Software Engineering

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Software Process

Chapter 2

- A software process is a set of related activities that leads to the production of a software product.

- These activities may involve the development of software from scratch in a standard programming language like Java or C.

- There are many different software processes but all must include four activities that are fundamental to software engineering:

    1. *Software specification*
    2. *Software design and implementation*
    3. *Software validation*
    4. *Software evolution*
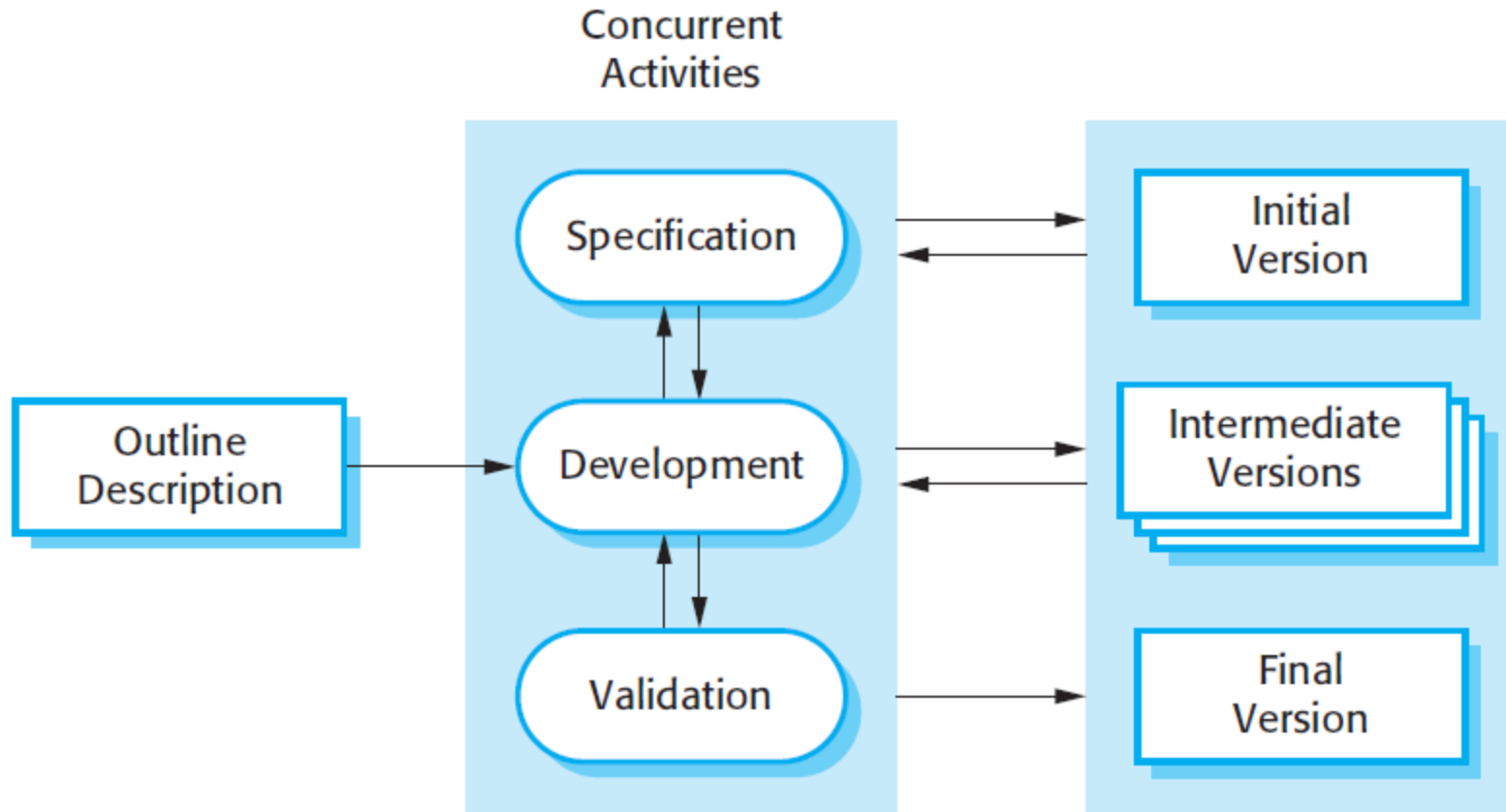
Software process models

1. The waterfall model. represents them as separate process phases.

2. Incremental development. This approach interleaves the activities. It is developed as a series of versions (increments), with each version adding functionality to the previous version.

