Brunel University London

Software Development and Management
CS2002

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Software Development Process

The Software Process

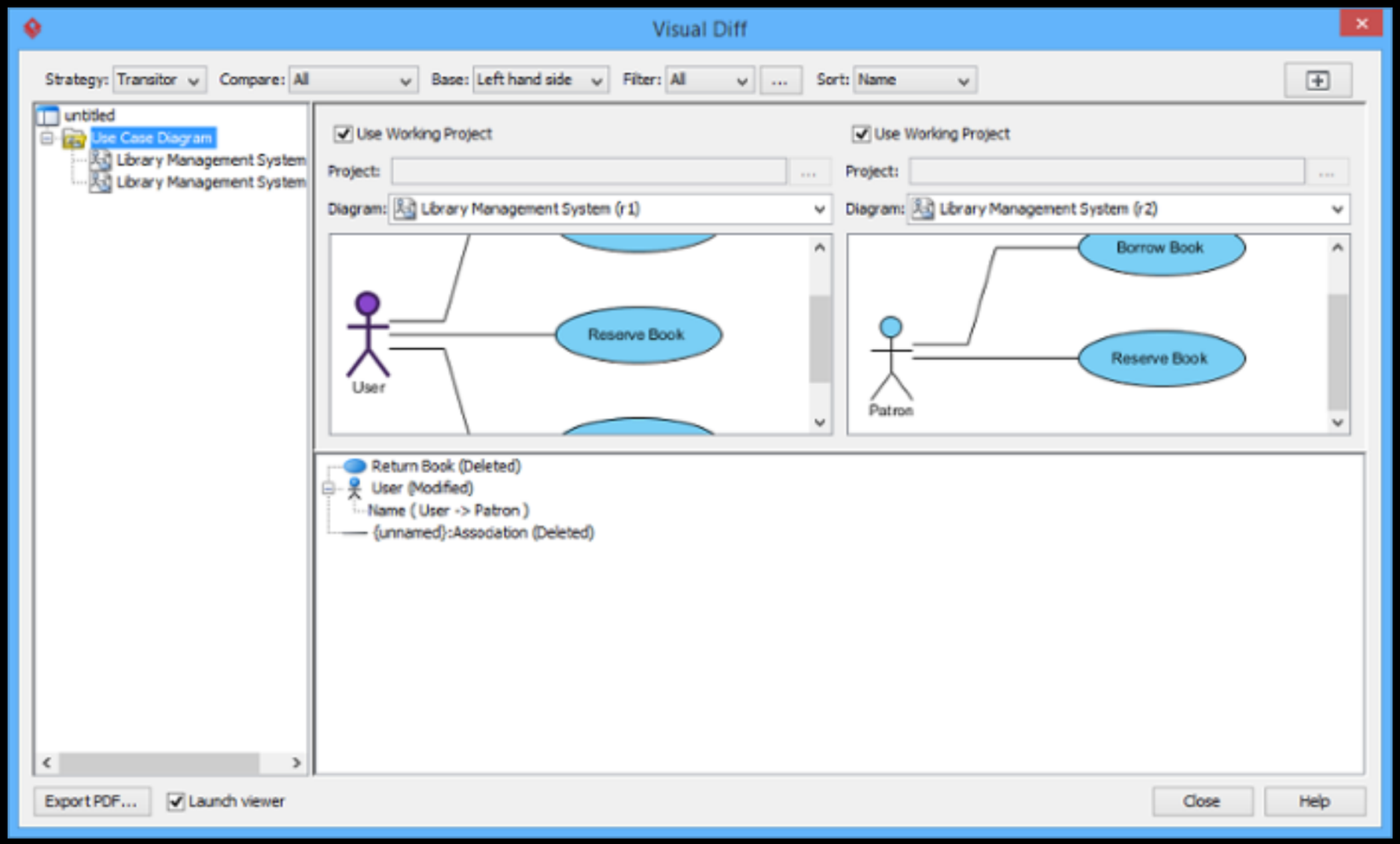
A structured set of activities required to develop a software system

Many different software processes, but all involve:

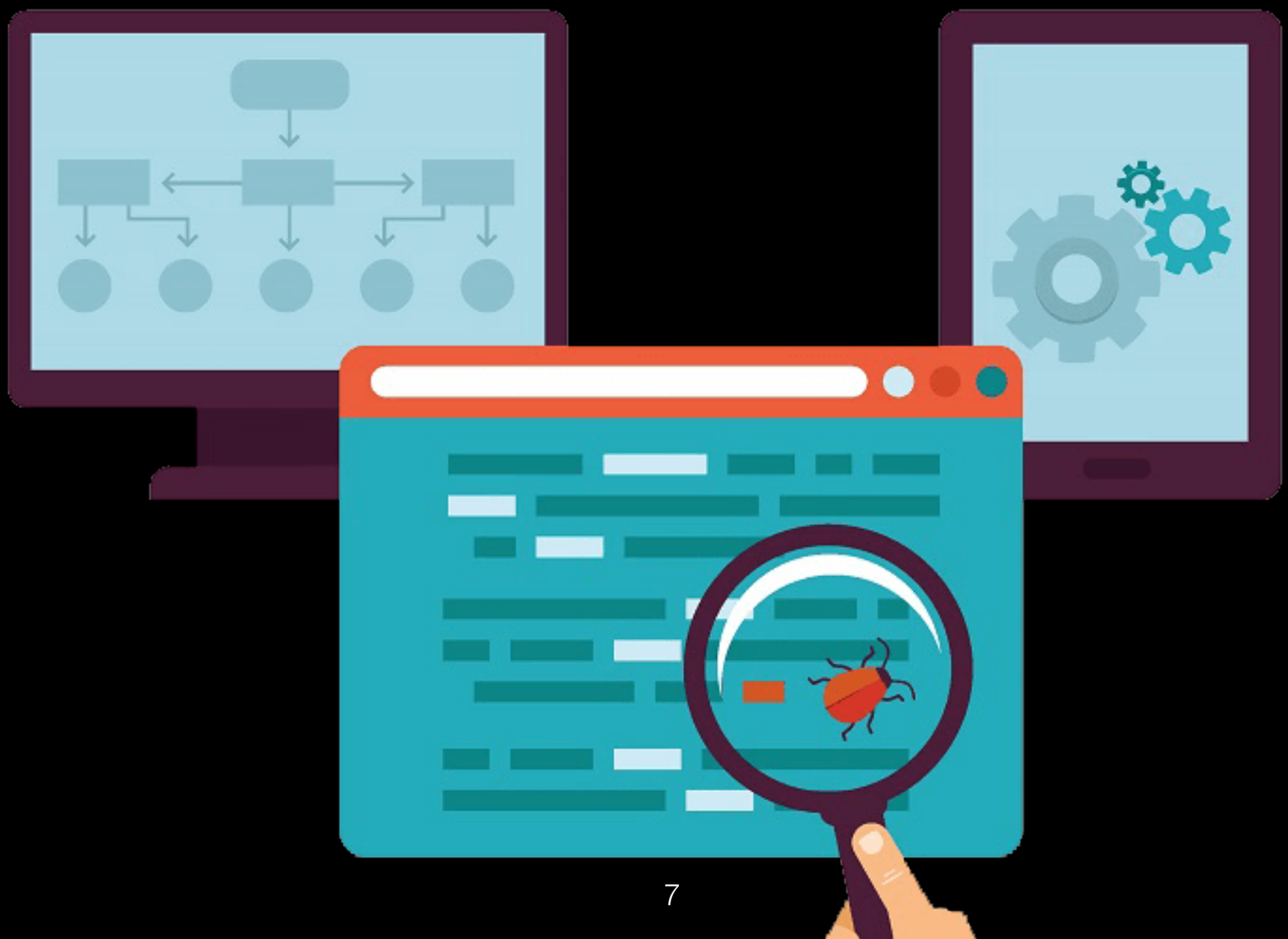
- specification
- design and implementation
- validation
- evolution

