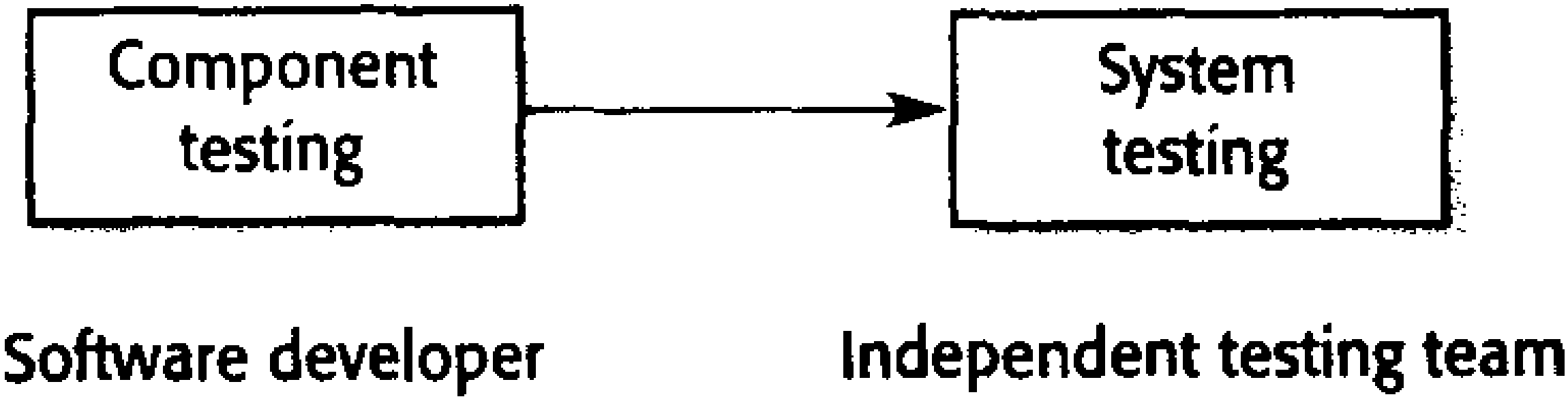
Software Testing

Software Testing

- After the delivery of the system the customer may carry out a series of acceptance tests to check that the performs as specified.
- This model of testing process is appropriate for large systems but for smaller systems or for systems that are developed through scripting or reuse there are often fewer distinct stages in the process.
- The two fundamental testing activities are component testing that is testing the parts of the system and system testing that is testing the system as a whole
- The aim of component testing stage is to discover by testing individual program components. These components may be functions, objects or reusable components
- During system these components are integrated to form sub system or complete system. At this stage system testing should focus on establishing that the system meets its functional and non functional requirements, and does not behave in unexpected ways. Inevitably defects in components that have been missed during earlier testing are discovered during system testing

Testing Phases



Software Testing

- The software testing process has two distinct goals
  - To demonstrate to the developer and the customer that the software meets its requirements.
  - For custom software this means that there should be at least one test for every requirement in the user and the system requirements documents.
  - For generic software products it means that there should be tests for all of the system features that should be incorporated in the product release.
  - Some systems may have an explicit acceptance testing phase where the customer formally checks that the delivered system conforms to its specification
  - To discover faults or defects in the software where the behaviour of the software is incorrect, undesirable or does not conform to its specification.
  - Defect testing is concerned with rooting out all kinds of undesirable system behaviour, such as system crashes unwanted interactions with other systems, incorrect computations and data corruption

System Testing

- System testing involves integrating two or more components that implement system functions or features and then testing this integrated system.

- In an iterative development process, system testing is concerned with testing an increment to be delivered to the customer.

