Software Testing

Lecture # 25, 26, 27
12, 13, 15 April

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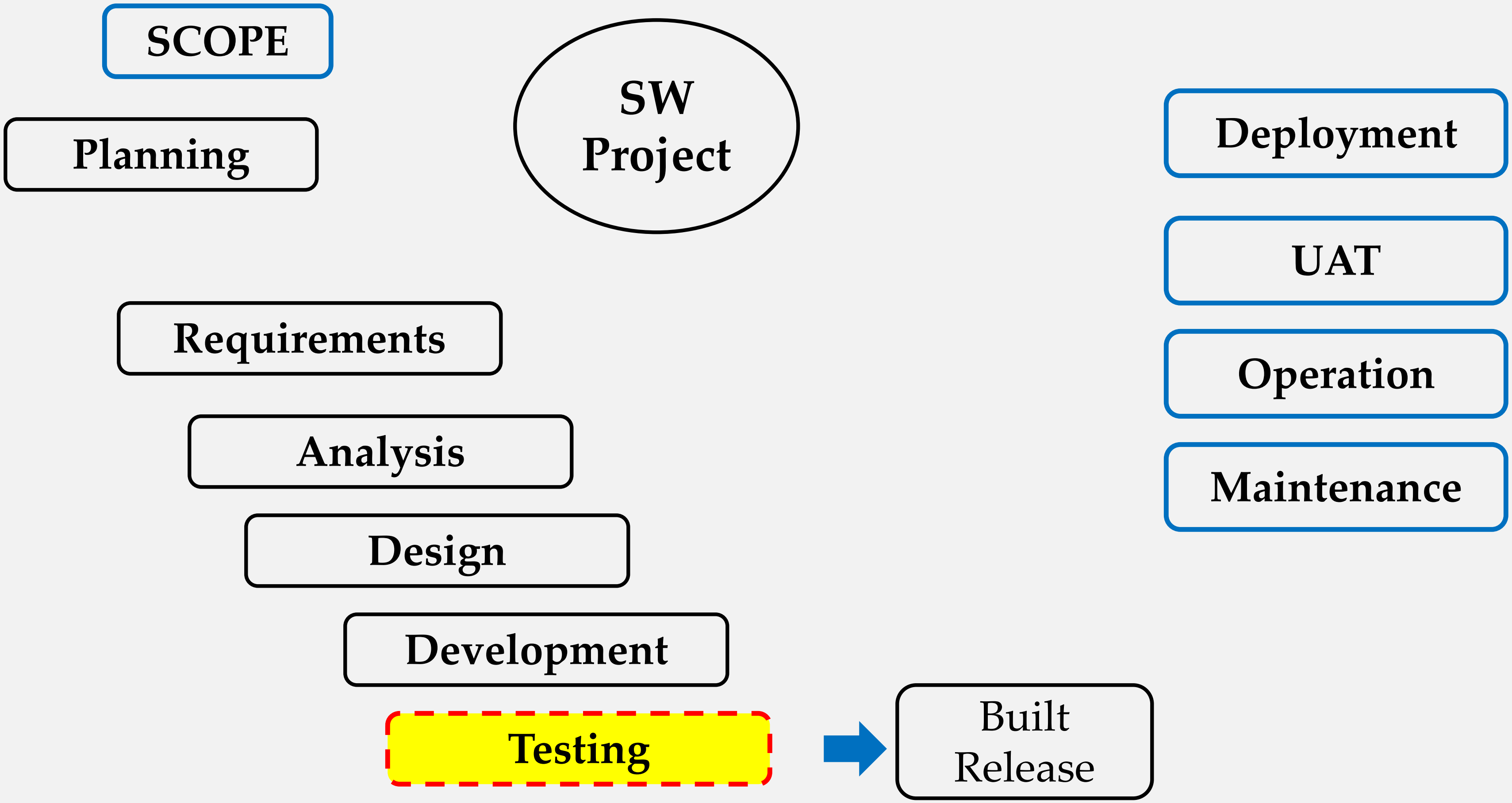
Intro. to Software Engineering
SE-110

Topics covered

- Testing definition
- Testing strategies
- Verification and validation
- Testing stages