Specification

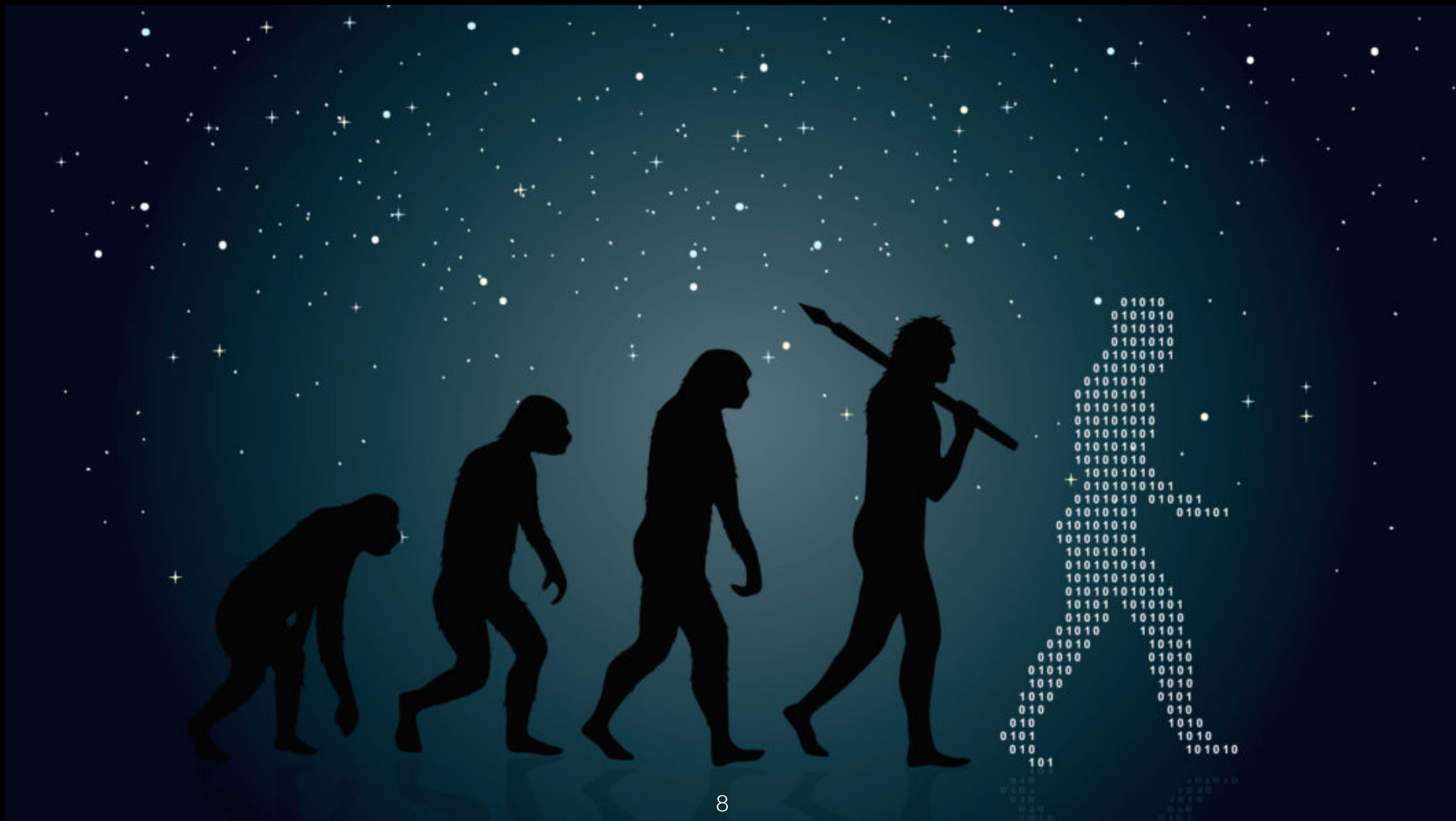
Design and implementation



Validation



Evolution



Software process model

It is an abstract representation of a process, a description of the process from a particular perspective

Plan-driven process

A plan-driven process is a process where all the process activities are planed in advance and progress is measured against this plan

Agile process

In agile, planning is incremental and it is easier to change the process to accommodate changing customer requirements

