Software Project Management

Objectives

- Introduce students to a variety of approaches and techniques in SPM
- Use current SPM tools
- Develop new SPM ideas
- Document reading, experiences and ideas
- Improve writing and presentation skills

Today

- Introduction to SE 362
- Fundamentals of Project Management
- Introduction to Software Project Management

Course Outline

- Introduction to PM and SPM
- Software models and process improvement
- Project planning, scheduling, estimation
- Personnel and project organization
- Change management, monitoring & control
- Protocols and standards
- Software QA and risk management

Workload and Evaluation

- Six assignments (30%)
- Midterm (20%)
- Final Exam (50%)

- In-class presentations, critiques, discussion
- Groupwork for three of the assignments

Textbooks

- Recommended Text (Free, in the library!)

  Quality Software Project Management, Futrell & Shafer

- Lots of Other Texts (Widely varying content)

  Rapid Development, Steve McConnell

  Information Technology Project Management, Kathy Schwalbe

  IT Project Management, Jack Marchewka

  Software Engineering Project Management, edited by Richard H. Thayer

  Software Project Survival Guide, Steve McConnell

Format

- Essentials of software project management
- Research and textbook readings and writing
- Real-world case studies
- Industry visitors
- Highly interactive

My Background

- Civil Engineering

- Information Systems Management

- 15 years each in industry and academia

- 1 year with KPMG, IT Consulting

- Projects of all shapes and sizes – health, construction, government

PM Profession

- Professional Organizations
  - Project Management Institute (PMI) (pmi.org)
  - Software Engineering Institute (SEI)
  - IEEE Software Engineering Group
- Certification
  - PMI PMP
- The "PMBOK" – PM Body of Knowledge

Project Management Skills

- Leadership
- Communications
- Problem Solving
- Negotiating
- Influencing the Organization
- Mentoring
- Process and technical expertise

Software Project Management

Management

Project
Management

Software
Project
Management
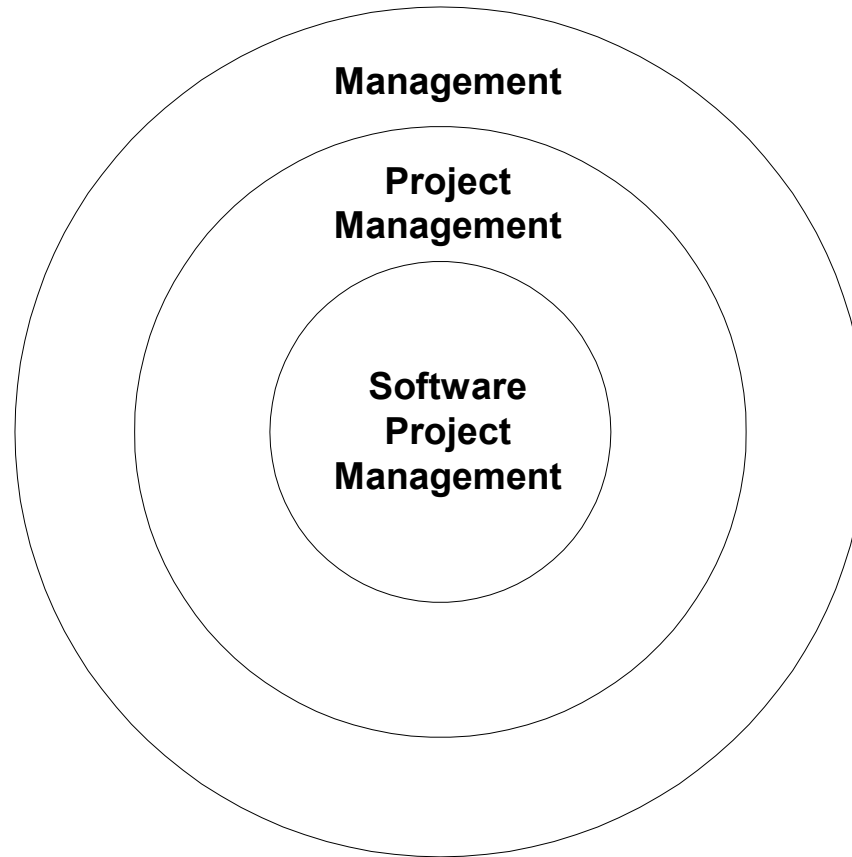
Some PM History

