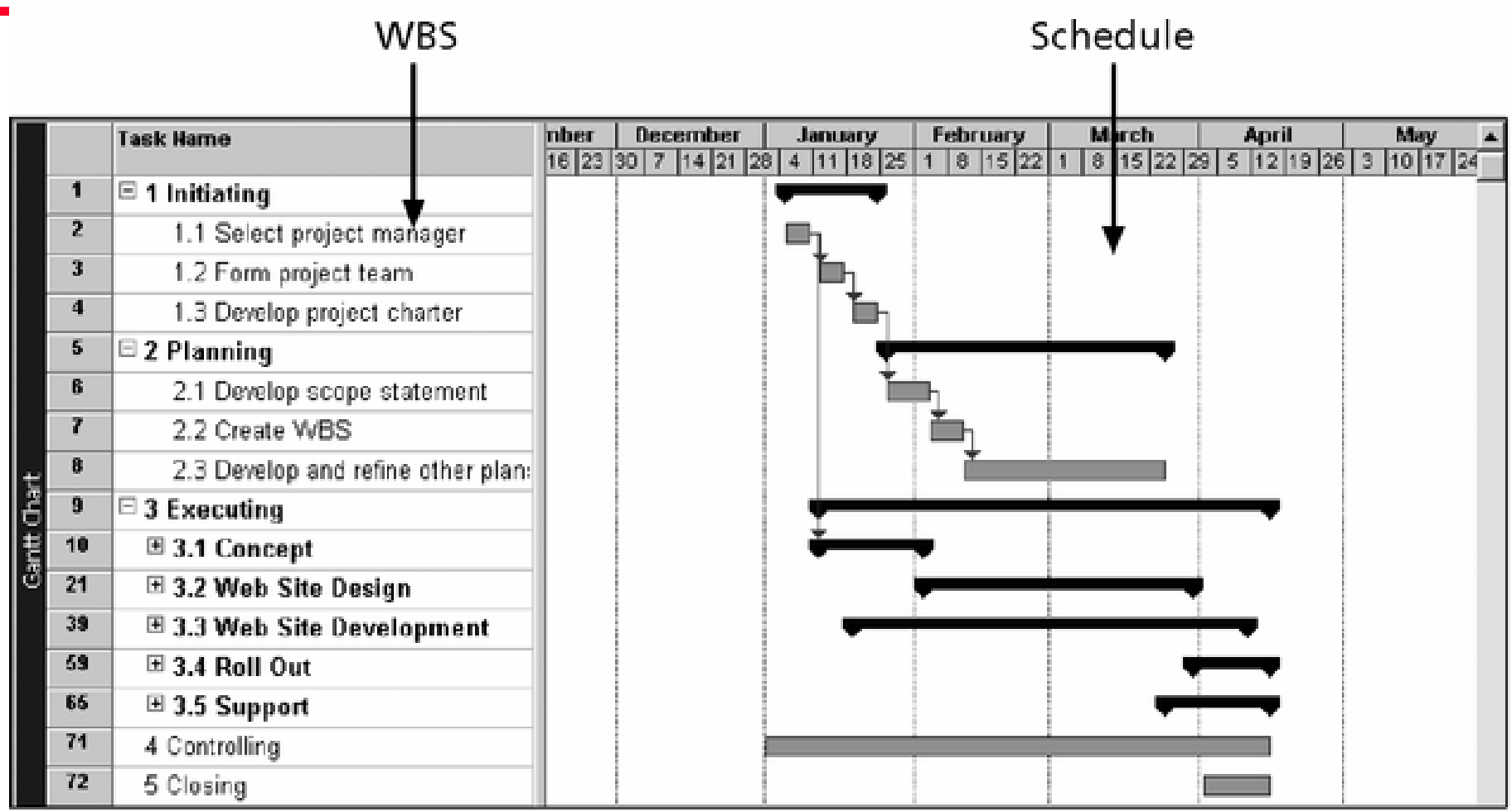
5.0 Support

Intranet WBS and Gantt Chart in Project 2000



Project 2000

Intranet Gantt Chart Organized by Project Management Process Groups



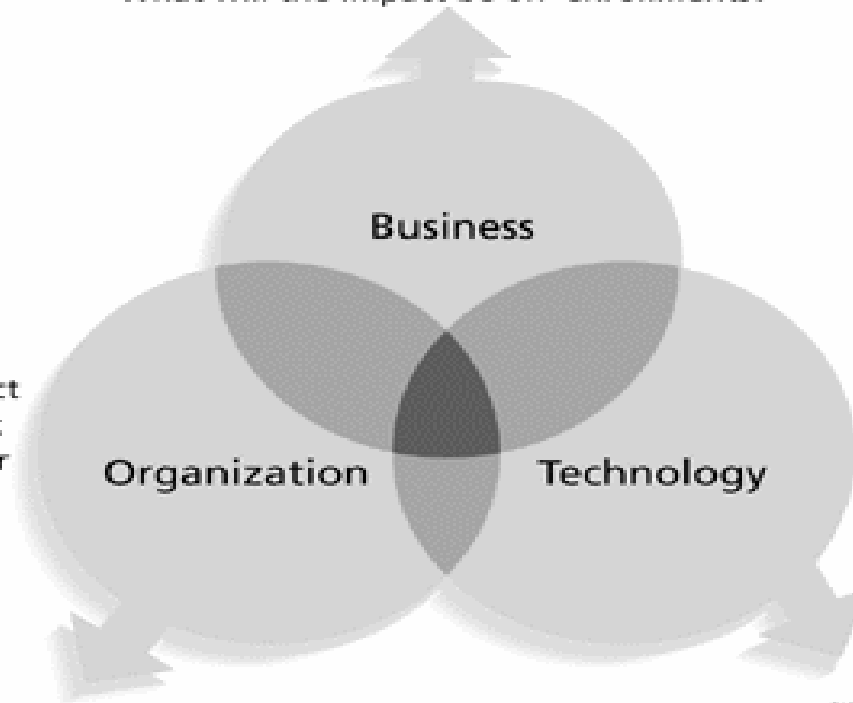
Approaches to Developing WBSs

- **Guidelines:** Some organizations, such as the DOD, provide guidelines for preparing WBSs.
- **Analogy approach:** Review WBSs of similar projects and tailor to your project.
- **Top-down approach:** Start with the largest items of the project and break them down.
- **Bottom-up approach:** Start with the specific tasks and roll them up.

Organizational Structures

Three-Sphere Model for Systems Management

- What will the laptop project cost the college?