SCOPE

Planning

SW Project

Requirements

Analysis

Design

Development

Testing

Built Release

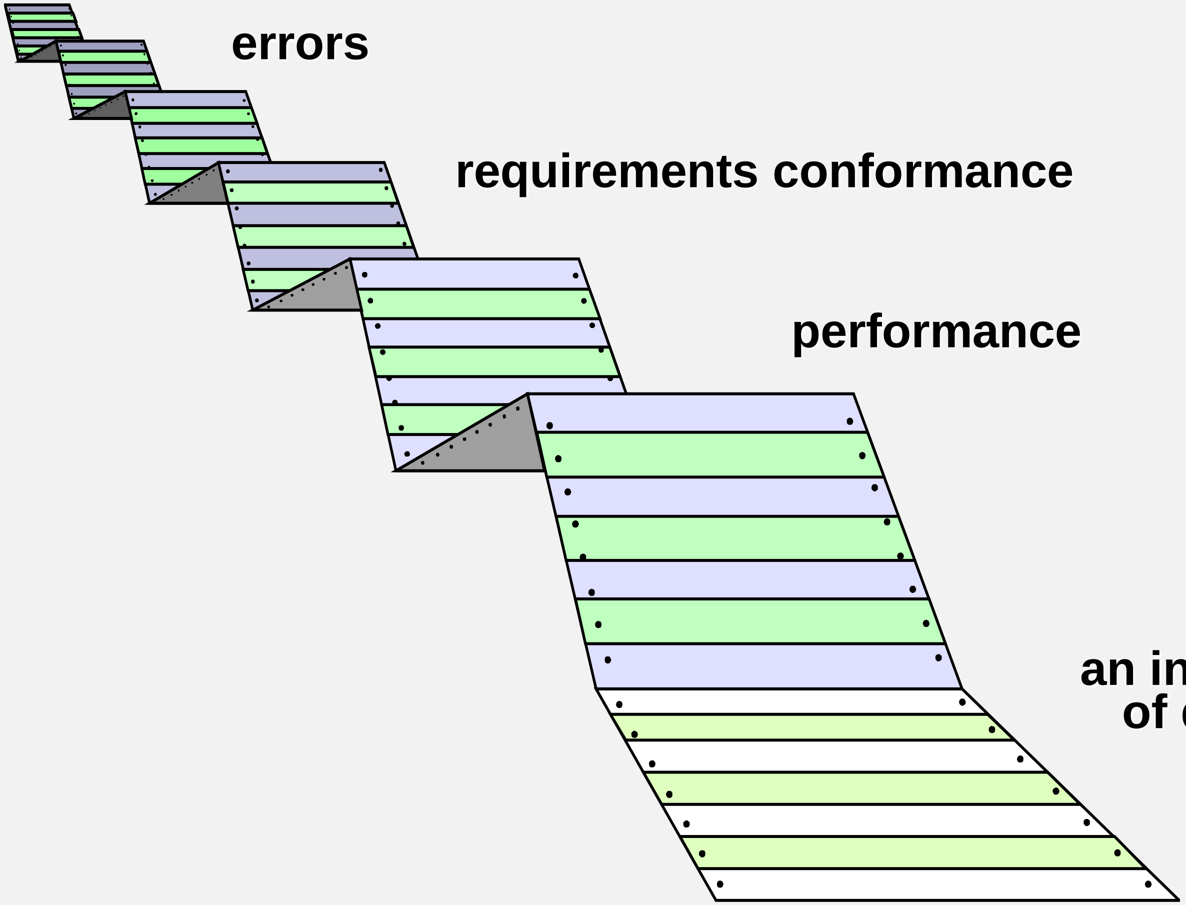
Deployment

UAT

Operation

Maintenance

What Testing Shows



errors

requirements conformance

performance

an indication
of quality

Software testing- Definition

- **Testing is the process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not.**
- **Software testing is a process of analyzing or operating software for the purpose of finding bugs.**
- **Software testing is the process of testing the *functionality* and correctness of software by running it.**
- **Software testing is usually performed for one of two reasons:**
  1) **Defect detection**
  2) **Reliability estimation**

Why Software Testing?