- 1970's: Early PM ideas and software
  - military, defense, construction industry
  - Fred Brooks, *The Mythical Man-Month*
- 1980's: SPM, TQM
- 1990's: Large shift to PM-based models
  - 1990-93: Re-engineering, self-directed teams
  - 1996-99: Risk mgmt, project offices
- 2000's: Global projects

Project Management

- What's a project?
- PMI definition
  - *A project is a temporary endeavor undertaken to create a unique product or service*
- Progressively elaborated
  - With repetitive elements
- A project manager
  - Analogy: conductor, coach, captain

Project vs. Program Management

- What's a 'program'?
- Mostly differences of scale
- Often a number of related projects
- Longer than projects
- Definitions vary

Interactions / Stakeholders

- As a PM, who do you interact with?
- Project Stakeholders
    - Project sponsor
    - Executives
    - Team (developers and maybe others)
    - Customers
   - Contractors (as needed)
    - Functional managers

PM Tools: Software

- Low-end
  - Basic features, tasks management, charting
  - MS Excel, Milestones Simplicity
- Mid-market
  - Handle larger projects, multiple projects, analysis tools
  - MS Project (approx. 50% of market)
- High-end
  - Very large projects, specialized needs, enterprise
  - AMS Realtime
  - Primavera Project Manager