In practice, most of the processes include elements of both approaches

Software process models

- The waterfall model
- Incremental development
- Integration and configuration

Software process models

- The waterfall model
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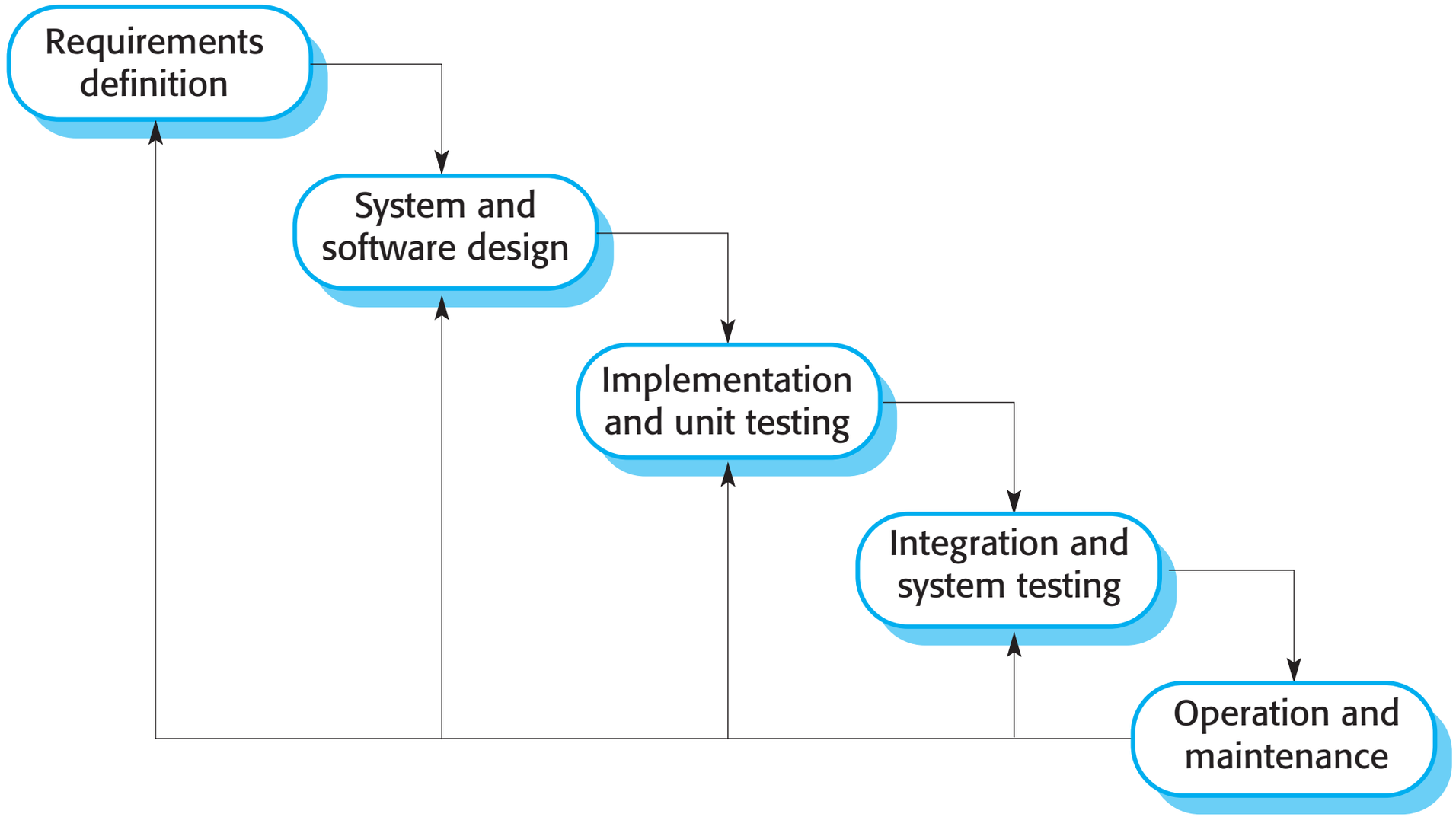
In practice, most large systems are developed using a process that incorporates elements from all of these models

