Software Testing

Ohjelmankehityspr., versionhallinta ja testaus – Chapter 7

What is Software Testing?

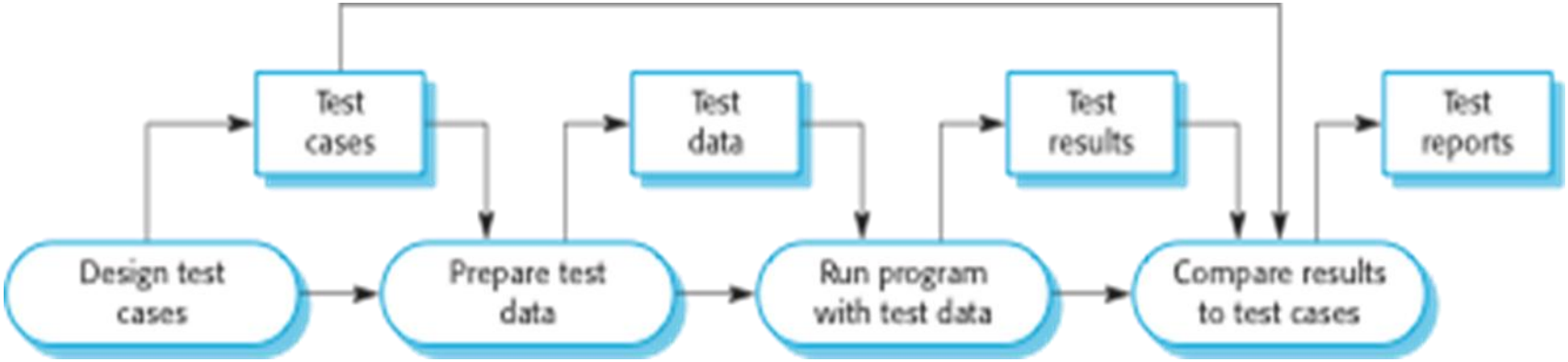
- The process of evaluating a system if the actual results match the expected results
- To ensure software system is defect and errors free
- Testing is part of a more general verification and validation process
- It is done either manually or using automated tools

> "A process of analyzing a software item to detect the differences between existing and required conditions (that is defects/errors/bugs) and to evaluate the features of the software item." ANSI/IEEE 1059 Standard

Validation and defect testing

- Validation testing
  - You expect the system to perform correctly using a given set of test cases that reflect the system's expected use.
  - **Goals of Validation Testing**
    - To demonstrate to the developer and the system customer that the software meets its requirements
    - A successful test shows that the system operates as intended.
- Defect testing
  - The test cases are designed to expose defects.
  - The test cases in defect testing can be deliberately obscure and need not reflect how the system is normally used.
  - **Goals of Defect Testing**
    - To discover faults or defects in the software where its behaviour is incorrect or not in conformance with its specification
    - A successful test is a test that makes the system perform incorrectly and so exposes a defect in the system.

A model of the software testing process



Stages of Testing

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

Unit testing

- Unit testing is the process of testing individual components in isolation.
- It is a defect testing process.
- Units may be:
  - Individual functions or methods within an object
  - Object classes with several attributes and methods
  - Composite components with defined interfaces used to access their functionality.

Software Testing – ISO Standards

Standards to improve the quality of software

- ISO/IEC 9126
- ISO/IEC 25000:2005
- ISO/IEC 12119
- IEEE 829
- IEEE 1044-1
- IEEE 12207

Types of Software Testing

- Manual Testing
  - Testing a software manually without using any automated tool or script
  - Testers use test plans, test cases or test scenarios to test a software
- Automation Testing
  - Testing through scripts or by using another software to test the product
  - It involves automation of manual process
  - It is also used to test the application from performance, load and stress point of view

Software Testing Tools

- IBM Rational Functional Tester
- SilkTest
- TestComplete
- Testing Anywhere
- WinRunner
- LoadRunner
- Visual Studio Test Professional

Software Testing Methods

- Black Box Testing
  - Testing an application without knowing the interior working of the application is black box testing
- White Box Testing
  - It is the detailed investigation of internal logic and structure of the code.
  - White-box testing is also called glass testing or open-box testing.
  - In order to perform white-box testing on an application, a tester needs to know the internal workings of the code.
- Grey Box Testing
  - A technique to test the application with having a limited knowledge of the internal workings of an application.

Black-Box Testing	Grey-Box Testing	White-Box Testing
The internal workings of an application need not be known.	The tester has limited knowledge of the internal workings of the application.	Tester has full knowledge of the internal workings of the application.
Also known as closed-box testing, data-driven testing, or functional testing.	Also known as translucent testing, as the tester has limited knowledge of the insides of the application.	Also known as clear-box testing, structural testing, or code-based testing.
Performed by end-users and also by testers and developers.	Performed by end-users and also by testers and developers.	Normally done by testers and developers.
Testing is based on external expectations - Internal behavior of the application is unknown.	Testing is done on the basis of high-level database diagrams and data flow diagrams.	Internal workings are fully known and the tester can design test data accordingly.
It is exhaustive and the least time-consuming.	Partly time-consuming and exhaustive.	The most exhaustive and time-consuming type of testing.
Not suited for algorithm testing.	Not suited for algorithm testing.	Suited for algorithm testing.
This can only be done by trial-and-error method.	Data domains and internal boundaries can be tested, if known.	Data domains and internal boundaries can be better tested.

SRC:https://www.tutorialspoint.com/software_testing/software_testing_methods.htm

Testing Web Application - Exercise

- Tetesting web applications (kamk.fi , asio pages or mooodle learning environment)for
  - Potential bugs
  - Issues related to web application security
  - Functionalities of the application
  - The ability to handle traffic

Checklist

- Functionality Testing
- Usability Testing
- Interface testing
- Database testing
- Compatibility testing
- Performance testing
- Security Testing
- Crowd testing

Functionality Testing

- To check if an application is as per the functional requirements mentioned in the developmental documentation
  - **Test all links** to make sure that there are not any broken links
    - Links include: Outgoing links, Internal link, Anchor Links, MailTo Links
  - Test Forms: Make sure all fields in form accept and process appropriate values
  - Test Cookies:
    - Make sure cookies are deleted when cache is cleared or when they expire

Usability Testing

- Site Navigation
  - Links, Menus and buttons are easily visible and consistent on all web pages
- Site Content
  - Check for legible content (No grammatical/spelling errors)
  - Images in pages should have an “alt” text

Interface Testing

- Application
  - Ensure that all requests are sent to the database and output for clients are displayed correctly
- Web Server
  - Ensure web server is handling all requests without any service denial
- Database Server
  - Ensure queries sent to databases give expected results

Database testing

- Test if errors are displayed while executing queries
- Data integrity is maintained while creating and updating data
- Test the response time of queries

Compatibility testing

- Browser compatibility test
  - Works properly across different browsers
- Operating System Compatibility
  - Works fine across multiple Operating Systems

Performance Testing

- To test website under different loads
  - Response time at different connection speeds
  - Determine the behavior of the website under normal and peak loads
  - Test if crash occurs due to peak load

Security Testing

- Test for any unauthorized access
- Restrict downloads without appropriate access
- Check sessions are automatically killed after prolonged user inactivity
- On use of SSL certificates, website should re-direct to encrypted SSL pages.

Crowd Testing:

- Select a large number of people (crowd) to execute tests

References

- Software Engineering, 9th Edition by Ian Sommerville
- https://www.tutorialspoint.com/software_testing/
- http://www.guru99.com/web-application-testing.html