Tools: Gantt Chart
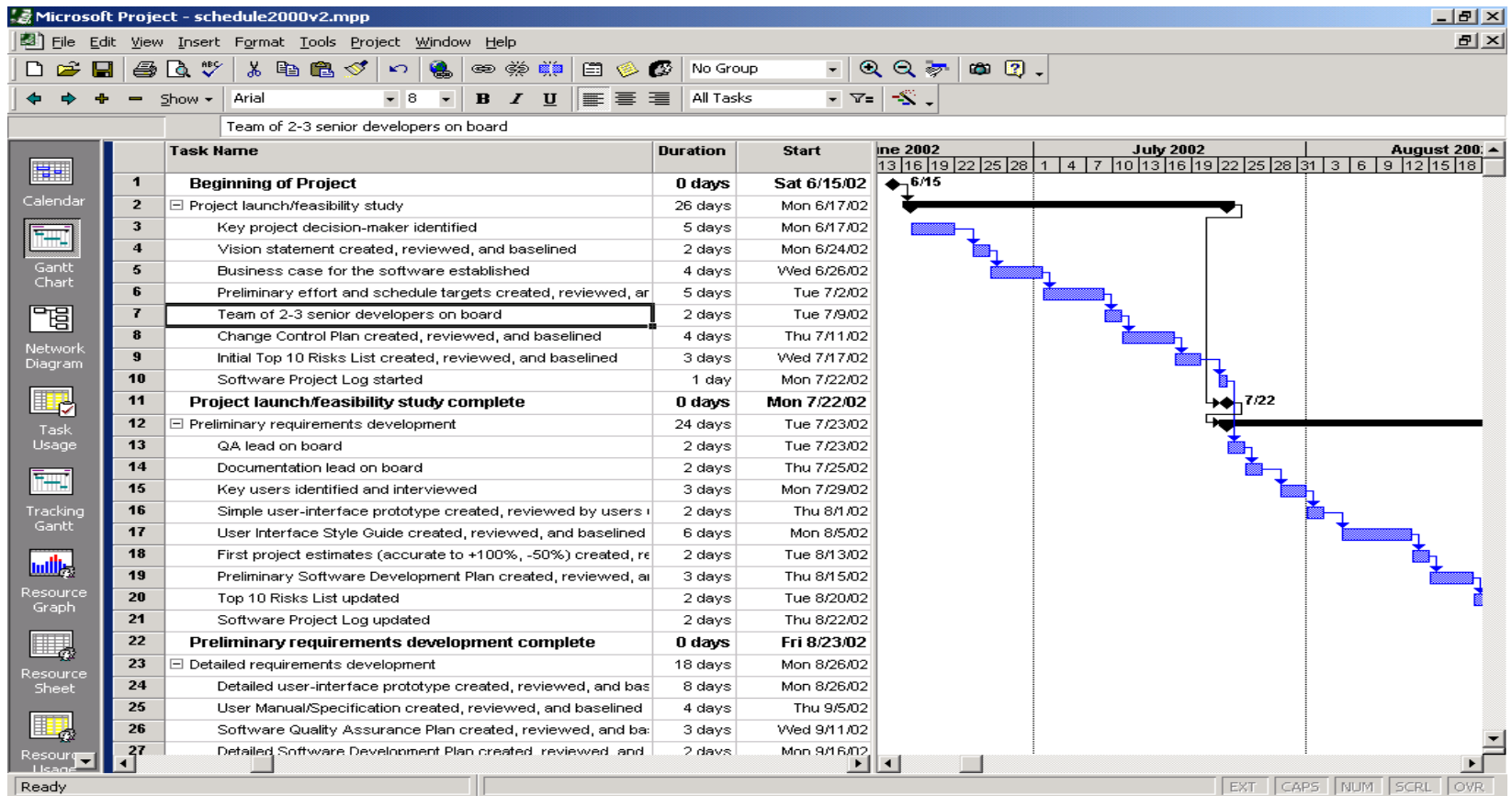
Tools: Network Diagram
