Faculty of Engineering and Technology
Department of Computer Science

6129COMP Contemporary Software Development

Abir Hussain
a.hussain@ljmu.ac.uk
Room 633, Byrom Street

Lecture number 9

Software Testing

In this session…

- Overview of Software Testing
- Types of Testing
- Logic Errors

Introduction

- Software testing is the process of performing one or more tests.
- Test is a technical operation that determines one or more characteristics of a given software element or system, based on a specified procedure.
- The means of software testing is the hardware and/or software and the procedures for its use, including the executable test suite used to carry out the testing.

Software testing infrastructure

- Software testing is commonly described in terms of a series of testing stages.
- Aggregated software testing activities are commonly referred to as software testing phases or stages
- Within each testing stage, testing tools are used to conduct the analysis.

Testing stages

- For large software applications, firms typically use a 12-stage process that can be aggregated into three categories:
  - General testing stages.
  - Specialized testing stages
  - User-involved testing stages

General testing stages

- General testing stages are basic to software testing and occur for all software
  - Subroutine/unit testing
  - New function testing
  - Regression testing
  - Integration testing
  - System testing

Specialized Testing Stages

- Specialized software testing stages occur less frequently than general software testing stages and are most common for software with well-specified criteria.
- The following stages are considered specialized software testing stages:
  - Error-handling/survivability testing
  - Recovery testing
  - Security testing
  - Platform testing stage
  - Viral protection testing stage

User-Involved Testing Stages

- For many software projects, the users and their information technology consultants are active participants at various stages along the software development process, including several stages of testing.
- Users generally participate in the following stages:
  - Usability testing
  - Field or beta testing
  - Lab or alpha testing
  - Acceptance testing

Software testing types

- Software testing activities can also be classified into three types:
  - Conformance testing activities: Conformance testing activities looks if a software product meets the requirements of a particular specification.
  - Interoperability testing activities: whether a software product will exchange and share information (interoperate) with other products.
  - Performance testing activities: assess the performance of a software product with respect to specified metrics.

Types of Testing

- Many different types of testing
- Black box testing
  - No knowledge of internal program design or code required
  - Tests are based on requirements and functionality
- White box (glass box) testing
  - Knowledge of the internal program design and code required
  - Tests are based on coverage of code statements, branches, paths, conditions

Types of Testing

- Software Unit testing
  - Focus on individual modules/components
  - Follows a black box or white box testing (logic) approach
- Integration testing
  - Tests interfaces between two or more connected modules
- System testing
  - Tests the systems as a whole

Logic Errors

- Logic errors are one of the most common forms of error in programs
- Logic errors result from an incorrect translation of a design into code or an incorrect design or both
- Logical errors will not prevent code from compiling but they will result in incorrect calculations and/or behaviour such as incorrect output or even cause the program to crash

Software testing inadequacies

- In the past, software development focused on writing code and testing specific lines of that code.
- Little effort was spent to determine its fit within a larger system.
- Testing was seen as necessary to prove to the final consumer that the product worked.

Software testing inadequacies

	Requirements Analysis	Preliminary Design	Detailed Design	Coding and Unit Testing	Integration and Test	System Test
1960s – 1970s	10%			80%	10%	
1980s	20%		60%		20%	
1990s	40%	30%		30%		

Software quality attributes

- One of the parameters in that profit function is quality.
- Quality is defined as the bundle of attributes present in a commodity and, where appropriate, the level of the attribute for which the consumer holds a positive value.

Attribute	Description
Product Operation	
Correctness	How well the software performs its required function and meets customers' needs
Reliability	How well the software can be expected to perform its function with required precision
Integrity	How well accidental and intentional attacks on the software can be withstood
Usability	How easy it is to learn, operate, prepare input of, and interpret output of the software
Efficiency	Amount of computing resources required by the software to perform its function
Product Revision	
Maintainability	How easy it is to locate and fix an error in the software
Flexibility	How easy it is to change the software
Testability	How easy it is to tell if the software performs its intended function
Product Transition	
Interoperability	How easy it is to integrate one system into another
Reusability	How easy it is to use the software or its parts in other applications
Portability	How easy it is to move the software from one platform to another

Summary

- In this lecture, software testing was shown including general testing stages, specialized testing stages and user-involved testing stages