- **An investigation conducted to provide stakeholders with information about the quality of the software under test.**

- **To detect failures so that defects may be discovered and corrected.**

- **Testing cannot establish that a product functions properly under all conditions; but can only establish that it does not function properly under specific conditions**

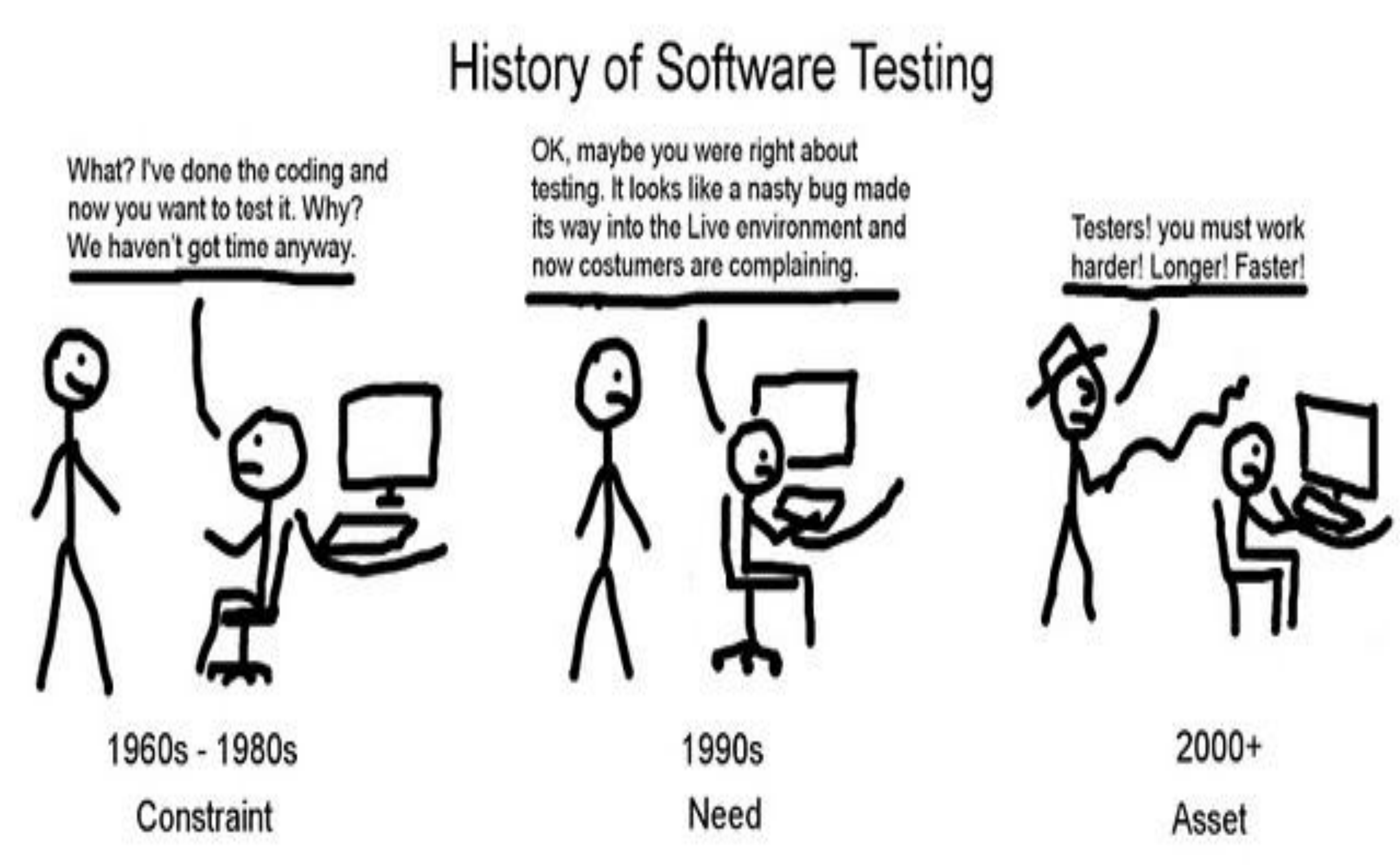
Manual Testing

- **Manual testing includes testing a software manually, i.e., without using any automated tool or any script. In this type, the tester takes over the role of an end-user and tests the software to identify any unexpected behavior or bug.**
- **Testers use test plans, test cases, or test scenarios to test a software to ensure the completeness of testing.**