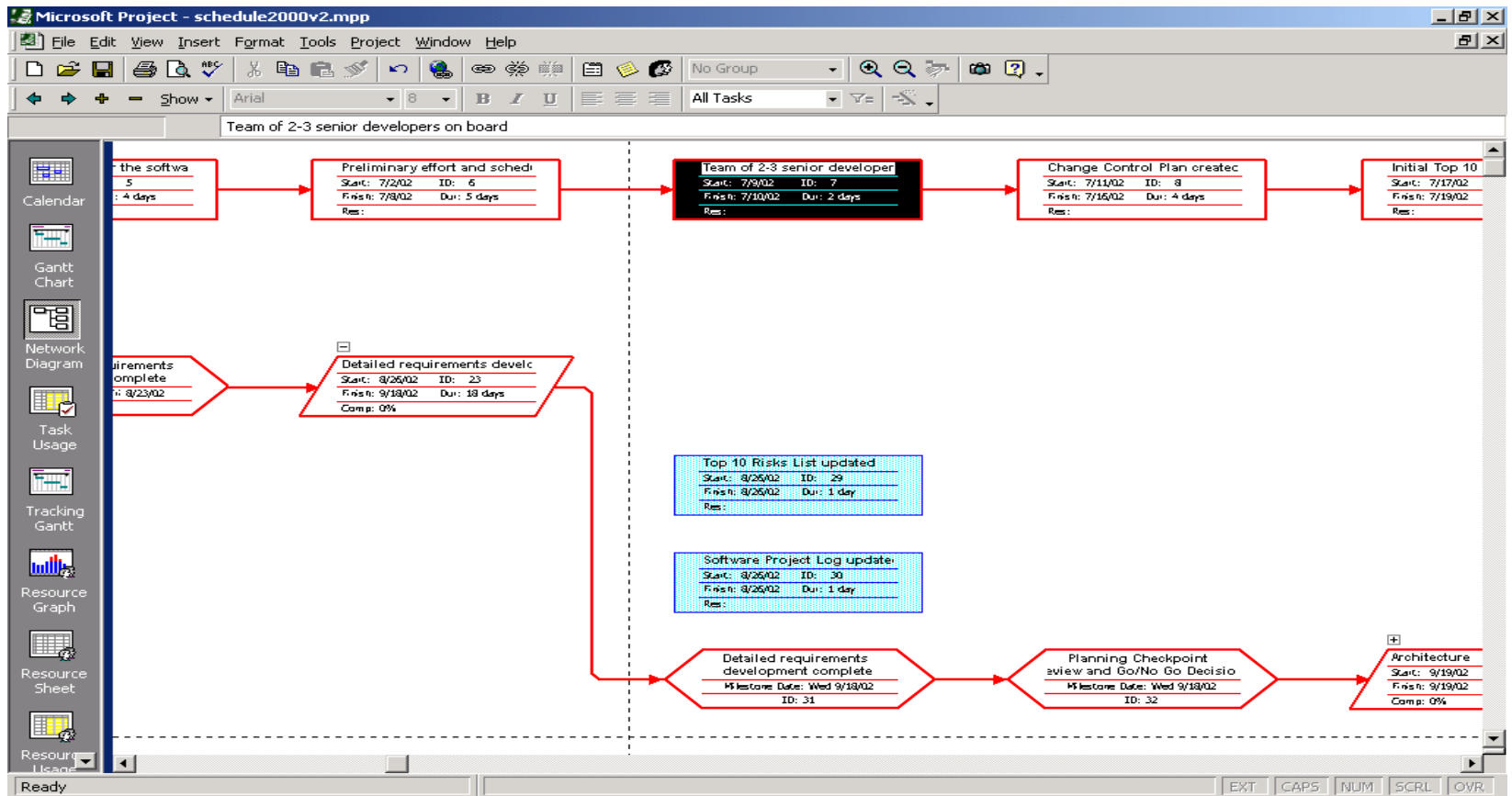
PMI's 9 Knowledge Areas