- What will it cost students?
- What will support costs be?
- What will the impact be on enrollments?



- Will the laptop project affect *all* students, just traditional students, or only certain majors?

- How will the project affect students who already have PCs or laptops?

- Who will train students, faculty, and staff?

- Who will administer and support training?

- Should the laptops use Macintosh, Windows, or both types of operating systems?

- What applications software will be loaded?

- What will the hardware specifications be?

- How will the hardware impact LAN and Internet access?

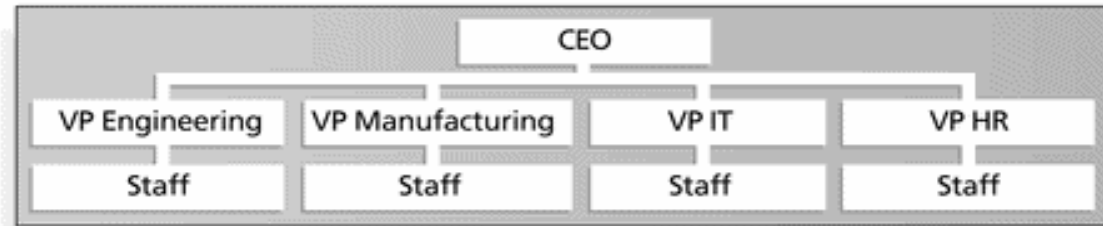
Organizational Structures

Three basic organizational structures:

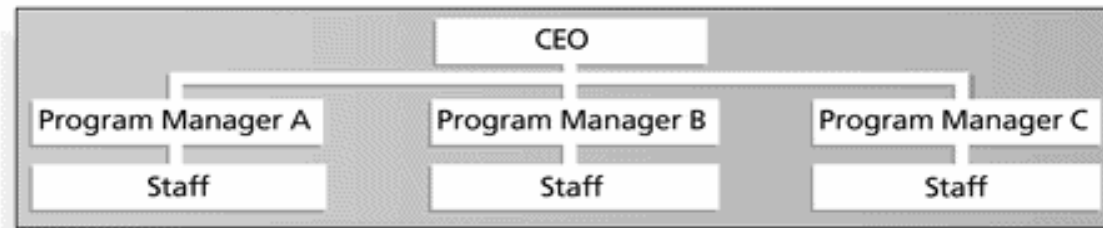
- **Functional:** Functional managers report to the CEO.
- **Project:** Program managers report to the CEO.
- **Matrix:**
 - ✚ Middle ground between functional and project structures; personnel often report to two or more bosses; structure can be a weak, balanced, or strong matrix.
 - ✚ Project managers have staff from various functional areas

Functional, Project, and Matrix Organizational Structures

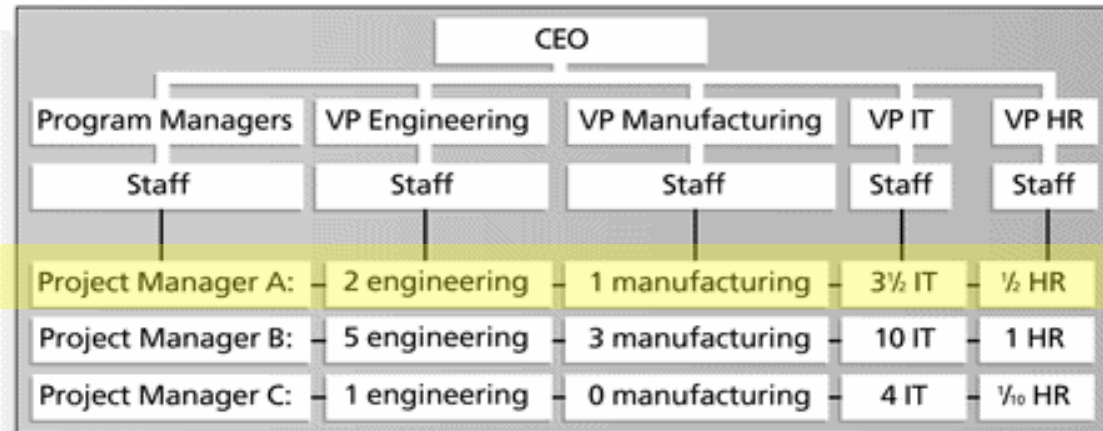
Functional



Project



Matrix



Project managers have staff from various functional areas

Organizational Structure Influences on Projects

Project Characteristics	Organizational Structure Type				
	Functional	Matrix			Project
		<i>Weak Matrix</i>	<i>Balanced Matrix</i>	<i>Strong Matrix</i>	
Project manager's authority	Little or none	Limited	Low to Moderate	Moderate to high	High to almost total
Percent of performing organization's personnel assigned full-time to project work	Virtually none	0-25%	15-60%	50-95%	85-100%
Who controls the project budget	Functional manager	Functional manager	Mixed	Project manager	Project manager
Project manager's role	Part-time	Part-time	Full-time	Full-time	Full-time
Common title for project manager's role	Project Coordinator/ Project Leader	Project Coordinator/ Project Leader	Project Manager/ Project Officer	Project Manager/ Program Manager	Project Manager/ Program Manager
Project management administrative staff	Part-time	Part-time	Part-time	Full-time	Full-time

PMBOK® Guide, 2000, 19, and PMBOK® Guide 2004, 28.

