Chapter 1: Introduction
Ingegneria del software: scenario di riferimento
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- How the customer explained it
- How the Project Leader understood it
- How the Analyst designed it
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How the customer explained it
How the Project Leader understood it
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How the Programmer wrote it
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How the project was documented
Ingegneria del software: scenario di riferimento

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- How the project was documented
- What operations installed
Ingegneria del software: scenario di riferimento

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- How the project was documented
- What operations installed
- How the customer was billed
- How it was supported
Ingegneria del software: scenario di riferimento
Can you develop this system?
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The impossible Fork
Why is Software Development difficult?

• The problem is usually ambiguous
• The requirements are usually unclear and changing when they become clearer
• The problem domain (called application domain) is complex, and so is the solution domain
• The development process is difficult to manage
• Software offers extreme flexibility
• Software is a discrete system
  • Continuous systems have no hidden surprises
  • Discrete systems can have hidden surprises!

David Lorge Parnas - an early pioneer in software engineering who developed the concepts of modularity and information hiding in systems which are the foundation of object-oriented methodologies.
Software Development is more than just Writing Code

• It is problem solving
  • Understanding a problem
  • Proposing a solution and plan
  • Engineering a system based on the proposed solution using a *good* design

• It is about dealing with complexity
  • Creating abstractions and models
  • Notations for abstractions

• It is knowledge management
  • Elicitation, analysis, design, validation of the system and the solution process

• It is rationale management
  • Making the design and development decisions explicit to all stakeholders involved.
Computer Science vs. Engineering

- **Computer Scientist**
  - Assumes techniques and tools have to be developed.
  - Proves theorems about algorithms, designs languages, defines knowledge representation schemes
  - Has infinite time...

- **Engineer**
  - Develops a solution for a problem formulated by a client
  - Uses computers & languages, techniques and tools

- **Software Engineer**
  - Works in multiple application domains
  - Has only 3 months...
  - ...while changes occurs in the problem formulation (requirements) and also in the available technology.
Software Engineering: A Working Definition

Software Engineering is a collection of techniques, methodologies and tools that help with the production of

A high quality software system developed with a given budget before a given deadline while change occurs

Challenge: Dealing with complexity and change
Software Engineering: A Problem Solving Activity

• **Analysis:**
  • Understand the nature of the problem and break the problem into pieces

• **Synthesis:**
  • Put the pieces together into a large structure

For problem solving we use techniques, methodologies and tools.
Course Outline

Dealing with Complexity
- Notations (UML, OCL)
- Requirements Engineering, Analysis and Design
  - OOSE, SA/SD, scenario-based design, formal specifications
- Testing
  - Vertical and horizontal testing

Dealing with Change
- Rationale Management
  - Knowledge Management
  - Patterns
- Release Management
  - Configuration Management, Continuous Integration
- Software Life Cycle
  - Linear models
  - Iterative models
  - Activity-vs Entity-based views
- Project Management

Application of these Concepts in the Exercises