SOFTWARE DESIGN & ANALYSIS (Week-1)

USAMA MUSHARAF

MS-CS (Software Engineering)

LECTURER (Department of Computer Science)

FAST-NUCES PESHAWAR

COURSE CONTENT

- Principles of Object Technology. OOP Review. Principles of Modeling.
- OOA&D Overview. OO Development Process.
- Requirements Engineering, Analysis, and Specification: Requirements Engineering, Use Cases, Prototyping,
- Class Models. Interaction Diagrams. Verification and Validation.
- Architectural and Detailed Design.
- Class Diagrams. Interaction Diagrams. State Machines and Diagrams. Implementation, Package Diagrams. Activity Diagrams.
- OO Patterns,
- Verification and Validation.
- Note: Students may also be introduced to Object Diagram, Component Diagram, Package Diagram, Deployment Diagram, Network Diagram.

RECOMMENDED BOOKS

Recommended Books

- 1. Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development by Craig Larman, Prentice Hall; 3rd Edition (October 30, 2004). ISBN-10: 0131489062
- 2. Using UML: Software Engineering with Objects and Components by Perdita Stevens, Addison-Wesley; 2nd Edition (February 13, 2006). ISBN-10: 0321269675
- 3. Fundamental of Object-Oriented Design in UML by Meiler Page-Jones, Addison Wesley, 2000. ISBN: 020169946X.
- 4. The Unified Modeling Language User Guide by G. Booch, J. Rambaugh and I. Jakobson, Addison-Wesley Professional; 2nd Edition (2005). ISBN- 10: 0321267974.

OBJECTIVE OF THIS COURSE

- The course will start with requirements gathering, & end with implementation in object oriented programming language.(JAVA)

EVALUATION CRITERIA

Assessment	Weightage
Assignment	5%
Quiz	5%
Project	10%
Sessional 1	15%
Sessional 2	15%
Final Exam	50%

WEEKLY PLAN

Week	Topics
Week 1 - 5	1. Intro to Software Design and Analysis, Brief overview of Software Engineering Phases, Problems in Software Development, Software Design Process, Difference between Design and Architecture, 2. Software Process Models. Software Requirement Engineering, Structure Analysis 3. Requirement Engineering (Cont…), Analysis Modeling, Object Oriented Analysis, Modeling with UML (Static and Dynamic Models), Design Principles and Concepts 4. Design Principles and Concepts (Cont..), Object Oriented Design Concepts, Object Oriented Design with a Case Study, 5. Case Study with in depth Requirement Analysis & Design

WEEKLY PLAN

Week	Topics
Week- 6 - 9	**Software Development** Intro to Java Programming, Environment Setup, Basic Syntax and Programming language constructs. Control Structures, Arrays, Multi-Dimensional Arrays, Practice with some small case studies. **Software Development (Design Mapping to Code)** Object-Orientation, Classes , Objects. Constructors. Class Association (Inheritance), Polymorphism, Object Association (Composition, Aggregation), Abstract Classes, Interfaces, SOLID Principles-Hands-on. Exception Handling,
Week 10 - 12	▪ GUI, Graphical User Interface Design in Java, ▪ Event Driven Programming in Java, ▪ Database Connectivity
Week 13 - 15	**Problem Solving Using Design Patterns,** Software Design Patterns, Design Patterns Implementation in Java.

CONTENTS OF WEEK # 1

1. Intro to Software & Software Development,
2. Brief overview of Software Engineering Phases,
3. Problems in Software Development

Software can have huge impact in any aspect of our society

WHERE CAN WE FIND SOFTWARE?

SOME POPULAR ONES...

SOME POPULAR ONES...

Google Search I'm Feeling Lucky

Google.com.pk offered in: اردو

AND EVEN IN…

CONCLUSION

Software is almost everywhere!!!

SOFTWARE APPLICATIONS

- ✓ Personal Computer Software
- ✓ Business Software
- ✓ System Software
- ✓ Real Time Software
- ✓ Engineering & Scientific Software
- ✓ Embedded Software
- ✓ Web Based Software
- ✓ Artificial Intelligence Software

PROBLEMS IN SOFTWARE DEVELOPMENT

Common issues

- The final software does not fulfill the needs of the customer
- Hard to extend and improve: if you want to add a functionality later its mission impossible
- Bad documentation
- Bad quality: frequent errors, hard to use, ...
- More time and costs than expected

A clever person solves a problem.