The Waterfall model



The Waterfall model

Difficulty in accommodating change once the process is under way

in principal a phase has to be completed before moving onto the next phase

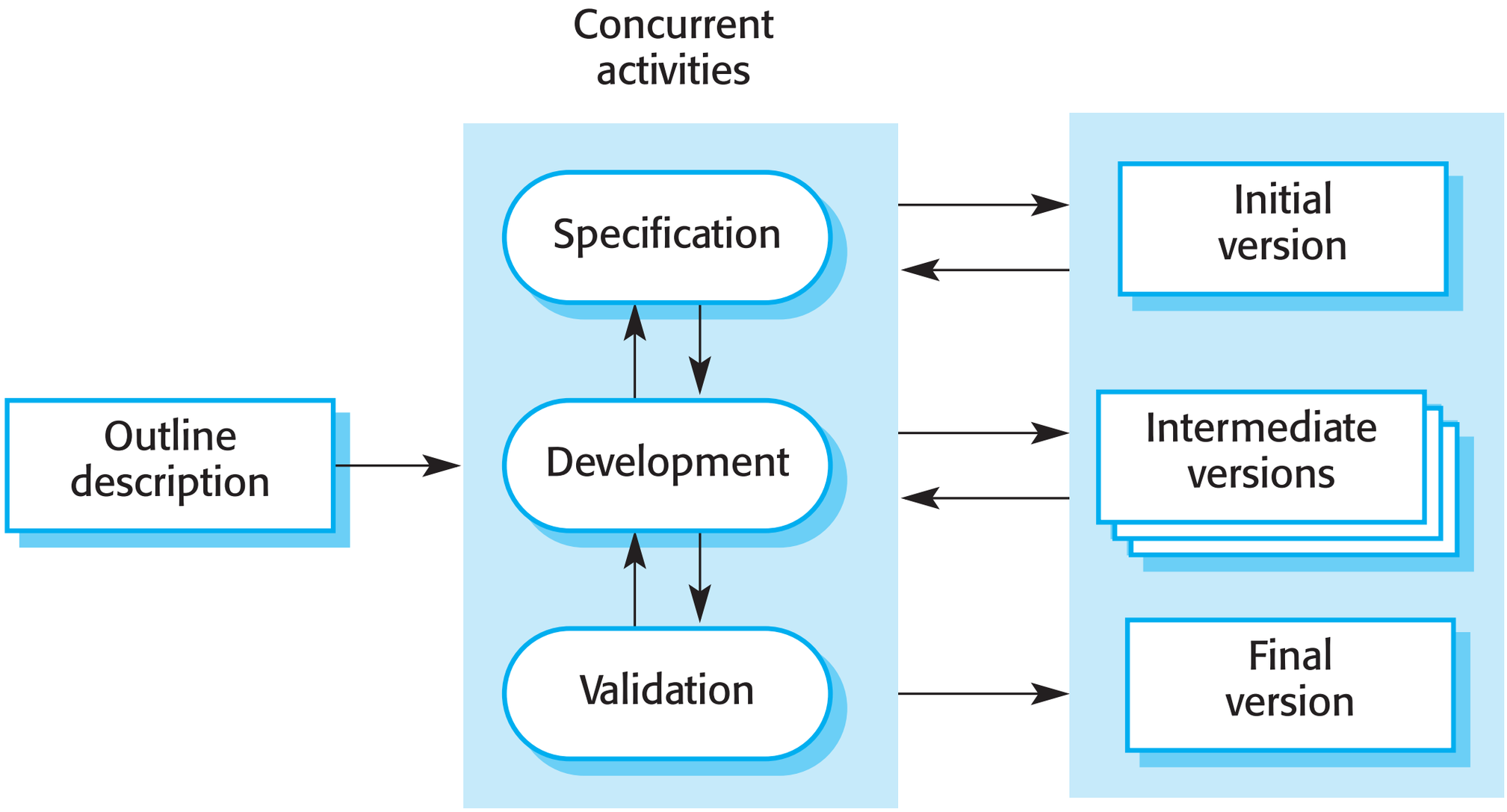
The Waterfall model

Rigid partitioning of a project into distinct stages make it difficult to respond to changing requirements

The Waterfall model

- used in situations when requirements are well-understood and changes will be limited during the design process
- in large systems engineering project where a system is developed at several sites, helping coordinate the work