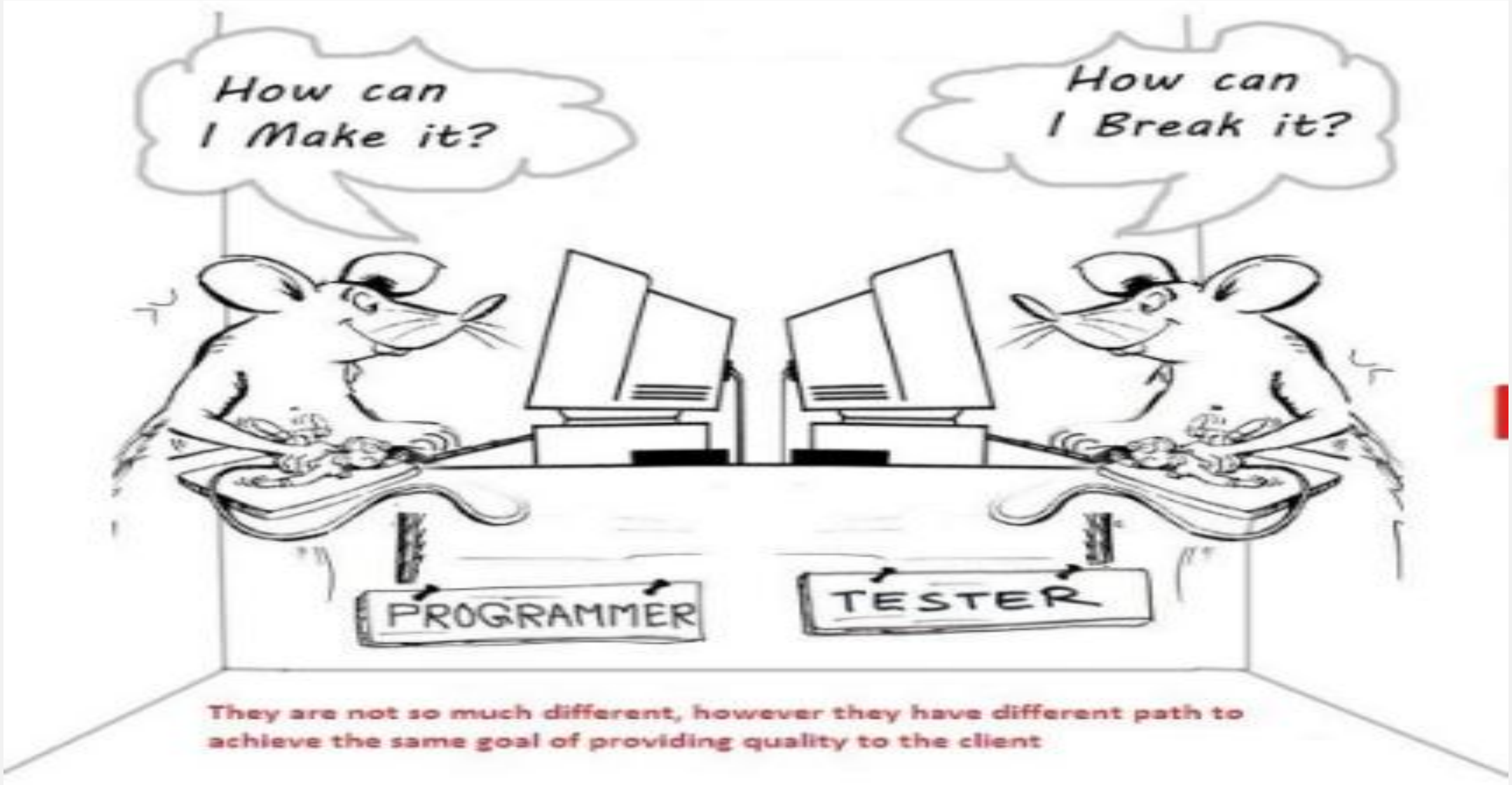
Automation Testing

- When the tester writes scripts and uses it to test the product. This process involves automation of a manual process.
- Automation Testing is used to re-run the test scenarios that were performed manually, quickly, and repeatedly.