3. Reuse-oriented software engineering. This approach is based on the existence of a significant number of reusable components.

The waterfall model

- The result of each phase is one or more documents that are approved ('signed off').
- The following phase should not start until the previous phase has finished.
- The waterfall model should only be used when the requirements are well understood and unlikely to change radically during system development.
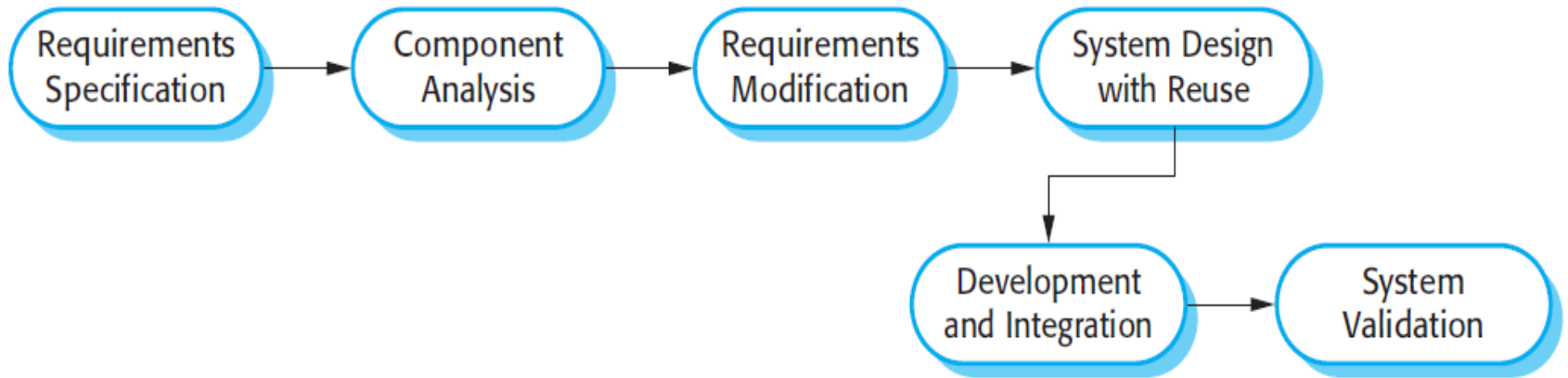
Incremental development

Concurrent Activities

Outline Description → Specification / Development / Validation → Initial Version / Intermediate Versions / Final Version

•By developing the software incrementally, it is cheaper and easier to make changes in the software.

•The customer can evaluate the system at a relatively early stage in the development to see if it delivers what is required.

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- Incremental development has three important benefits, compared to the waterfall model:
    1. The cost.
    2. It is easier to get customer feedback
    3. More rapid delivery.

- What are the problems of this model? Explain.