Project and Product Life Cycles

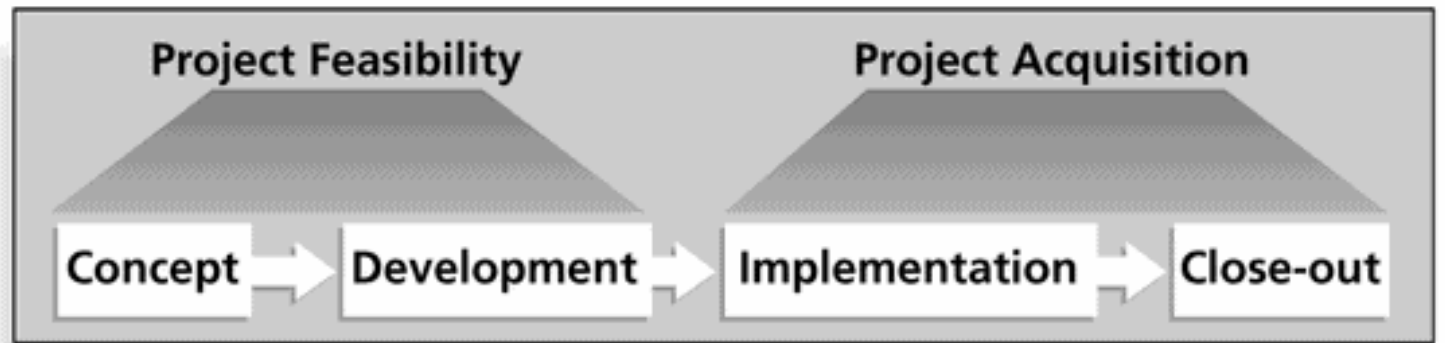
Project Life Cycle

- A **project life cycle** is a collection of project phases that defines:
 - ✚ What work will be performed in each phase.
 - ✚ What deliverables will be produced and when.
 - ✚ Who is involved in each phase.
 - ✚ How management will control and approve work produced in each phase.
- A **deliverable** is a product or service produced or provided as part of a project.

Project Phases

- In the early phases of a project life cycle:
 - ✚ Resource needs are usually lowest.
 - ✚ The level of uncertainty (risk) is highest.
 - ✚ Project stakeholders have the greatest opportunity to influence the project.
- In the middle phases of a project life cycle:
 - ✚ The certainty of completing a project increases.
 - ✚ More resources are needed.
- In the final phase of a project life cycle:
 - ✚ The focus is on ensuring that project requirements were met.
 - ✚ The sponsor approves completion of the project.

Phases of the Traditional Project Life Cycle



Sample deliverables for each phase	Management plan	Project plan	Last work package	Completed work
	Preliminary cost estimate	Budgetary cost estimate	Definitive cost estimate	Lessons learned
	3-level WBS	6+-level WBS	Performance reports	Customer acceptance

Product Life Cycles

- Products also have life cycles.
- A **systems development life cycle (SDLC)** is a framework for describing the phases involved in developing information systems.

Product Life Cycle Models

- **Waterfall model:** Has well-defined, linear stages of systems development and support.
- **Spiral model:** Shows that software is developed using an iterative or spiral approach rather than a linear approach.
- **Prototyping model:** Used for developing prototypes to clarify user requirements.
- **Rapid Application Development (RAD) model:** Used to produce systems quickly without sacrificing quality.

Product Life Cycle Models

- **Incremental build model:** Provides for progressive development of operational software.
- **Extreme programming (XP):** Developers program in pairs and must write the tests for their own code. XP teams include developers, managers, and users.

SDLC & WBS

System Development Life Cycle “SDLC”

