

QA

What is Quality?

- Quality is relative to customer needs
- Fitness for intended use
- Degree of customer satisfaction
- Example: Quality of a pen can be relative to its users. Let's say Person A defines the quality of a pen as “good design”. Likewise, Person B can define it as “good thickness for others to read”. So, quality can be relative to each user differently.
- However, there can be general characteristics to quality but the customer is the one who defines the relative nature of the product.

What is Quality Assurance?

- Quality assurance is the process that helps a business ensure its products meet the quality standards set by the company or industry.

Quality Control

- Quality Control is the set of activities carried out to determine the level of quality.
- Includes all operational techniques and activities to fulfill the requirements

Testing

- Testing is finding out how well something works.
- Comparison between actual and expected result.
- Testing is the process consisting of all life cycle activities, both static and dynamic (testing techniques), concerned with planning, preparation and evaluation of software products and related work products to determine that they satisfy specified

requirements, to demonstrate that they are fit for purpose and to detect defects.

- Software testing ensures the software product is defect free.

Why Testing?

- To identify bugs, errors and defects early in the development and fix them before going into production.
- To improve the quality of the software.

Requirements of testing

- Completeness
- Clearness
- Correctness
- Testability

Bug

- An error caused the deviation between expected and actual result.
- Causes systems to behave in unintended ways.

Requirements for testing

- Clear understanding of software's requirements.
- Test plan or strategies to the approach.
- Quality standards it must meet before the product release.



QA	QC	Testing
Subset of SDLC	Subset of QA	Subset of QC
Process oriented	Product oriented	Product oriented
Ensure that process and procedures are in place to achieve quality	Activities to ensure the product quality	Validate the product against specification
Focus on process to achieve required quality	Focus on product to check for the required quality	Focus on actual testing of the product
Prevent defects	Find and fix defects	Find and fix defects
Proactive process	Reactive process	Reactive process
Whole project team involved	Testing team	Testing team

Human and Errors

Errors

- Errors can be caused by
 - a. Miscommunication
 - b. Incomplete specifications
 - c. Lack of domain knowledge
 - d. Inadequate testing
 - e. External factors like hardware and software issues
- Errors can be present at any level in SDLC and may result from human factors or system-level interactions.

Importance of addressing errors

- Quality and reliability
- User experience
- Security and privacy
- Cost and resources

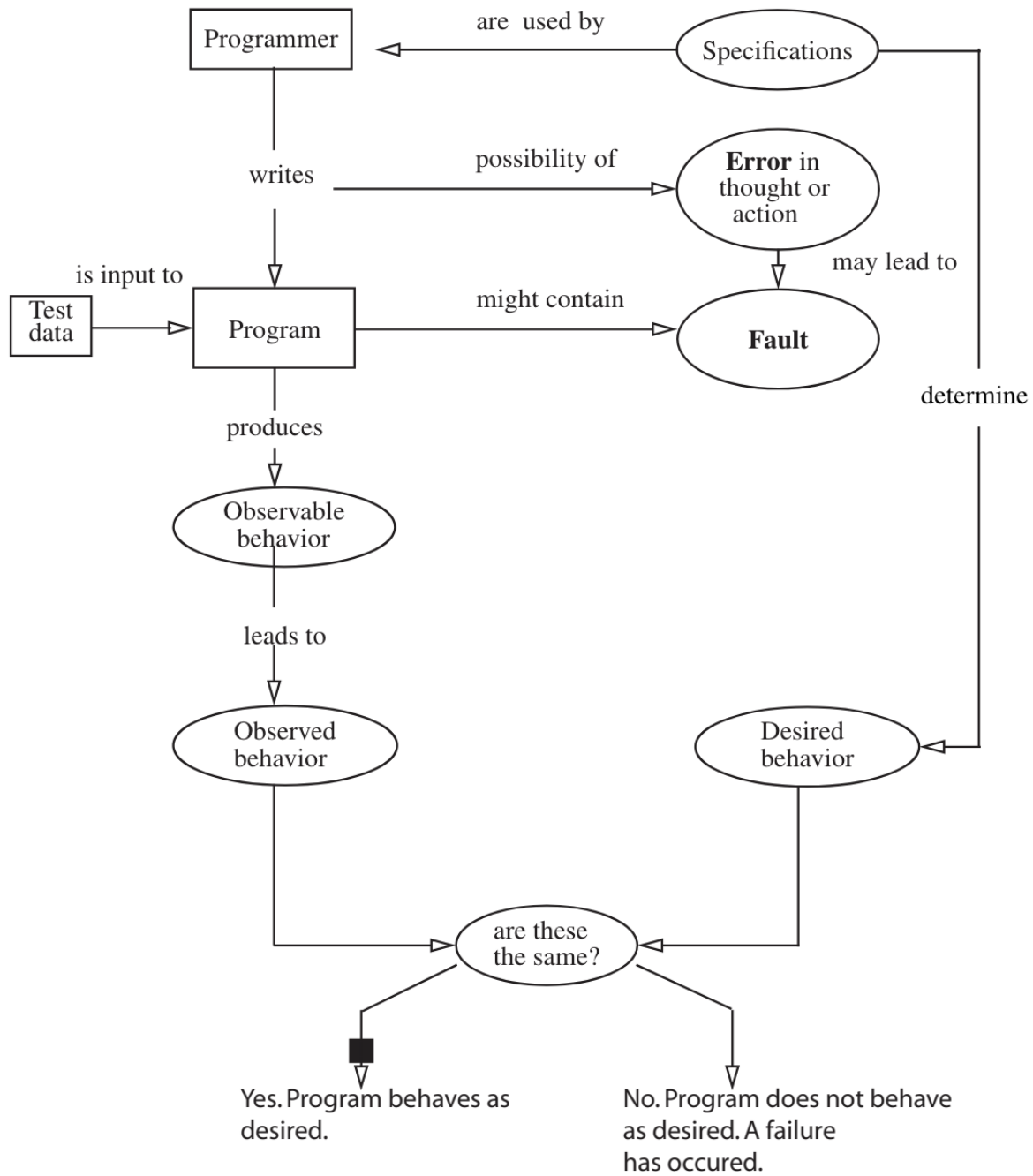
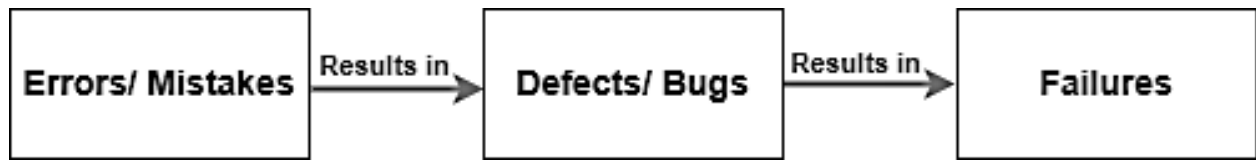
- Reputation and brand image
- Legal and regulatory compliance
- Competitive advantage
- Productivity and efficiency