A wise person avoids it.

- Albert Einstein

SOLUTION

SOFTWARE ENGINEERING

SE HISTORY

- SE introduced first in 1968 – conference about “software crisis” when the introduction of third generation computer hardware led more complex software systems then before.

- Early approaches based on informal methodologies leading to
  -
  -
  -

- Need for new methods and techniques to manage the production of complex software.

WHAT IS SOFTWARE ENGINEERING?

- Systematic approach for developing software
- Methods and techniques to develop and maintain quality software to solve problems.
- Study of the *principles* and *methodologies* for developing and maintaining software systems.

WHAT IS SOFTWARE?

According to the IEEE

Software is:

“Computer programs, procedures, and possibly associated documentation and data pertaining to the operation of a computer system”.

THE ROLE OF SOFTWARE ENGINEERING

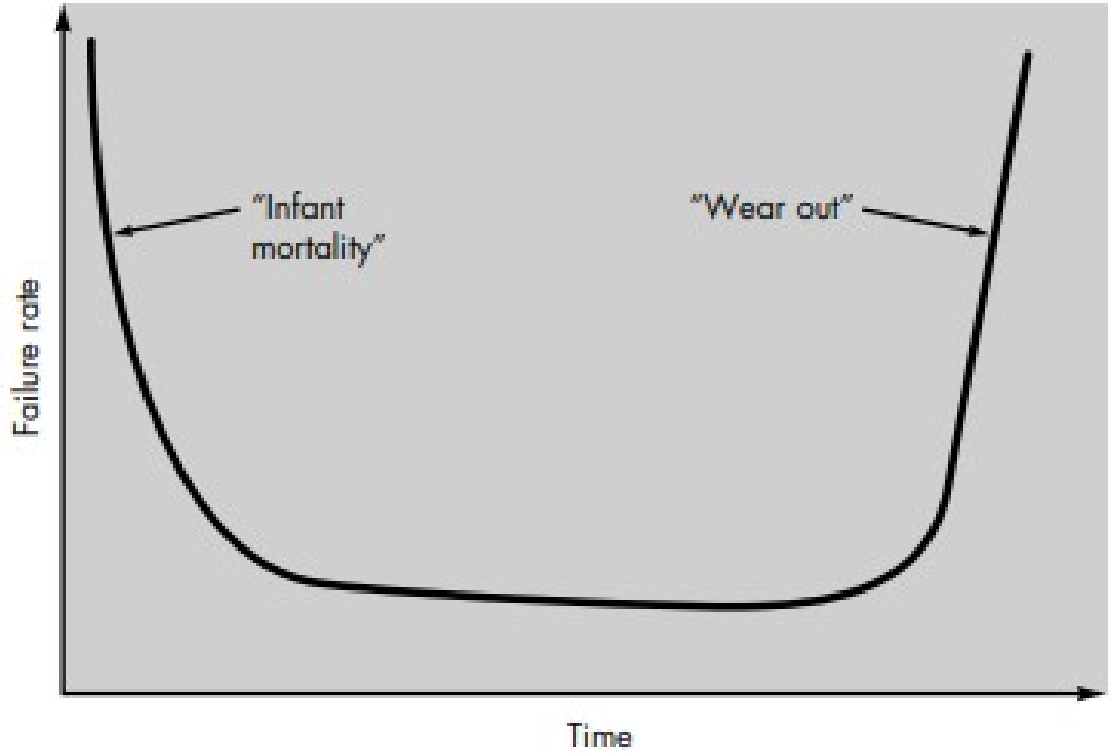
A bridge from customer needs to programming implementation

