

# Software Presentation

SE 2A04 Fall 2000

## Software Development

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- Every software product should include documentation that presents the product to clients, reviewers, users, and maintainers
- It is useful to produce documentation that makes it appear as if the software product were developed by a rational process
  - Mathematicians have long followed this approach in presenting their results

See D. Parnas, "A rational design process: how and why to fake it", *IEEE Transactions on Software Engineering*, Vol. SE-12, No. 2, February 1986.

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## Development Activities

- A **rational** development process is needed to produce quality software
- Any proposed rational process is necessarily an **idealization**
  - Humans inevitably make errors
  - Communication between humans is imperfect
  - Many things are not understood at the start
  - Supporting technology always has limitations

1. Investigation and specification of the **requirements** for the desired product
2. **Design** of a product that satisfies the requirements
3. **Implementation** of a product according to the design
4. **Verification and analysis** of the requirements, design, and implementation
5. **Maintenance** of the product (including the requirements and design documents)

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## 1. Requirements

- What is the problem that needs to be solved?  
What are the product requirements that need to be satisfied?

- Output: **Requirements Specification**
  - Functional requirements
  - Requirements imposed by the environment
  - Other requirements (e.g., cost, delivery date, style considerations, performance)

- The Requirements Specification should include everything needed to design the product—no more, no less
- Any design that satisfies the requirements should be acceptable

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## 3. Implementation

- What is a solution to the problem?  
What is an executable implementation of the design?

- Outputs:
  - **Source Code (with comments)**
  - **Product Description**
  - **Installation Instructions**
  - **User Manual**

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## 2. Design

- How will the problem be solved?  
How will the product requirements be satisfied?

- Output: **Design Document**
  - Includes a **module guide** that describes how the design is decomposed into modules
  - Includes a **module interface specification (MIS)** and **module internal design (MID)** for each module of the design

- The Design Document should include everything needed to implement the product—no more, no less
- Any implementation that satisfies the design should be acceptable

## 4. Verification and Analysis

- What behavior does the product exhibit?  
Is the behavior correct?

- Forms of verification and analysis (outputs):
  - Inspection (**Inspection Reports**)
  - Testing (**Test Data**)
  - Mathematical verification (**Formal Mathematics**)

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## 5. Maintenance

### Documentation

- What needs to be maintained?  
How will it be maintained?
  - Outputs:
  - Documentation and Software Repository
  - Maintenance Plan
  - Maintenance Records
- The Repository should be maintained using a **version control system** such as CVS and should contain all previous versions of the documentation and software
  - Like other kinds of engineering documentation, software documentation must be based on mathematics and logic
  - Concepts must be as clear and simple as possible
  - Notation must be both precise and concise

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## Software "Life Cycle" Models

- Waterfall
- Refinement
- Incremental
- Spiral
- Prototyping

1. Design the documentation with great care
2. Use the same set of documents for the entire process
3. Integrate the documents with each other
4. Make the documents:
  - (a) Accurate
  - (b) Consistent
  - (c) Easy to navigate
  - (d) Easy to review
  - (e) Easy to modify
5. Keep the documentation up-to-date and keep a record of all changes

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