If a manual test costs $X to run the first time, it will cost $X to run every time thereafter.
An automated test can cost 3 to 30 times $X the first time, but will cost about $0 after that.


History of Software Testing
What? I've done the coding and now you want to test it. Why? We haven't got time anyway.
OK, maybe you were right about testing. It looks like a nasty bug made its way into the Live environment and now costumers are complaining.
Testers! you must work harder! Longer! Faster!
1960s - 1980s
Constraint
1990s
Need
2000+
Asset

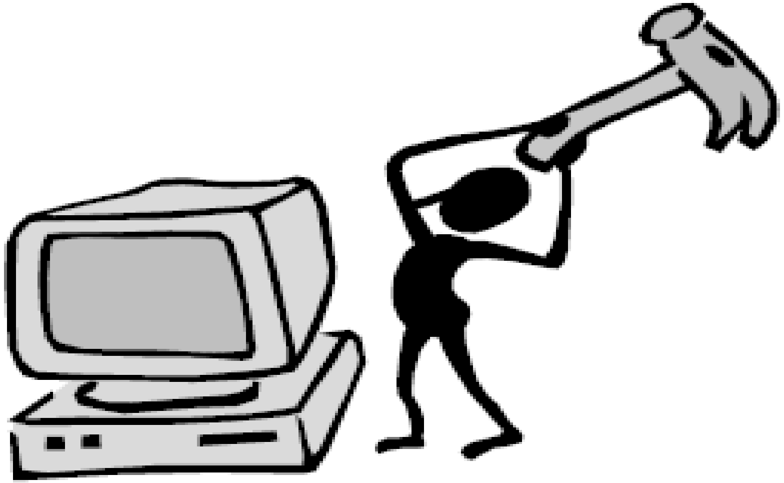
Development Vs Testing



They are not so much different, however they have different path to achieve the same goal of providing quality to the client

When to Start / Stop Testing?

Who Should Test?



- Developer
  - Understands the system
  - But, will test gently
  - And, is driven by deadlines

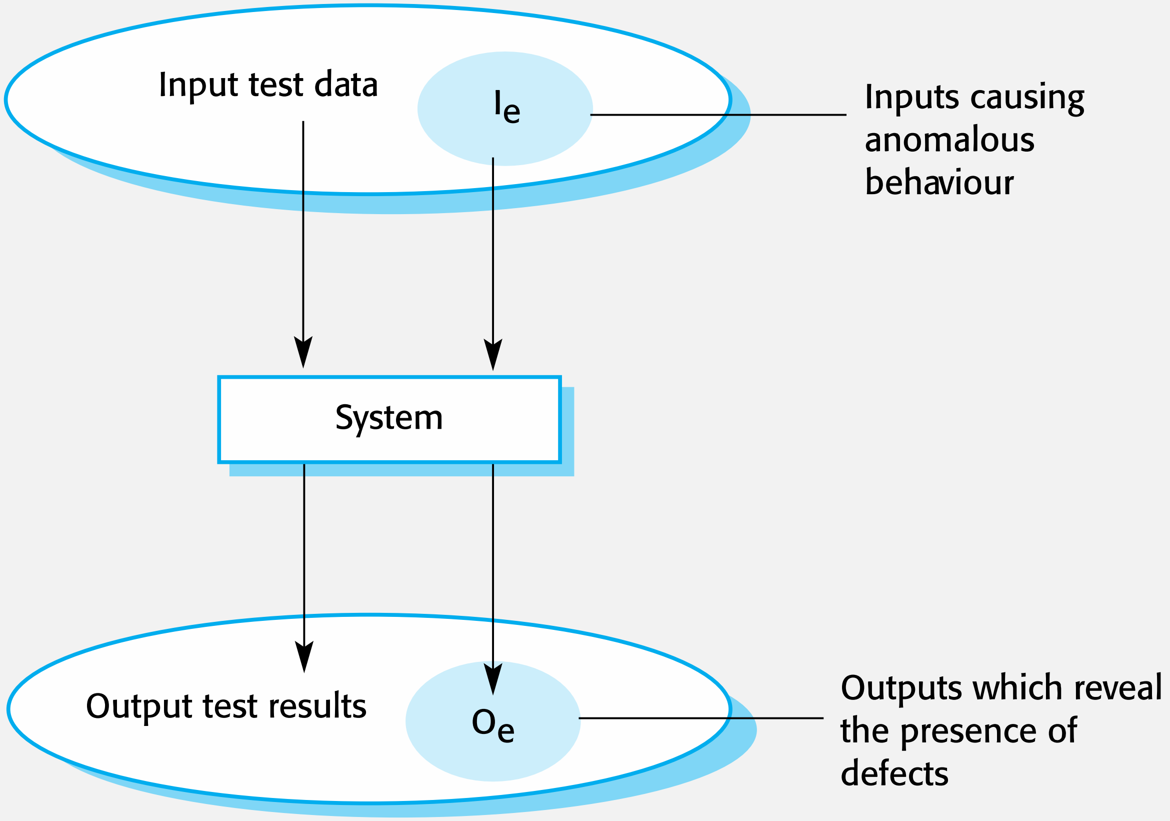
- Independent tester
  - Must learn system
  - But, will attempt to break it
  - And, is driven by "quality"