1. Project *integration* management
2. Scope
3. Time
4. Cost
5. Quality
6. Human resource
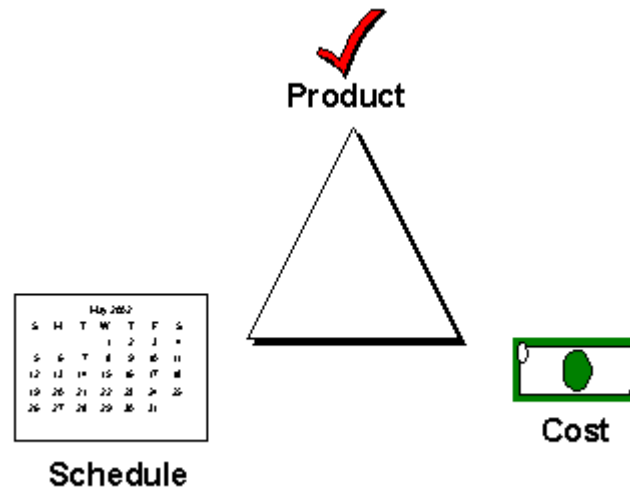7. Communications
8. Risk
9. Procurement

Strategy

- Classic Mistake Avoidance

- Development Fundamentals

- Risk Management

- Schedule-Oriented Practices

Four Project Dimensions

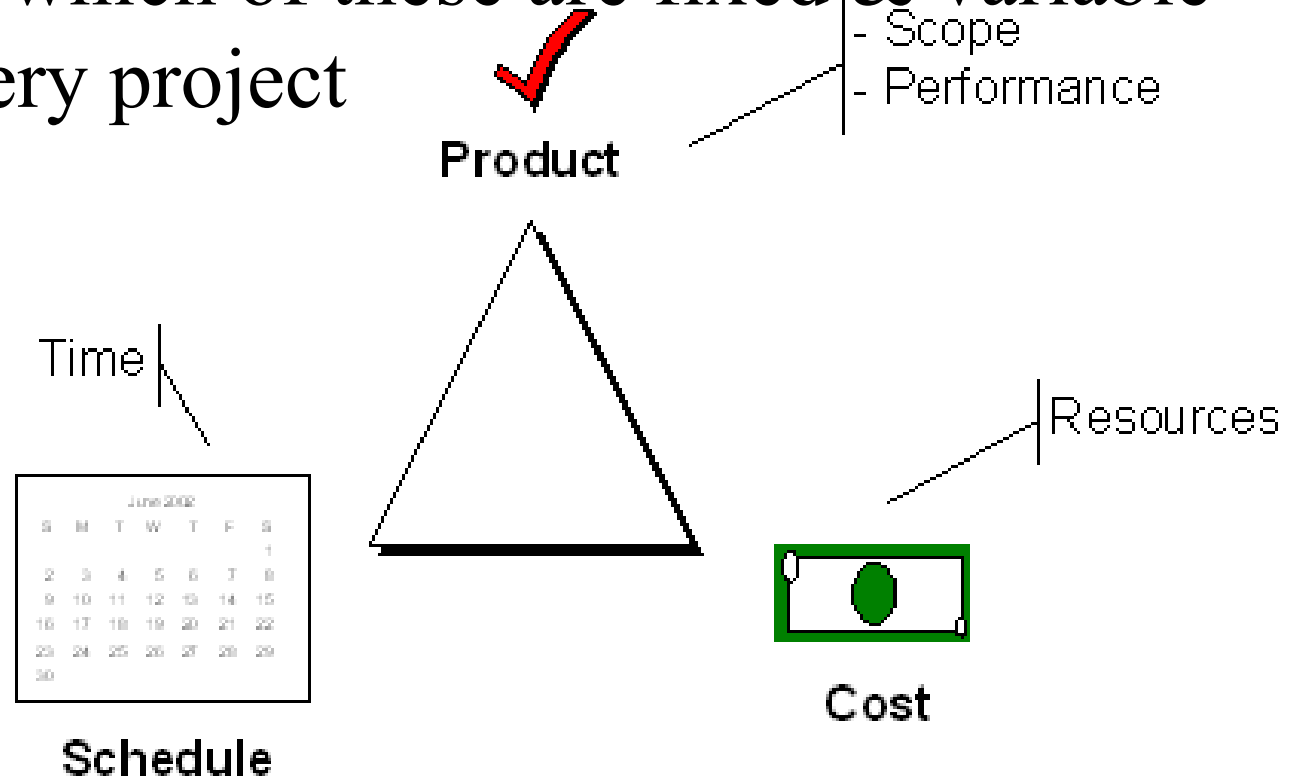- People
- Process
- Product
- Technology

Trade-off Triangle

- Fast, cheap, good. Choose two.

Trade-off Triangle

- Know which of these are fixed & variable for every project

Product
- Scope
- Performance

Time

Resources

Schedule

Cost

People

- "It's always a people problem."

  Gerald Weinberg, *The Secrets of Consulting*

- Developer productivity: 10-to-1 range

- Improvements:
  - Team selection
  - Team organization
  - Motivation

People …2

- Other success factors
  - Matching people to tasks
  - Career development
  - Balance: individual and team
  - Clear communication

Process

- Is process stifling?
- Two Types: Management & Technical
- Development fundamentals
- Quality assurance
- Risk management
- Lifecycle planning

Process …2

- Customer orientation
- Process maturity improvement
- Rework avoidance
- Avoid abuse by neglect

Product

- The "tangible" dimension
- Product size management
- Product characteristics and requirements
- Feature creep management

Technology

- Often the least important dimension

- Language and tool selection

- Value and cost of reuse

Planning

- Determine requirements
- Determine resources
- Select lifecycle model
- Determine product features strategy

Tracking

- Cost, effort, schedule

- Planned vs. Actual

- How to handle when things go off plan?