Human Perception and Error

- “Deviation from the expected” may not be due to an error for one or more reasons.
- Suppose that a tester wants to test a program to sort a sequence of integers. The program can sort an input sequence in both descending or ascending orders depending on the request made. Now suppose that the tester wants to check if the program sorts an input sequence in ascending order. To do so, he types in an input sequence and a request to sort the sequence in descending order. Suppose that the program is correct and produces an output which is the input sequence in descending order. Upon examination of the output from the program, the tester hypothesizes that the sorting of the program is incorrect. This is a situation where the tester made a mistake (an error) that led to his incorrect interpretation (perception) of the behavior of the program (the product).

Failure & Fault

- Failure is the result of error or bugs.
- The programmer might misinterpret the requirements and consequently write incorrect code.
- Upon execution, the program might display behavior that does not match with the expected behavior implying thereby that a failure has occurred.
- The Fault is a state that causes the software to fail to accomplish its essential function.
- Human mistakes cause fault.
- Fault is commonly referred to as ‘bug’ or a ‘defect’



Testing VS Debugging

Testing	Debugging
Process of finding and locating defects of the Software	Process of fixing the identified defects
Performed by testing team	Performed by debugging team
Testing can be manual or automated	Debugging is always manual. It can't be automated
Testing is a stage of the SDLC	Debugging is not an aspect of SDLC, it occurs as a consequence of testing
Purpose is to find many defects as possible	Purpose is to remove the detected defects
Planned with predefined test cases	Often unplanned, in response to issues
Ensures correct functionality and requirements	Seeks root causes of defects

Software Quality

Software quality refers to the degree to which software conforms to its requirements and meets the needs of its users.

Formal Definition: “the capability of software product to satisfy stated and implied needs when used under specified conditions.”

Software quality depends on the degree to which those established requirements accurately represent stakeholder needs, wants and expectations.

Software Quality Management (SQM) is the process of constant improvement of product quality, integrated into the development process until the expectations are achieved. Software quality management aims to create a working environment where quality is the responsibility of everyone on the team.

QA and QC are the elements of software quality management.

How to measure software quality?

- Error density – errors per size of work
- Defect density
- Failure rate
- Reliability models
- Escaped defects – defects missed during development

Challenges faced when ensuring software quality

- Difficulty in clearly defining requirements
- Maintaining effective communication with stakeholders
- Deviation from specification
- Architecture and design errors
- Coding errors
- Non-compliance with current processes/procedures – teams ignoring defined process and taking shortcuts
- Inadequate work product reviews and tests – Rigorous QC is essential
- Documentation errors

Importance of Software Quality

- Improves product quality
- The software meets user needs and expectations and generate more value, leading to increased user adoption and potentially higher revenue
- Helps bring down the cost of rework as defects are detected early in SDLC
- Increased productivity

Software Requirement

According to IEEE standard 729, a requirement is defined as follows:

- A condition or capability needed by a user to solve a problem or achieve an objective
- A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification or other formally imposed documents
- A documented representation of a condition or capability as in 1 and 2.

Main types of software requirements can be of 3 types:

1. Functional requirements
2. Non-functional requirements
3. Domain requirements

How to write a software requirements specification?

The best way to create, organize, and share requirements is a Software Requirements Specification (SRS).

A software requirements specification (SRS) is a document that describes what the software will do and how it will be expected to perform. It also describes the functionality the product needs to fulfill the needs of all stakeholders (business, users).

Think of an SRS as a blueprint or roadmap for the software that is going to be build upon.

SRS comprises of four D's:

1. Define your product's purpose
2. Describe what you're building
3. Detail the requirements
4. Deliver for the approval

Importance of software requirements

- Understanding client needs
- Scope definition
- Avoiding ambiguity
- Basis for planning and estimation
- Quality assurance
- Communication and collaboration
- Change management
- Customer satisfaction
- Efficient development process