The role of the independent tester is to remove the conflict of interest inherent when the builder is testing his or her own product.

Program Testing

- Testing is intended to show that a program does what it is intended to do and to 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.
- Can reveal the presence of errors NOT their absence.
- Testing is part of a more general verification and validation process, which also includes static validation techniques.

An Input-output Model of Program Testing



Input test data

I_e

Inputs causing anomalous behaviour

System

Output test results

O_e

Outputs which reveal the presence of defects

Verification vs Validation

- Verification:
  "Are we building the product right”.
- The software should conform to its specification.
- Validation:
  "Are we building the right product”.
- The software should do what the user really requires.

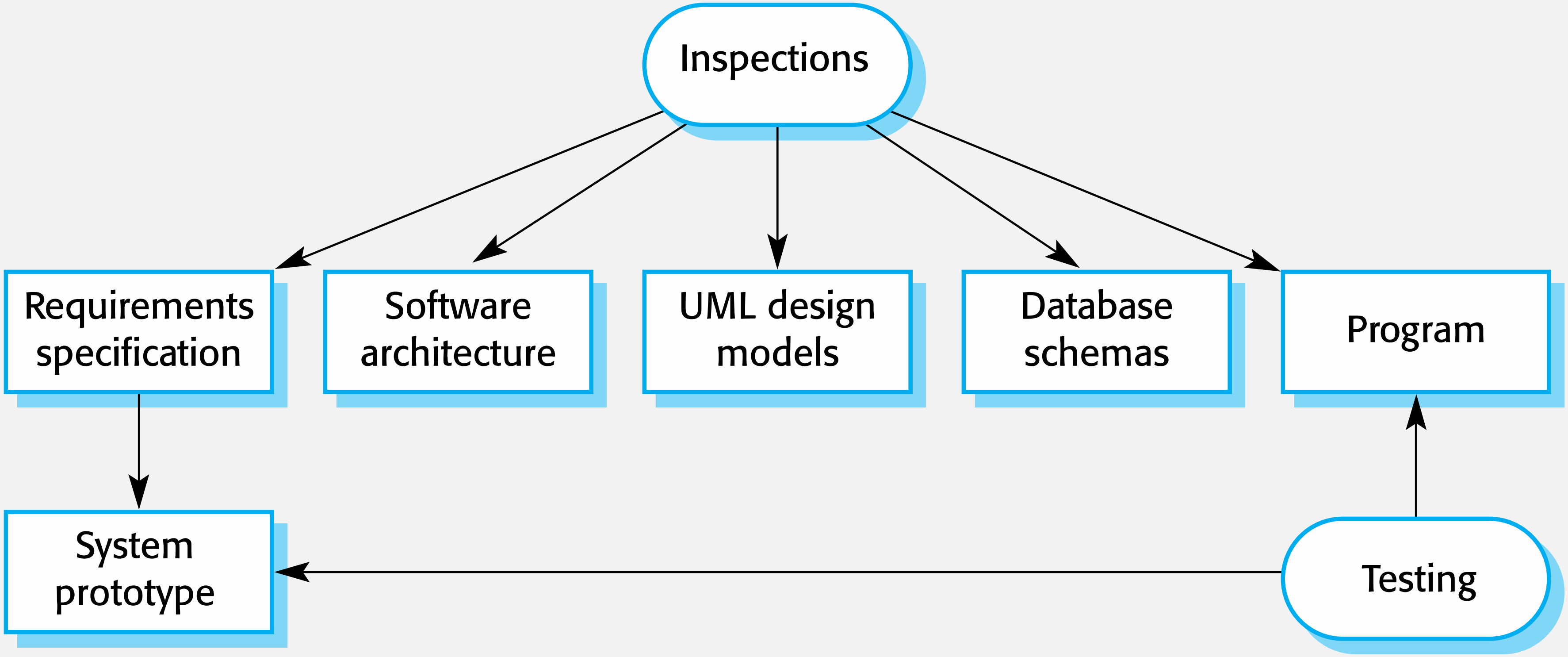
V & V Confidence

- Aim of V & V is to establish confidence that the system is ‘fit for purpose’.
- Depends on system’s purpose, user expectations and marketing environment
  - Software purpose
    - The level of confidence depends on how critical the software is to an organisation.
  - User expectations
    - Users may have low expectations of certain kinds of software.
  - Marketing environment
    - Getting a product to market early may be more important than finding defects in the program.

Inspections and Testing

- Software inspections Concerned with analysis of the static system representation to discover problems (static verification)