Measurements

- Actual (To date) and Projected
  - Cost
  - Schedule
  - Effort
  - Product features

Measurements …2

- Alternatives
  - Earned value analysis
  - Defect rates
  - Productivity (ex: SLOC)
  - Complexity (ex: function points)
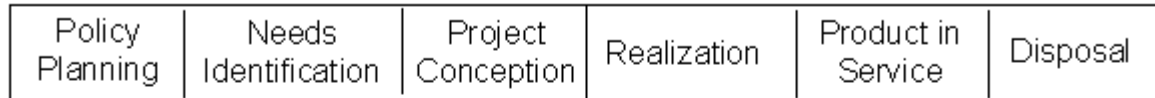
Technical Fundamentals

- Requirements
- Analysis
- Design
- Construction
- Quality Assurance
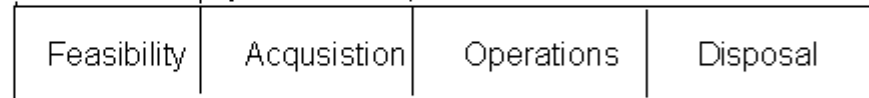- Deployment

Project Phases

- All projects can be divided into phases
- Project Life Cycle is all phases together
- Each phase marked by Deliverables
- Same for software project phases

Lifecycle Relationships

Software Project Management

- Key Issues: Cost, Quality, Time
- Software Project Planning
- Software Project Control

Software Project Planning

Software Requirements Engineering

1. Users' needs, goals, expectations

2. Prototyping strategy

3. Software requirements specifications

4. Requirements traceability method

Software Project Planning - 2

Project Plan Development

1. Activities, tasks

2. Cost estimation

3. Schedule, finish date

Software Project Planning - 3

Risk Management

1. Anticipate potential problems

2. Mitigate or avoid the problems

3. Track existing and potential problems

Software Project Planning - 4

Incremental Release Process Model

1. Provide periodic demonstrations

2. Reach short-term goals

3. Check progress towards long-term goals

Software Project Control

Work Package Development

1. Work Breakdown Structures (WBS)

2. Work Package Specifications

3. Binary Tracking Technique

4. Earned Value Tracking Technique, comparing to planned values

Software Project Control - 2

Software Metrics

1. Product metrics

2. Process metrics

   Necessary for planning and control

Software Project Control - 3

Software Configuration Management

1. Identify software components
2. Track component changes
3. Track documentation
● Control software evolution

Software Project Control - 4

Software Quality Assurance
1. Use a SQA process
2. Use engineering standards

Peer Reviews
1. Walkthroughs
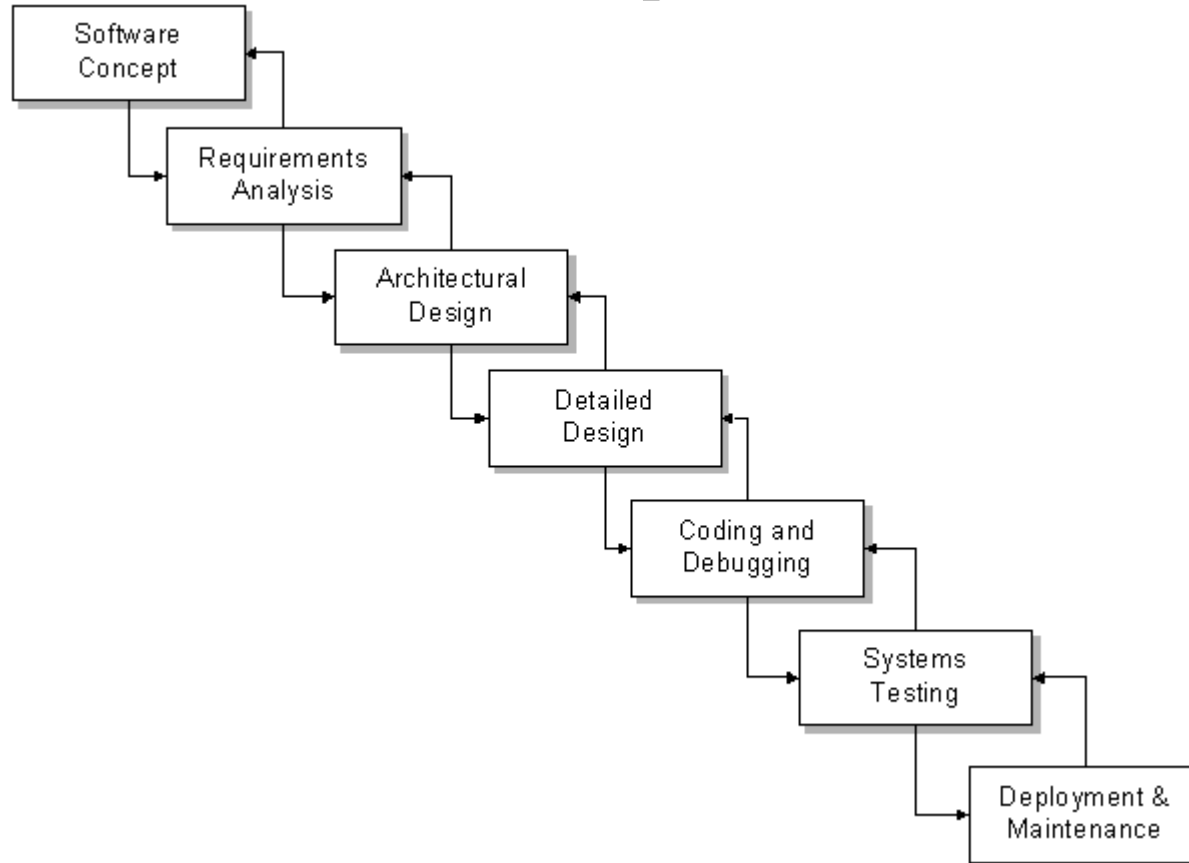2. Inspections