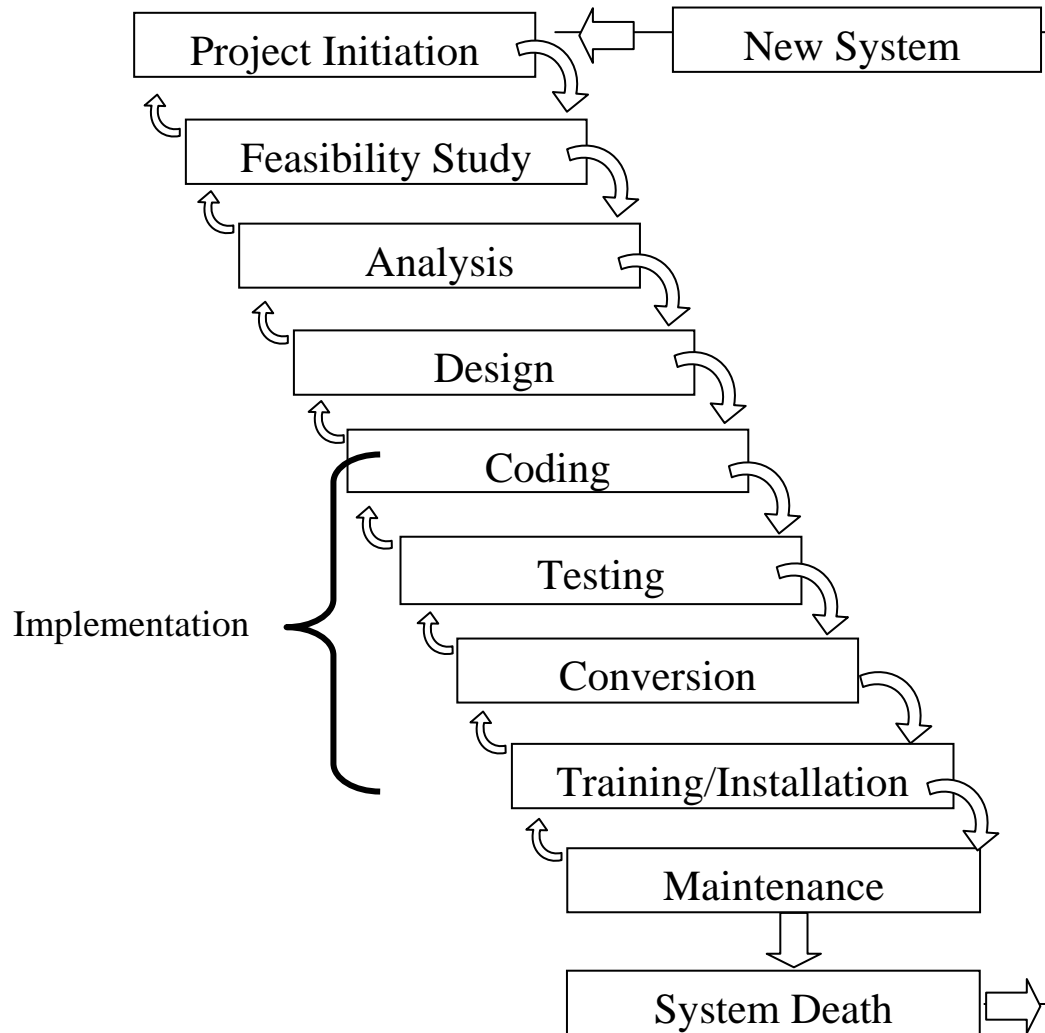
System Development Life Cycle

“SDLC”