  - May be supplement by tool-based document and code analysis.
- Software testing Concerned with exercising and observing product behaviour (dynamic verification)
  - The system is executed with test data and its operational behaviour is observed.

Inspections and Testing



Inspections

Requirements specification

Software architecture

UML design models

Database schemas

Program

System prototype

Testing

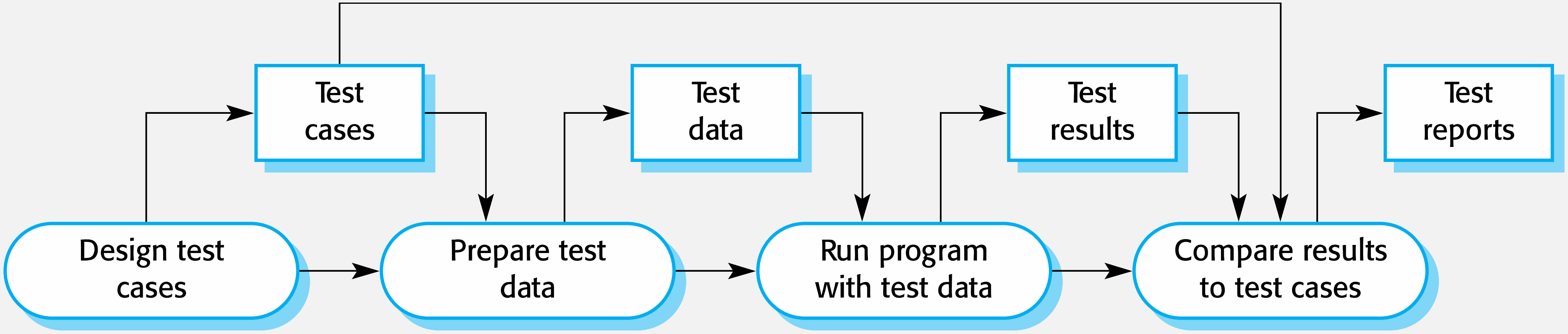
Software Inspections

- These involve people examining the source representation with the aim of discovering anomalies and defects.
- Inspections not require execution of a system so may be used before implementation.
- They may be applied to any representation of the system (requirements, design, configuration data, test data, etc.).
- They have been shown to be an effective technique for discovering program errors.

Inspections and Testing

- Inspections and testing are complementary and not opposing verification techniques.
- Both should be used during the V & V process.
- Inspections can check conformance with a specification but not conformance with the customer’s real requirements.
- Inspections cannot check non-functional characteristics such as performance, usability, etc.

A model of the Software Testing Process



Stages of Testing

- Development testing, where the system is tested during development to discover bugs and defects.
- Release testing, where a separate testing team test a complete version of the system before it is released to users.
- User testing, where users or potential users of a system test the system in their own environment.

That is all