Software Project Control - 5

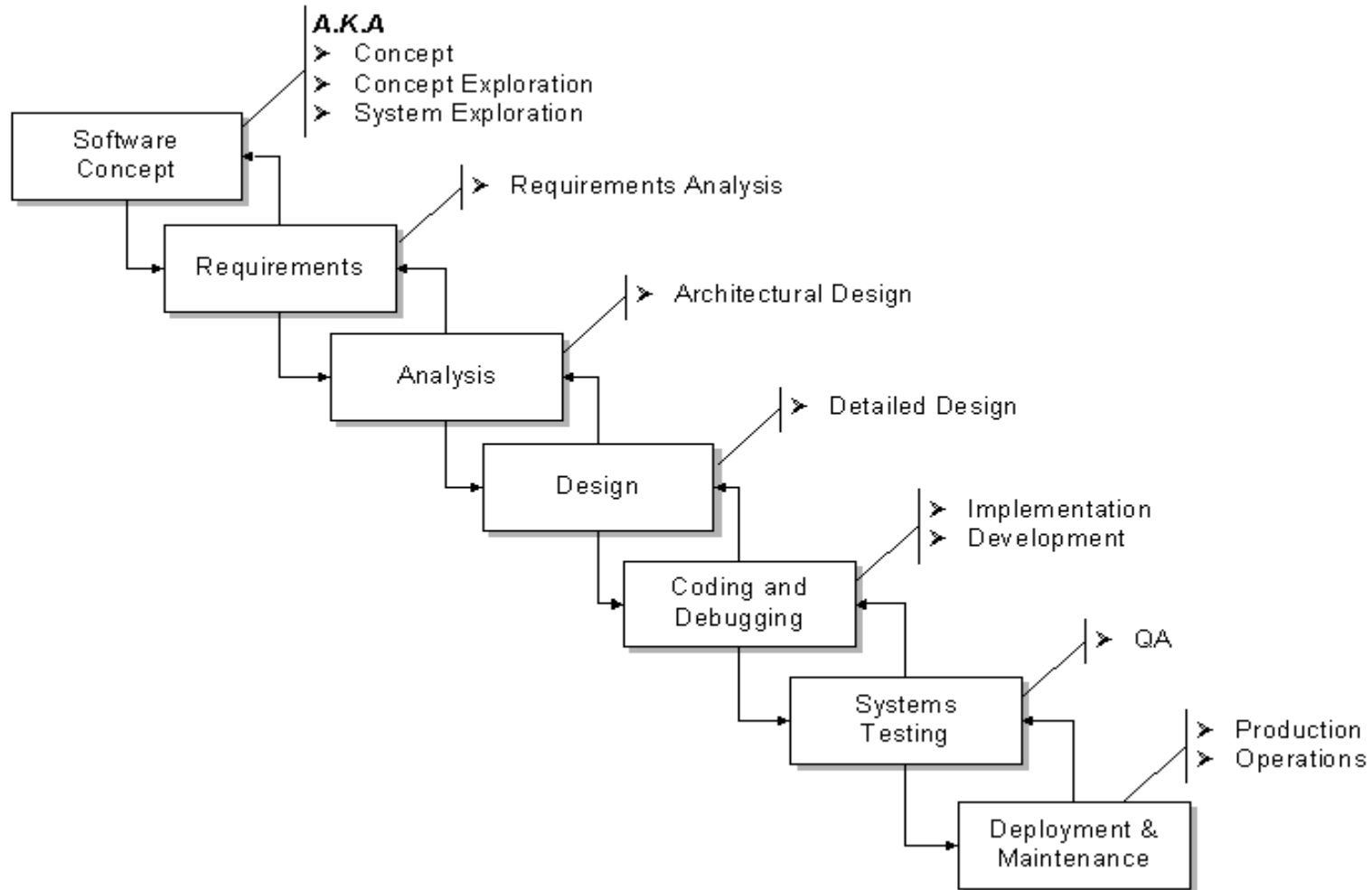Verification and Validation

1. Quality
2. Quantity

Software Engineering Assessment

1. Validate organizational capability
2. Identify software process improvements

Software Project Phases

Project Phases A.K.A.

A.K.A
- Concept
- Concept Exploration
- System Exploration

Software Concept

- Requirements Analysis

Requirements

- Architectural Design

Analysis

- Detailed Design

Design

- Implementation
- Development

Coding and Debugging

- QA

Systems Testing

- Production
- Operations

Deployment & Maintenance

Classic Mistakes

- Seductive Appeal

- Types
  - People-Related
  - Process-Related
  - Product-Related
  - Technology-Related

People-Related Mistakes

- Undermined motivation

- Weak personnel

  – Weak vs. Junior

- Uncontrolled problem employees

- Heroics

- Adding people to a late project

People-Related Mistakes …2

- Noisy, crowded offices
- Customer-Developer friction
- Unrealistic expectations
- Politics over substance
- Wishful thinking

People-Related Mistakes …3

- Lack of effective project sponsorship
- Lack of stakeholder buy-in
- Lack of user input

Process-Related Mistakes

- Optimistic schedules
- Insufficient risk management
- Contractor failure
- Insufficient planning