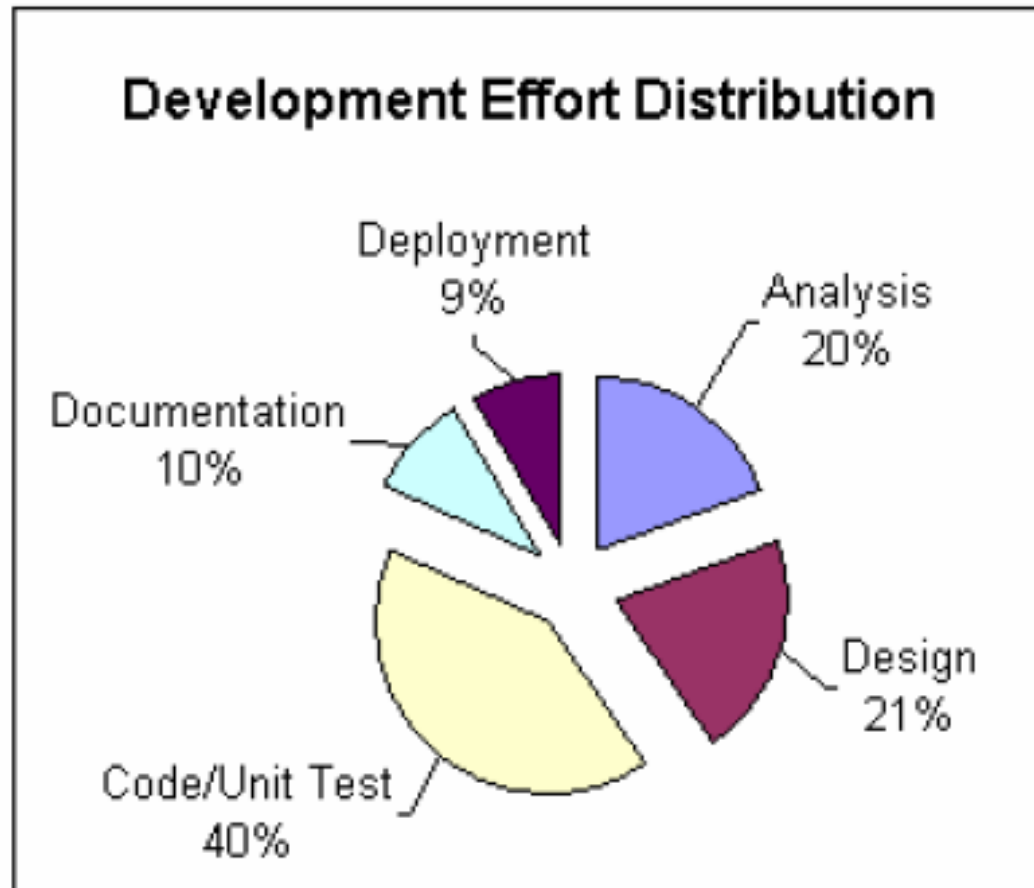
Includes the following phases:

- Project Initiation
- Feasibility Study
- Analysis
- Design
- Implementation
 - ✚ Coding + Documentation
 - ✚ + Testing
 - ✚ + Conversion
 - ✚ + Training + Installation
- Maintenance

System Development Life Cycle “SDLC”






Software Development Effort



System Development Life Cycle

“SDLC” (cont.)

Project Initiation

- Client faces a problem
- Needs for an improvement
- Sources of potential projects:
 -  Top management
 -  Steering committee
 -  Users

:

System Development Life Cycle

“SDLC” (cont.)

Feasibility Study

- Alternative solutions
- Economic feasibility (cost)
- Technical feasibility (technology available)
- Schedule feasibility (delivery date)
- Human Resources feasibility (New staff, Training)

System Development Life Cycle

“SDLC” (cont.)

Analysis: Determine and structure system requirements

- + Facts Finding / Requirement Elicitation / Domain Info / Requirements capturing
- + Requirements Structuring into Diagrams & Text
 - Natural language for text
 - Context Diagram
 - Data Flow Diagrams “DFDs”
 - ER Diagram
 - Decision Trees / Decision tables
 - Use Case Diagrams, Use Case description, SSD, Class diag,... (for Object Oriented Analysis” OOA”)

System Development Life Cycle

“SDLC” (cont.)

Design: Create new System designs

- ✚ System Architecture design
- ✚ Database Design “Normalised relations”
- ✚ Input GUI design “Graphical User Interface”
 - Forms
 - Menus
 - Icons
 - Dialogue boxes, etc
- ✚ Output design
 - Reports
 - Queries
- ✚ *Interface Design with*
 - *Subsystems (modules)*
 - *other external systems (bank sys, GOSI sys,...)*

System Development Life Cycle

“SDLC” (cont.)

Implementation: Translate designs into a working system

- Coding
- Testing
- Documentation
- Data conversion (from old to new system)
- Training
- Installation

System Development Life Cycle

“SDLC” (cont.)

Maintenance: Evolving system

- Requirements **WILL CHANGE** to reflect dynamic environment of business
- Continuous process