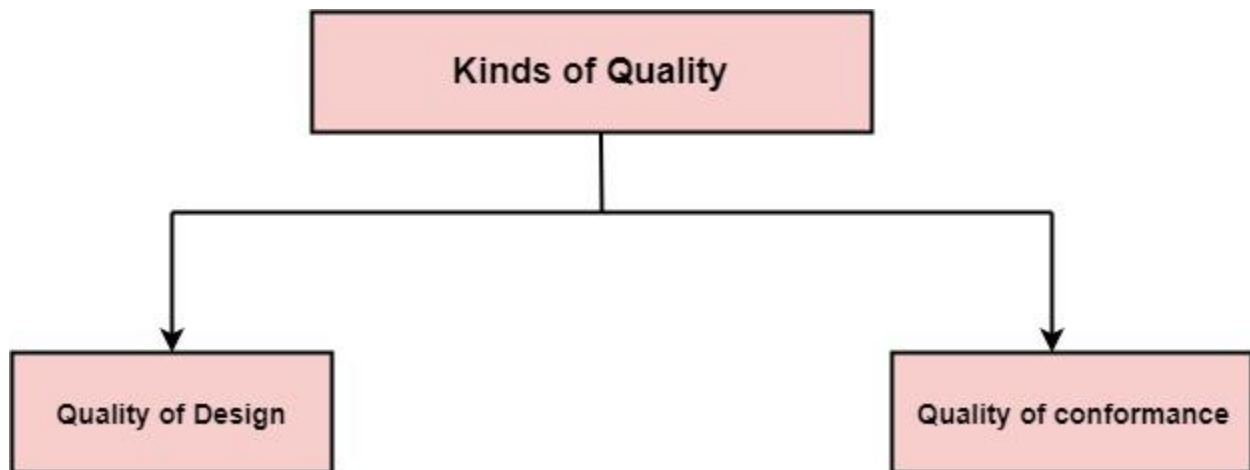


## Software Quality Assurance

### What is Quality?

Quality defines to any **measurable characteristics** such as **correctness, maintainability, portability, testability, usability, reliability, efficiency, integrity, reusability, and interoperability.**

There are two kinds of Quality:



**Quality of Design:** Quality of Design refers to **the characteristics that designers specify for an item.** The **grade of materials, tolerances, and performance specifications** that all contribute to the quality of design.

**Quality of conformance:** **Quality of conformance is the degree to which the design specifications are followed during manufacturing.** Greater the degree of conformance, the higher is the level of quality of conformance.

**Software Quality:** Software Quality is defined as the **conformance to explicitly state functional and performance requirements, explicitly documented development standards, and inherent characteristics** that are expected of all professionally developed software.

**Quality Control:** Quality Control involves a series of inspections, reviews, and tests used throughout the software process to ensure each work product meets the requirements place upon it. Quality control includes a feedback loop to the process that created the work product.

**Quality Assurance:** Quality Assurance is the preventive set of activities that provide greater confidence that the project will be completed successfully.

**Quality Assurance** focuses on how the engineering and management activity will be done?

As **anyone is interested in the quality of the final product**, it should be assured that we are building the right product.

It can be assured only when we do inspection & review of intermediate products, if there are any bugs, then it is debugged. This quality can be enhanced.

### **Importance of Quality**

We would expect the quality to be a concern of all producers of goods and services. However, the distinctive characteristics of software and in particular its intangibility and complexity, make special demands.

**Increasing criticality of software:** The final customer or user is naturally concerned about the general quality of software, especially its reliability. This is increasing in the case as organizations become more dependent on their computer systems and software is used more and more in safety-critical areas. For example, to control aircraft.

**Accumulating errors during software development:** As computer system development is made up of several steps where the output from one level is input to the next, the errors in the earlier ?deliverables? will be added to those in the later stages leading to accumulated determinable effects. In general, the later in a project that an error is found, the more expensive it will be to fix. In addition, because the number of errors in the system is unknown, the debugging phases of a project are particularly challenging to control.

### **Software Quality Assurance**

Software quality assurance is a planned and systematic plan of all actions necessary to provide adequate confidence that an item or product conforms to establish technical requirements.

A set of activities designed to calculate the process by which the products are developed or manufactured.

## SQA Encompasses

- A quality management approach
- Effective Software engineering technology (methods and tools)
- Formal technical reviews that are tested throughout the software process
- A multitier testing strategy
- Control of software documentation and the changes made to it.
- A procedure to ensure compliances with software development standards
- Measuring and reporting mechanisms.

## SQA Activities

Software quality assurance is composed of a variety of functions associated with two different constituencies ? the software engineers who do technical work and an SQA group that has responsibility for quality assurance planning, record keeping, analysis, and reporting.

**Following activities are performed by an independent SQA group:**

1. **Prepares an SQA plan for a project:** The program is developed during project planning and is reviewed by all stakeholders. The plan governs quality assurance activities performed by the software engineering team and the SQA group. **The plan identifies calculation to be performed, audits and reviews to be performed, standards that apply to the project, techniques for error reporting and tracking,** documents to be produced by the SQA team, and amount of feedback provided to the software project team.
2. **Participates in the development of the project's software process description:** The software team selects a process for the work to be performed. The SQA group reviews the process description for compliance with organizational policy, internal software standards, externally imposed standards (e.g. ISO-9001), and other parts of the software project plan.
3. **Reviews software engineering activities to verify compliance with the defined software process:** The SQA group identifies, reports, and tracks deviations from the process and verifies that corrections have been made.

4. **Audits designated software work products to verify compliance with those defined as a part of the software process:** The SQA group reviews selected work products, identifies, documents and tracks deviations, verify that corrections have been made, and periodically reports the results of its work to the project manager.
5. **Ensures that deviations in software work and work products are documented and handled according to a documented procedure:** Deviations may be encountered in the project method, process description, applicable standards, or technical work products.
6. **Records any noncompliance and reports to senior management:** Non-compliance items are tracked until they are resolved.

### Quality Assurance v/s Quality control

Quality Assurance	Quality Control
<b>Quality Assurance (QA)</b> is the set of actions including facilitation, training, measurement, and analysis needed to provide adequate confidence that processes are established and continuously improved to produce products or services that conform to specifications and are fit for use.	<b>Quality Control (QC)</b> is described as the processes and methods used to compare product quality to requirements and applicable standards, and the actions are taken when a nonconformance is detected.
<b>QA</b> is an activity that establishes and calculates the processes that produce the product. If there is no process, there is no role for QA.	<b>QC</b> is an activity that demonstrates whether or not the product produced met standards.
<b>QA</b> helps establish process	<b>QC</b> relates to a particular product or service
<b>QA</b> sets up a measurement program to evaluate processes	<b>QC</b> verified whether particular attributes exist, or do not exist, in a

	explicit product or service.
<b>QA</b> identifies weakness in processes and improves them	<b>QC</b> identifies defects for the primary goals of correcting errors.
Quality Assurance is a managerial tool.	Quality Control is a corrective tool.
Verification is an example of QA.	Validation is an example of QC.