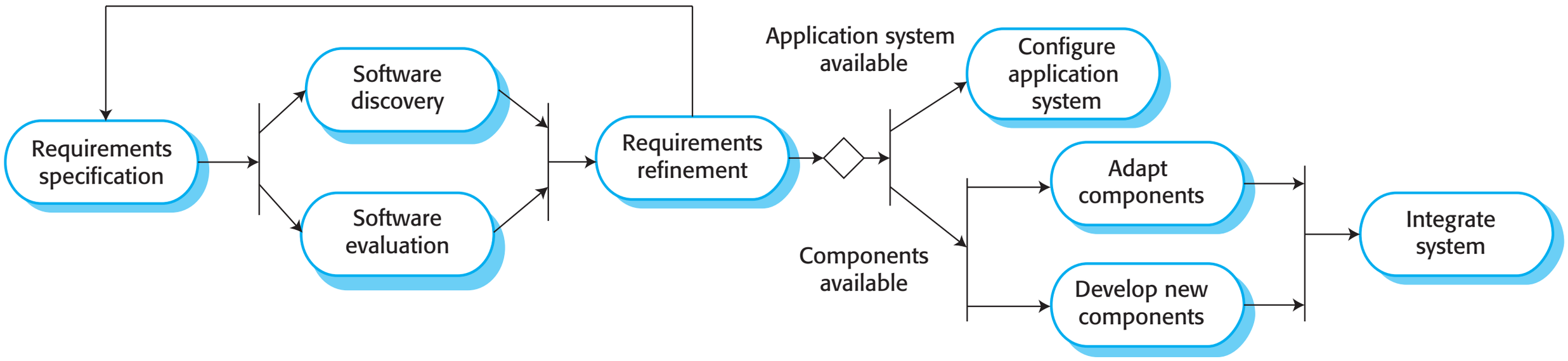
Incremental development



Incremental development

- Accommodating changing requirements is less costly
- Easier to get customer feedback on the work that has already been done
- More rapid delivery and deployment of useful software to the customer
- The process is not visible
- System structure tends to degrade as new increments are added

Reuse-oriented SE



Integration and configuration

- Based on software reuse where systems are integrated from existing components or application systems

- Reduced costs and risks as less software is developed from scratch

Integration and configuration

- Fast delivery and deployment of system
- Requirements compromises are inevitable so system may not meet real needs of users
- Loss of control over evolution of reused system elements

Process activities

Software processes are inter-leaved sequences of **technical, collaborative and managerial activities** with the overall goal of **specifying, designing, implementing and testing** a software system

Process activities

- The four basic process activities of specification, development, validation and evolution are organised differently in different development processes

- For example in the waterfall model, they are organised in sequence, whereas in incremental development they are interleaved.

Software specification

The process of establishing what services are required and the constraints on the system’s operation and development

Software specification

Requirements engineering process:

- Requirements elicitation and analysis
- Requirements specification
- Requirements validation

