Software Testing

Introduction to Software Testing

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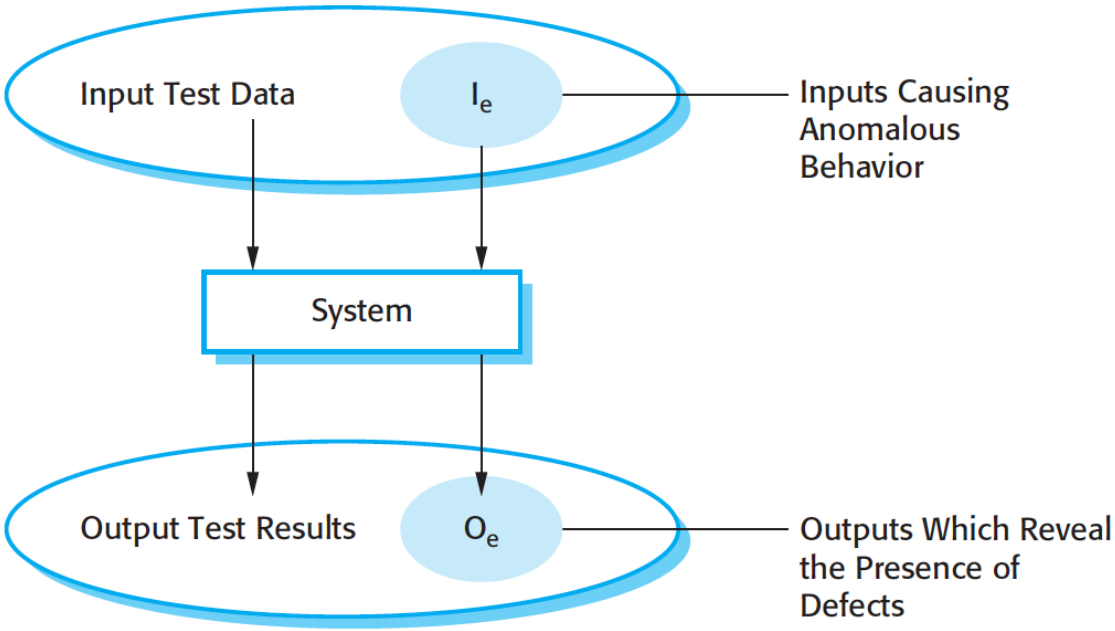
What is Testing

- Testing is intended to show that a program does what it is intended to do
- Discover program defects before it is put into use
- When you test software, you execute a program using artificial data
- You check the results of the test run for errors, anomalies, or information about the program's non-functional attributes

Testing Goal

- **Validation Testing**
  - To demonstrate to the developer and the customer that the software meets its requirements
  - There should be at least one test for every requirement in the requirements document
  - There should be tests for combinations of these features
- **Defect Testing**
  - To discover situations in which the behavior of the software is incorrect, undesirable, or does not conform to its specification
  - These are a consequence of software defects
  - Concerned with rooting out undesirable system behavior such as system crashes, unwanted interactions with other systems, incorrect computations, and data corruption

Testing Model



Incompleteness

- Testing cannot demonstrate that the software is free of defects or that it will behave as specified in every circumstance
- It is always possible that a test that you have overlooked could discover further problems with the system

(Edsger Dijkstra et al., 1972): “Testing can only show the presence of errors, not their absence”

Verification and Validation

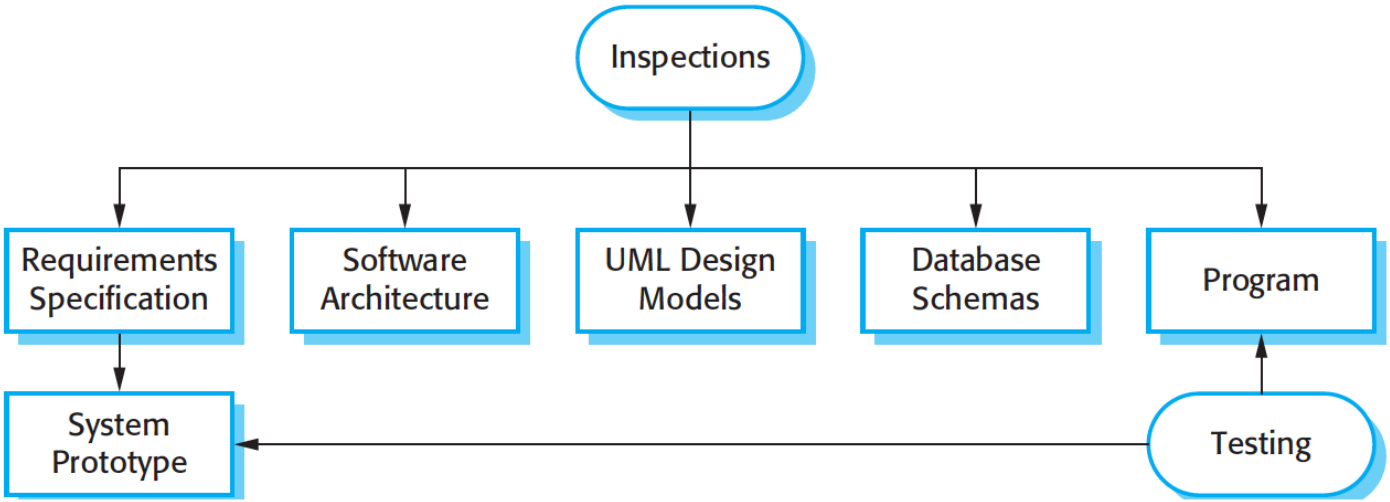
Testing is part of a broader process of software verification and validation (V & V)

Barry Boehm, 1979:

Validation: Are we building the right product?

Verification: Are we building the product right?

Inspection Vs. Testing



Static vs dynamic

Review or Inspection

- A single inspection session can discover many errors in a system
- Incomplete versions of a system can be inspected without additional costs
- Can also consider broader quality attributes of a program, such as compliance with standards, portability, and maintainability

Limitation of Inspection

Inspections are not good for discovering defects that arise because of

- unexpected interactions between different parts of a program
- timing problems
- problems with system performance

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