- Abandonment of plan under pressure

Process-Related Mistakes …2

- Wasted time during fuzzy front end
- Shortchanged upstream activities
- Inadequate design
- Shortchanged quality assurance

Process-Related Mistakes …3

- Insufficient management control

- Frequent convergence

- Omitting necessary tasks from estimates

- Planning to catch-up later

- Code-like-hell programming

Product-Related Mistakes

- Requirements gold-plating
  - Gilding the lily
- Feature creep
- Developer gold-plating
  - Beware the pet project
- Push-me, pull-me negotiation
- Research-oriented development

Technology-Related Mistakes

- Silver-bullet syndrome
- Overestimated savings from new tools and methods
  - Fad warning
- Switching tools in mid-project
- Lack of automated source-code control

References

- ACM Conferences
- ICSE
- SEI
- IEEE Computer Society Press
- IEEE Computer
- Journal of Systems and Software Sciences

Standards

- IEEE 1058, Standards for SPM Planning
- ACM
- CSA
- ISO
- SEI's CMM
- National Bureau of Standards

Software

- PERT/Gantt/CPM Scheduling
- Work Breakdown Structure (WBS)
- COCOMO II Model Definition Manual
- Sim SE
- Problems and Programmers

Homework

- Assignment 1
  - Reading 56 pages
  - Thinking
  - Writing one page
- Choose group partners
- Start thinking about Assignment 2