Software design and implementation

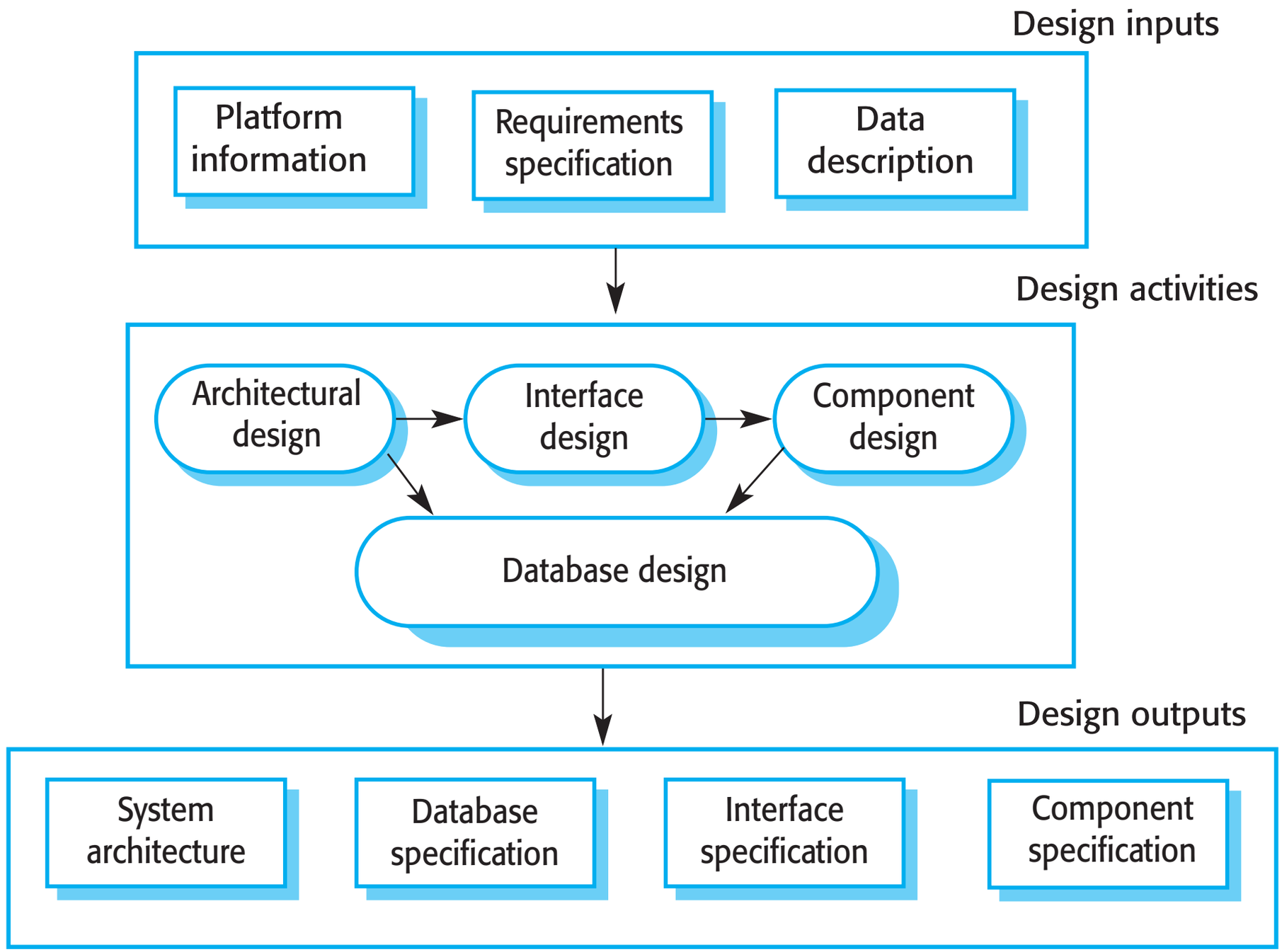
The process of converting the system specification into an executable system

Software design and implementation

- **Software design:** design a software structure that realises the specification
- **Implementation:** translate this structure into an executable program

The activities of design and implementation are closely related and may be inter-leaved