First law of software engineering

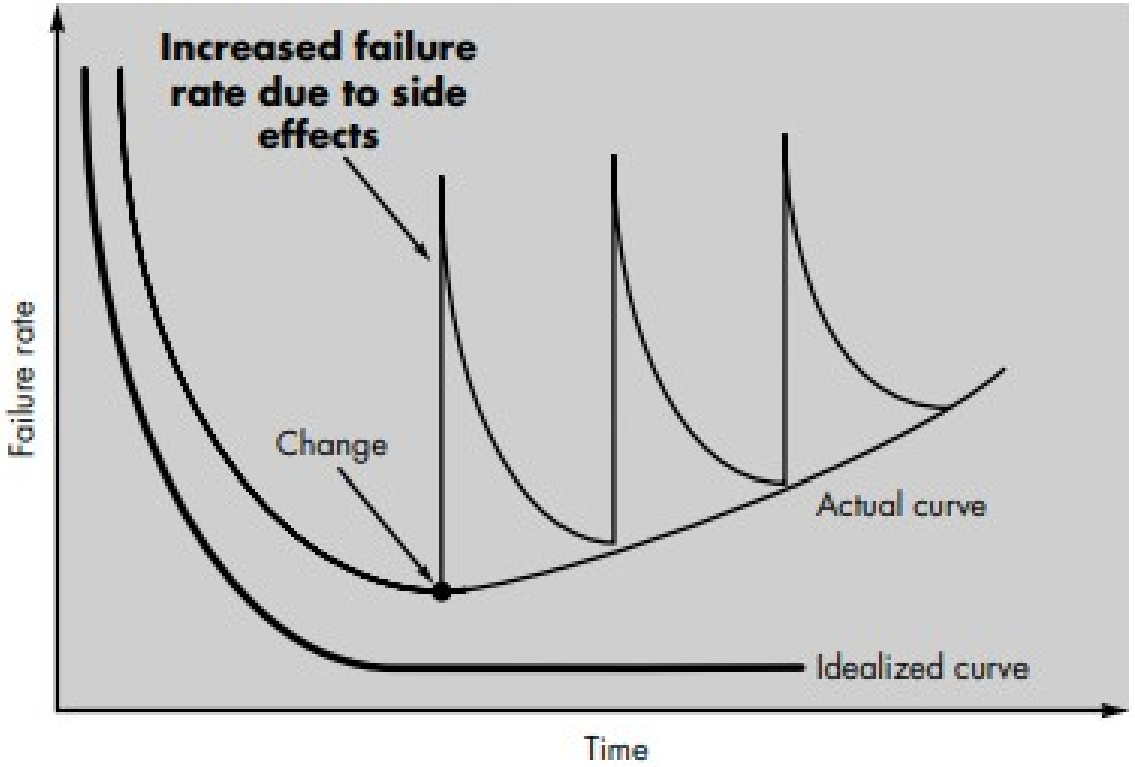
Software engineer is willing to learn the problem domain
(problem cannot be solved without understanding it first)