Reuse-oriented software engineering

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Requirements  →  Component  →  Requirements  →  System Design
Specification     Analysis       Modification     with Reuse
                                                       ↓
                                   Development  →  System
                                   and Integration   Validation
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- Reuse-oriented software engineering has the advantage of reducing the amount of software to be developed and so reducing cost and risks.
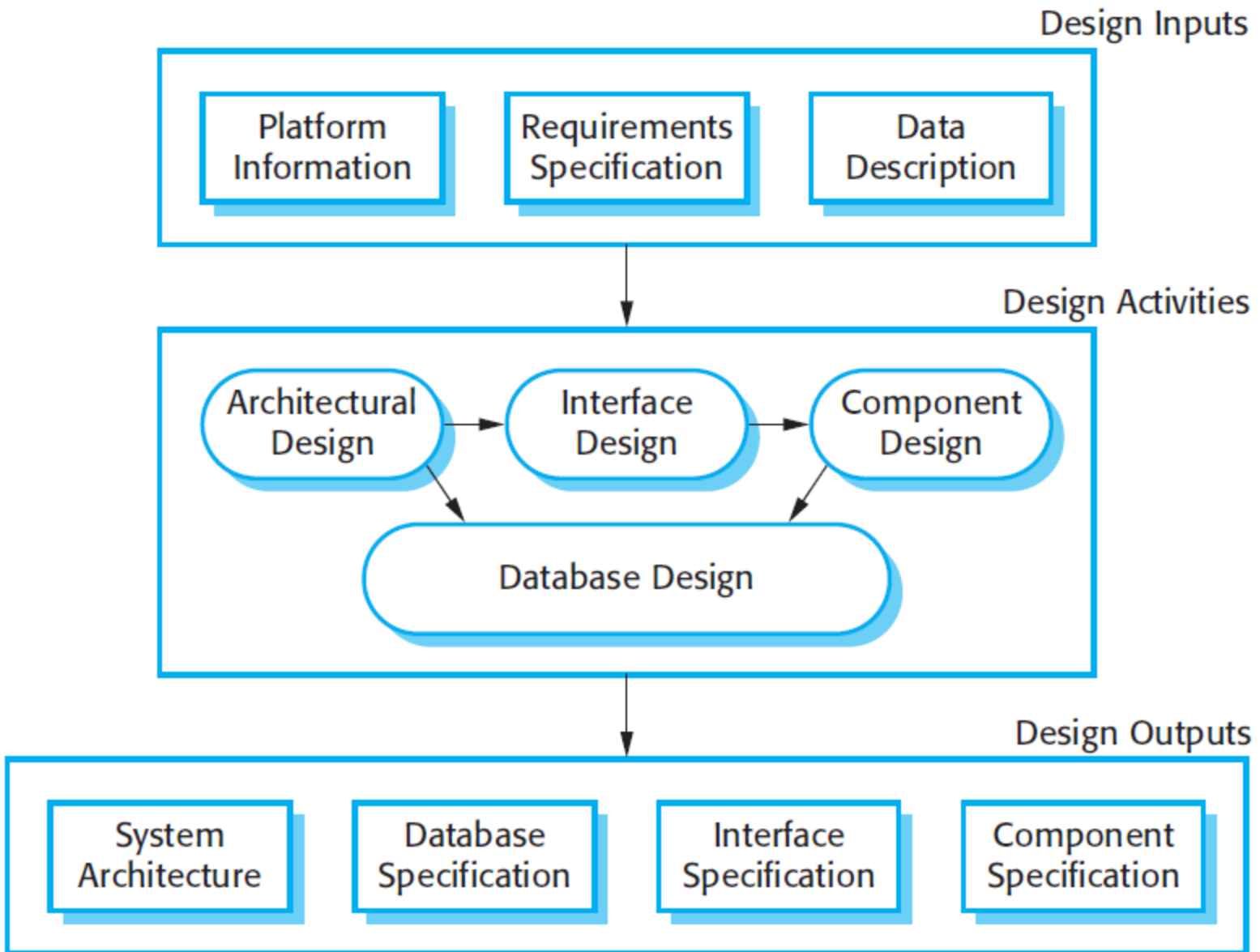- It usually also leads to faster delivery of the software.