A general model of the design process



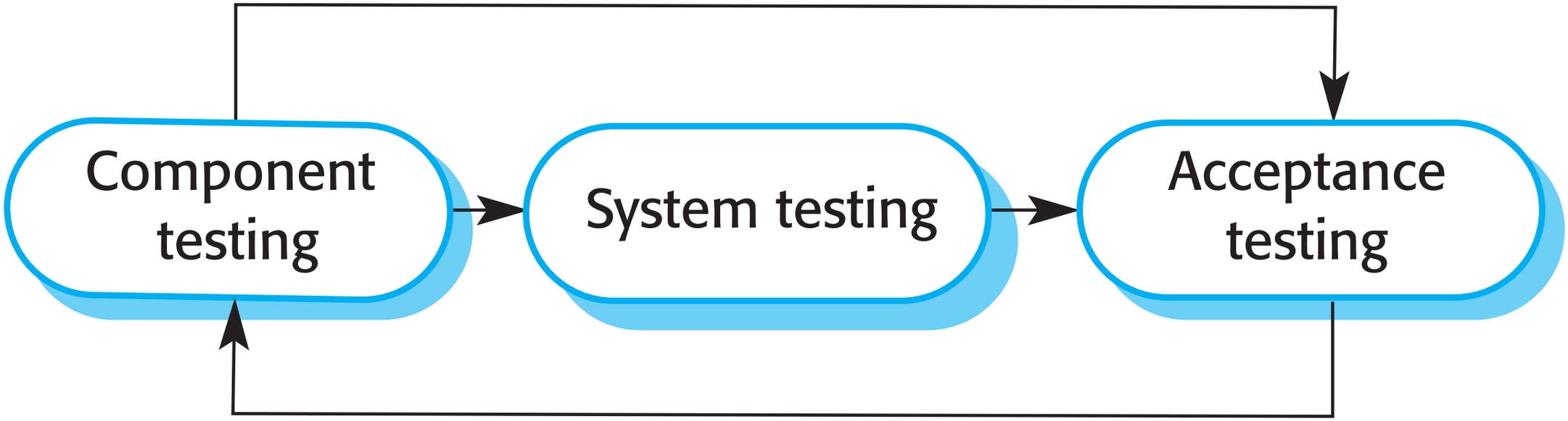
Software validation

Verification and validation (V&V) is intended to show that a system conforms to its specification and meets the requirements of the system customer

Software validation

- **Testing** is the most commonly used V&V activity
- **System testing** involves executing the system with test cases derived from the specification of the real data to be processed by the system

Stages of testing



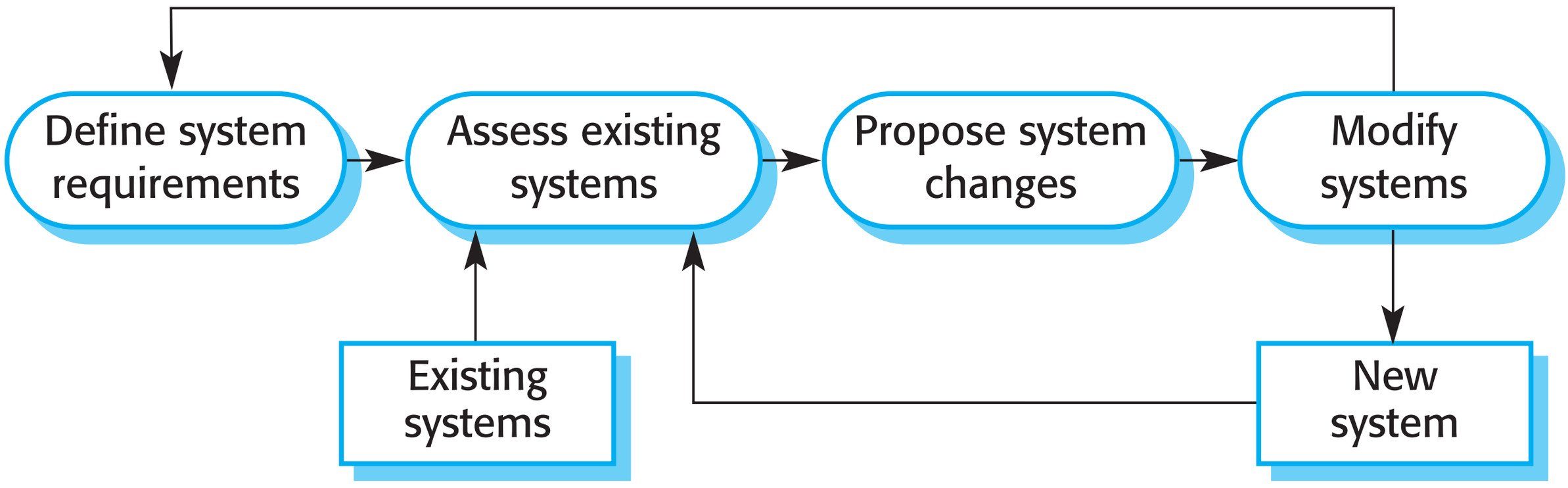
Software evolution

- Software is inherently flexible and can change
- As requirements change through changing business circumstances, the software that supports the business must also evolve and change

Software evolution

Although there has been a demarcation between development and evolution (maintenance), this is increasingly irrelevant as fewer and fewer systems are completely new – software development often becomes an evolution of existing software systems.

Evolution


Define system requirements
Assess existing systems
Propose system changes
Modify systems
Existing systems
New system

Reading

- Chapter 2, Sommerville