HARDWARE VS SOFTWARE

Failure curve for hardware

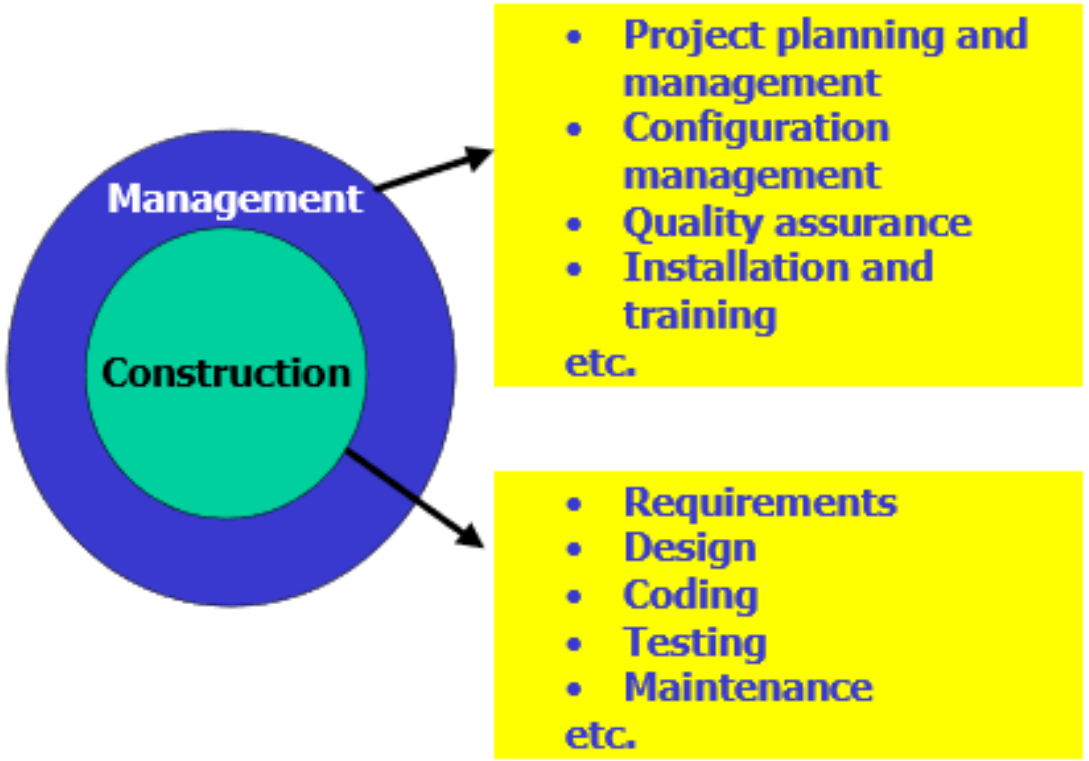


Idealized and actual failure curves for software



WHAT ARE THE ATTRIBUTES OF GOOD SOFTWARE?

SOFTWARE DEVELOPMENT



SOFTWARE ENGINEERING PHASES

- Definition: What?
- Development: How?
- Maintenance: Managing change
- Umbrella Activities: Throughout lifecycle

DEFINITION

REQUIREMENTS DEFINITION AND ANALYSIS

Developer must understand

- Application domain
- Required functionality
- Required performance
- User interface

DEFINITION (CONT.)

- Project planning
  - Allocate resources
  - Estimate costs
  - Define work tasks
  - Define schedule
- System analysis
  - Allocate system resources to
    - Hardware
    - Software
    - Users

DEVELOPMENT

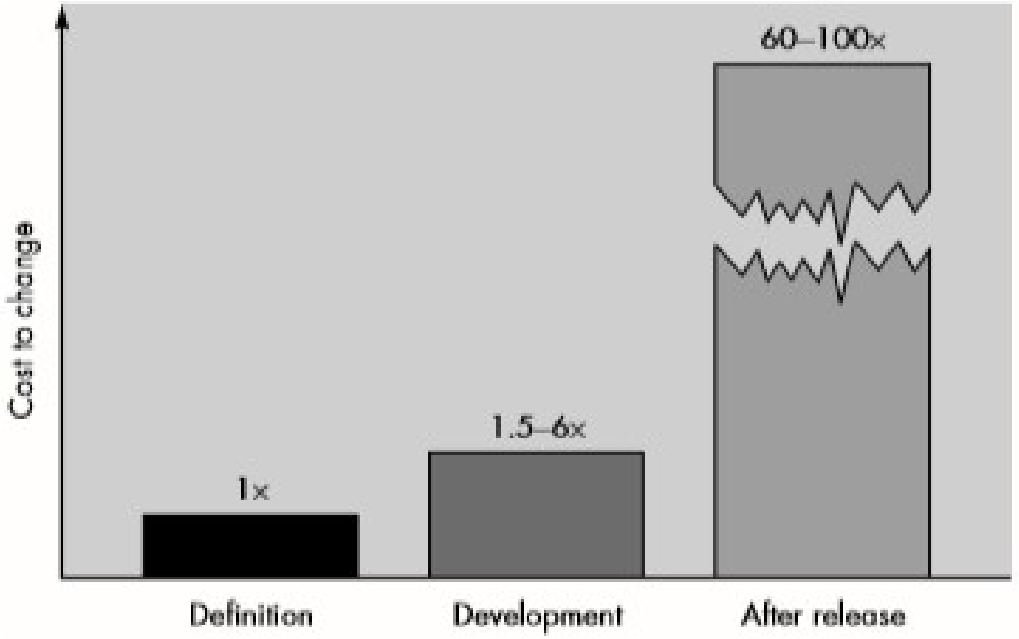
SOFTWARE DESIGN

- User interface design
- High-level design
  - Define modular components
  - Define major data structures
- Detailed design/Low level Design
  - Define algorithms and procedural detail