Software specification

- Software specification or requirements engineering is the process of understanding and defining what services are required from the system and identifying the constraints on the system's operation and development.
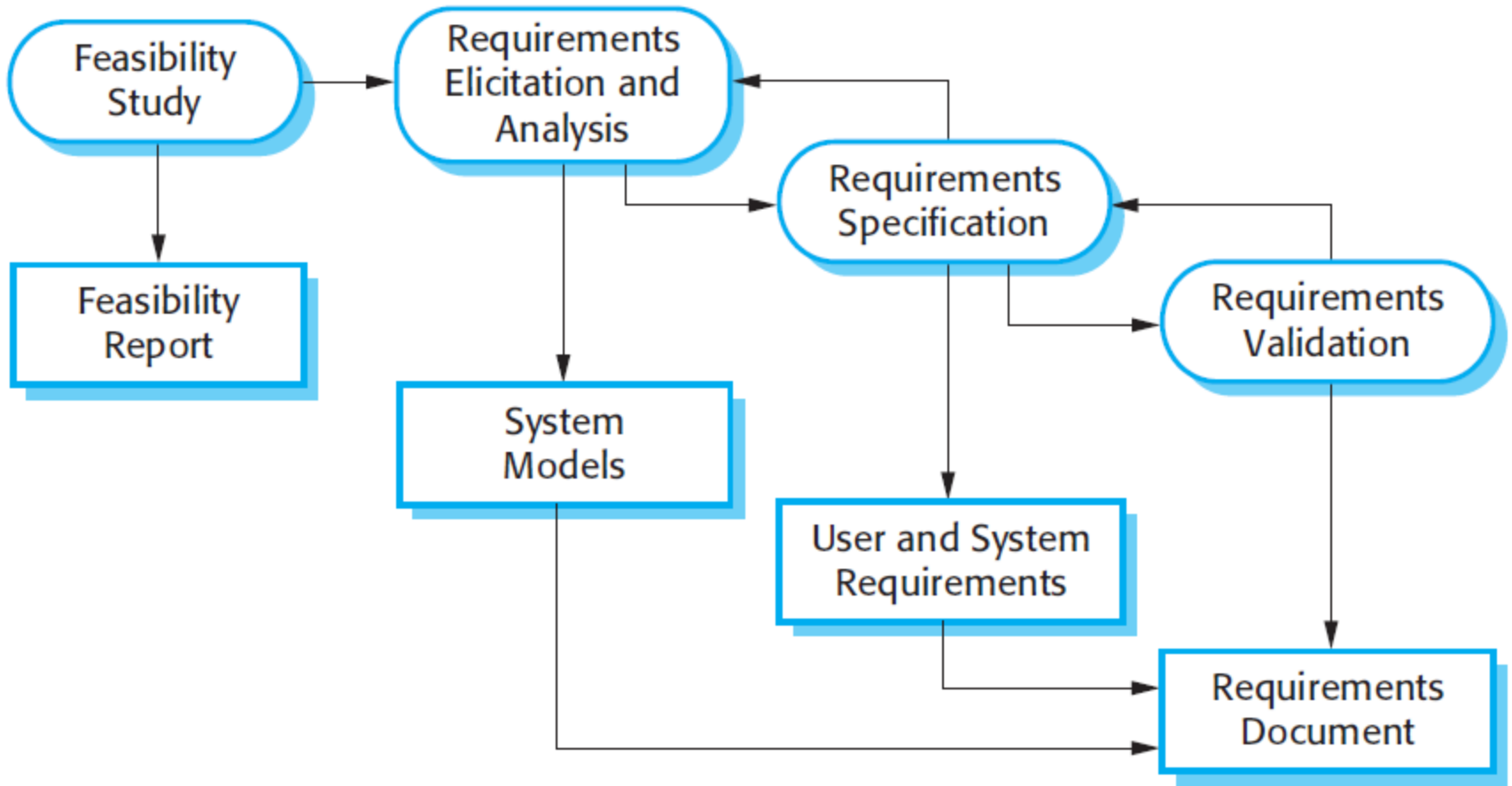
Software design and implementation

- The implementation stage of software development is the process of converting a system specification into an executable system.

- Designers do not arrive at a finished design immediately but develop the design iteratively.

Design Inputs

- Platform Information
- Requirements Specification
- Data Description

Design Activities

Architectural Design → Interface Design → Component Design

Database Design

Design Outputs

- System Architecture
- Database Specification
- Interface Specification
- Component Specification

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Software validation

- Software validation or, more generally, verification and validation (V&V) is intended to show that a system both conforms to its specification and that it meets the expectations of the system customer.

- Program testing, where the system is executed using simulated test data, is the principal validation technique.

- The stages in the testing process are:

1. *Development testing The components making up the system are tested by the* people developing the system. Each component is tested independently, without other system components.

2. *System testing System components are integrated to create a complete system.* This process is concerned with finding errors that result from unanticipated interactions between components and component interface problems.

3. *Acceptance testing This is the final stage in the testing process before the system* is accepted for operational use. The system is tested with data supplied by the system customer rather than with simulated test data.

- Acceptance testing is sometimes called '**alpha testing**'.

- When a system is to be marketed as a software product, a testing process called '**beta testing**' is often used. Beta testing involves delivering a system to a number of potential customers who agree to use that system.

Software evolution

- The flexibility of software systems is one of the main reasons why more and more software is being incorporated in large, complex systems.

- changes can be made to software at any time during or after the system development. Even

H.W

Suggested any problem (you can program it).

Try to solve it by :

      The waterfall model.

      Incremental development.

      Reuse-oriented software engineering.