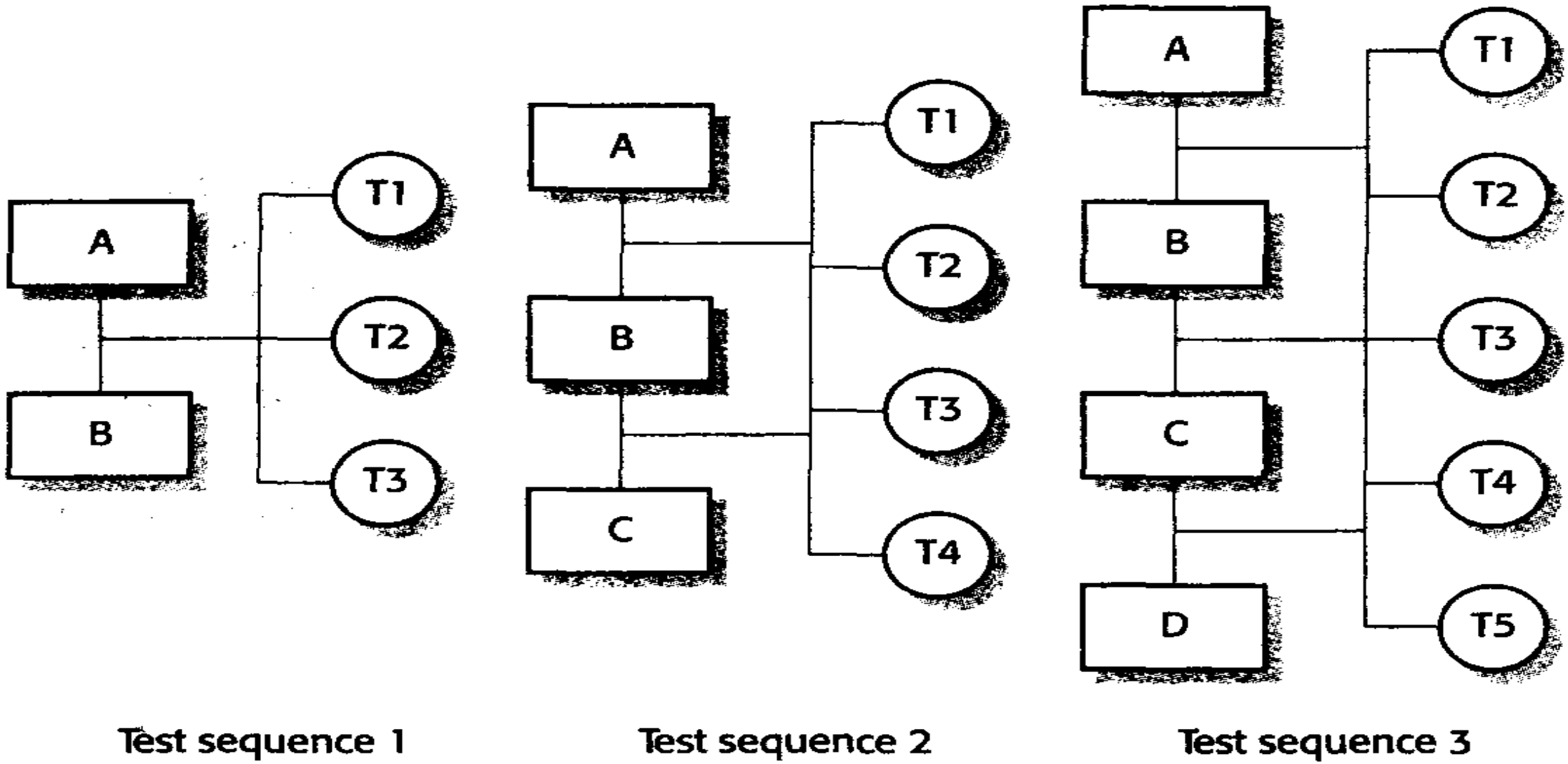
- In a waterfall model system testing is concerned with testing the entire system.

- For most complex systems there are two distinct phases to system testing
  - Integration testing
  - Release testing

Integration Testing

- The process of system integration involves building a system from its components and testing the resultant system for problems that arise from component interactions.
- The components that are integrated may be off the shelf components, reusable components that have been adopted for a particular system or newly developed components
- Integration testing checks that these components work together, are called correctly and transfer the right data at the right time across their interfaces
- System integration involves identifying clusters of components that deliver some system functionality and integrating these by adding code that makes them work together
- Sometimes the overall skeleton of the system is developed first and components are added to it also called as Top-Down Integration
- Alternatively, first components are integrated first and then functional components are added called as Bottom-Up Integration

Incremental Integration Testing



Test sequence 1

Test sequence 2

Test sequence 3

Integration Testing

- In the example shown below A, B,C, D are components and T1 to T5 are related sets of tests of the features incorporated in the system.
- T1, T2 and T3 are first run on a system composed of component A and component B and if these reveal defects they are corrected
- Component C is integrated and T1, T2 and T3 are repeated to ensure that there have not been unexpected interactions with A and B and if problems arise in this tests this probably means that they are due to transactions with the new component.
- The source of the problem is localised thus simplifying defect location and repair. Test T4 is also run on the system. Finally component D is integrated and tested using existing and new tests T5

Release Testing

- It is a process of testing a release of the system that will be distributed to customers.
- The primary goal of this process is to increase the suppliers confidence that the system meets its requirements so that it can be released as a product or delivered to the customer.
- Release testing is usually a **black box** testing process where the tests are derived from the system specification.
- The system is treated as a black box whose behaviour can only be determined by studying its inputs and the related outputs.
- Another name for this is functional testing because the tester is only concerned with the functionality and not the implementation of software
- The following figure illustrates the model of a system that is assumed in black box testing.
- The tester presents input to the component or the system and examines the corresponding outputs and if outputs are not those predicted then the test has detected a problem with the software
- When testing system releases try to break the software by choosing test cases that are in set I_e in the given figure
- The aim should be to select inputs that have a high probability of generating system failures

Black Box Testing