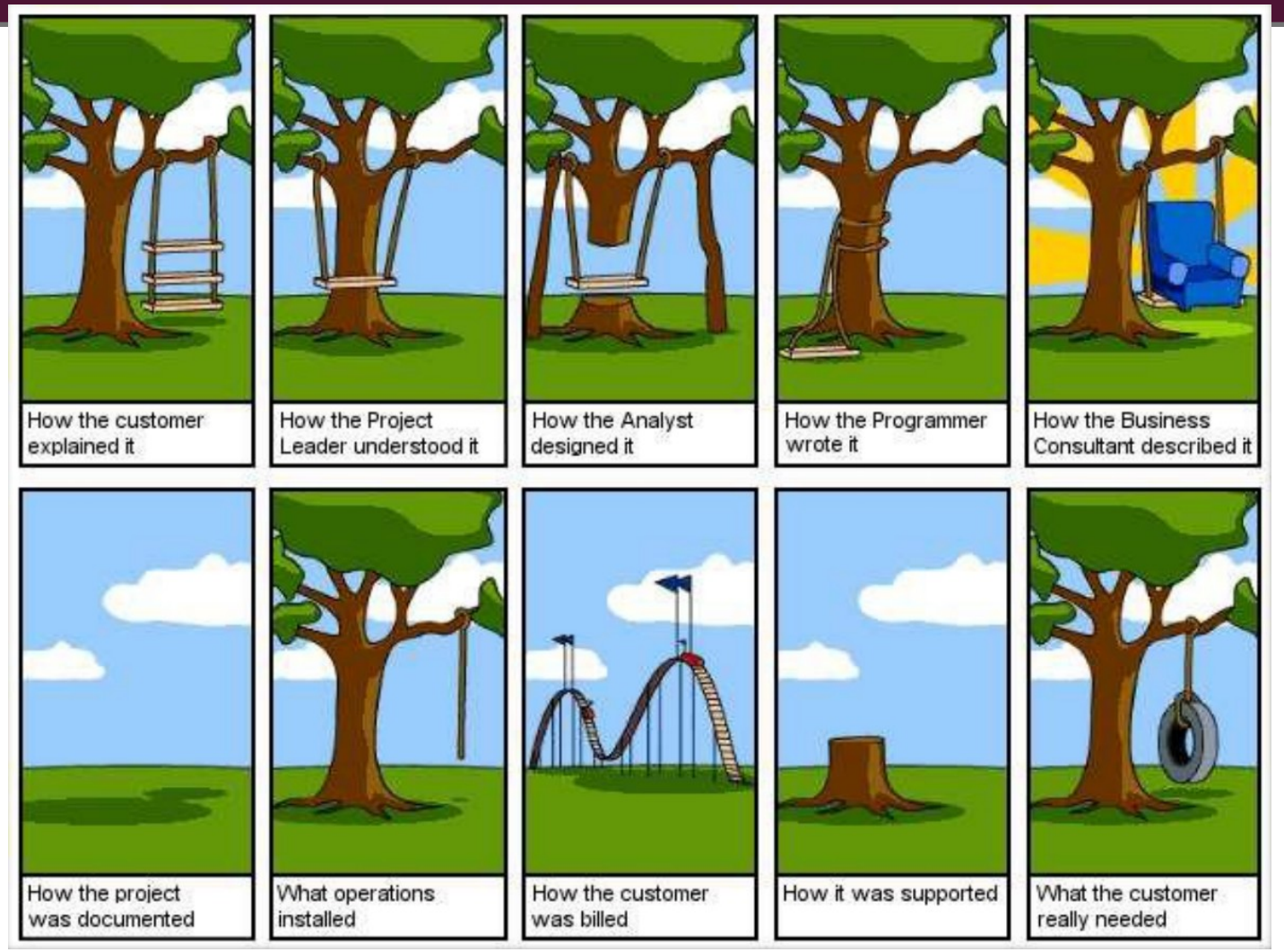
WHY IS SOFTWARE DEVELOPMENT SO DIFFICULT?

Changing requirements

- 5 x cost during development
- up to 100 x cost during mainter



MAJOR PROBLEMS IN SOFTWARE DEVELOPMENTS



HAVE A GOOD DAY!