



Software Development Management

Lecture 2

Introduction to Software Project Management

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Overview

- Software engineering
- Software project management
- Formal methods



Software Crisis

- Faulty software
- Delay in completion time
- Over budgeted
- Difficult to maintain software



Some important facts

- Relative cost of the software in a system is growing
- Increase in demand for software
- Increase in size and complexity of software
- Increase in performance of hardware



Software Engineering

- No standard definitions



Software Engineering

- Aimed at large software
- Systematic and well-defined techniques, methodologies and tools
- To design, code, test and maintain quality software
- Within a resource constrained environment



Large Software

- Developed by more than one person
- Effective communications are important
 - standards, documentations, etc
- Management issues
- Techniques and methodologies are useful only if automated systems can be built upon them



Phases of Software Development

- Requirements analysis and specifications
- Design
- Coding
- Testing
- Operation
- Maintenance



Some important observations

- Maintenance is the most expensive phase and coding is the least expensive phase
- The earlier the detection of faults, the less expensive the correction of faults



Characteristics of software

- Simple and elegant mathematical representation
- Logic intensive
- Cannot have partial completion
- Design costs are more expensive



What is a project?

- Key characteristics of a project:
 - A planned activity
 - Specific objectives or products
 - Work to be carried out in several phases
 - Limited resources
 - Deadline
 - Large and complex



Major differences between software products and hardware products

- Progress of software development is not obviously visible
- Modifications of software products are more easy and flexible
- Software products are usually more complex than the hardware products in terms of development or construction cost



Major processes in developing a software system

- Feasibility study
- Project planning
- Project execution



Feasibility Study

- Analyze the general requirements, costs and the functionalities and services provided by the system to be developed
- Aimed to determine whether a system should be developed or not
- Note that a feasibility study can be viewed as a project itself



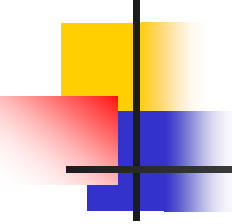
Important factors in planning a software project

- To know the nature of the system to be developed
 - A **management information system** or a control system
- To know clearly the objectives and products of the project
 - How to evaluate the objectives and products after the completion of the project



What is management?

- Management involves the following activities:
 - Planning
 - Staffing
 - Innovating
 - Directing
 - Monitoring
 - Liaising



What is software Project management?

- Understand the characteristics of software products
- Understand what is meant by project
- Understand what is meant by management



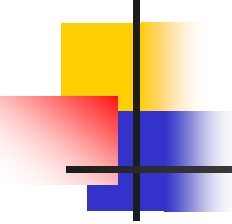
Common problems with software projects

- Lack of quality standards and measures
- Lack of measurable milestones
- Difficult to make the progress visible
- Poor communications
- Poor documentation
- Frequent changes of requirements
- Over budget and late delivery of software



Major issues of software project management to be covered

- Software development models
- Software size and cost estimation
- Software project planning
- Software risk management
- Resource allocation
- ISO 9000
- Performance tracking and report



Major issues of software project management to be covered (cont'd)

- Software project configuration management
- Software project team management



Main problems encountered with requirements and specifications

- Ambiguous
- Incomplete
- Inconsistent



Main problems encountered with requirements and specifications (cont'd)

- To overcome these problems via
 - Formality – achieving preciseness
 - Abstraction – contracting on essential parts



Formal Methods

- Mathematically based techniques
 - Providing a universal and concise language
 - Supporting formality
 - Supporting abstraction
 - Supporting logical reasoning
 - May support automation



Why formal methods?

- Unambiguous
- Concise
- May support automatic verification
- May support automatic processing



Why not formal methods?

- Lack of knowledge
- Lack of experienced staff
- Lack of supporting tools
- Cost-effectiveness



Formal Methods

- Most commonly used mathematical techniques:
 - Set theory
 - Logic
 - Automata



Z

- Developed at Oxford University (UK) in the late 1970s and early 1980s
- Use set theory and first-order logic to model the requirements
- Can check inconsistency among requirements



Z

- A specification language not a programming language
 - A what-to not a how-to
- Specify pre-conditions and post-conditions
- Based on state-based models



Essentials of State-Based Model

Besides *variables* and their *types*, we have:

- State
- Invariant
- Input and output
- Operation