

Course Title – Software Engg.

Course Code - 315323

Programme Name - Computer & Computer Science Engineering

Semester – Fifth

UNIT VI: Software Quality Assurance (Marks 08)

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Software Quality Assurance

8 marks.

⊕ Software Quality Management vs. s/w Quality Assurance.

⇒ Software Quality Management (SQM)

→ is process of ensuring that s/w product & development processes meet predefined standards & requirements. It span the entire software development lifecycle (SDLC), focusing on preventing defects rather than just detecting them.

objective :-

- ensure the product meets customer expectation
- maintain reliability, efficiency, usability & maintainability.
- improve processes to reduce defects and enhanced productivity.
- ensure compliance with industry standards (like ISO, CMMI, IEEE).

Components of SQM :-

1) Software Quality Assurance (SQA).

- focus on processes & standard.
- prevents defects through code review, testing strategies, audits, process checks.
- The main activity of quality assurance process is the selection & definition of standards that are applied to s/w development process / s/w product.

2) Software Quality Control (SQC)

- Focus on product verification.
- identifies & fixes defects through testing, Reviews & inspections, Bug tracking & resolution.

3) Software Quality Planning

- Define quality goals, metrics, tools & techniques
- prepare quality management plans.
- Align development process with organizational quality standards.

* Software Quality Assurance :-

- is a set of activities for ensuring quality in s/w engg. processes.
- is composed of a variety of tasks associated with two different constituencies
 - the s/w engg. who do technical work &
 - SQA group that has responsibility for quality assurance planning, oversight, record keeping, analysis & reporting.

objective

- deliver high quality s/w.
- prevent defects in the s/w process.

Activities in SQA

Process Definition → define standard development & testing processes.

Audits - check if the project follows standards

Review - review documents, code & plans.

Testing - Execute test cases.

Defect Management - track & fix

Training - Train team members on quality processes.

Diff Quality Assurance	Quality Control.
① QA is implementation of processes, methodologies & standards that ensure that the s/w developed, will be up to the required quality standards.	① QC is the set of activities that are carried out to verify the developed product meets the required standards.
② focus on improvement of process & methodology used to develop product.	② focus on improvement of product.
③ it is process oriented	③ it is product oriented.
④ it is preventive process which prevents bugs.	④ is corrective process as it focuses on identifying bugs & fixed them.
⑤ is verification activity	⑤ is a validation activity
⑥ all the persons involved in project.	⑥ only QA inspector / testing team finds the issue.

* Phases of s/w Quality Assurance

① Planning :- To define a strategy & plan for ensuring software quality.

→ identify quality goals & standards (eg. ISO, IEEE).

- prepare an SQA plan
- assign roles & responsibilities.
- Decide timelines for reviews, audits & testing.

plan identifies

- i) evaluation to be performed
- ii) Procedures for error reporting & tracking
- iii) Documents to be produced by SQA group.

Activity Phase :- To implement quality assurance tasks during development.

main activities,

- code inspections & walkthroughs
- verification & validation.
- test planning & execution.
- configuration management. (changes in code & doc).
- defect tracking and management.

Audit Phase :- To examine processes, work products and procedures to ensure they meet standards.

- conduct by internal or external auditors.
- audits can be formal (scheduled) or informal (random checks)
- ensure proper documentation, coding standards & process compliance

Review Phase :- To evaluate work products at various stages.

Types of Review

Peer Review - Done by team members

Manager Review - Done by senior staff / team leads.

Customer Review - Feedback from client.

Review are done for Requirement documents, Design documents, code, test plans.

* Quality Evaluation Standards

→ Quality Evaluation Standards are frameworks or models used to measure, control & improve the quality of software products and processes.

① Six Sigma :-

→ Six sigma is a data-driven approach used to improve s/w & business processes by eliminating defects & reducing variability.

→ The term six sigma is derived from six standard deviations.

→ It is used to eliminate error or faults or bugs in the software by evaluating the performance of the s/w process

→ Six sigma uses following approaches for processes.

i) DMAIC (Define, Measure, Analyze, Improve, Control),

— used when existing processes have fallen below acceptable levels & incremental improvement is desired.

ii) DMADV (Define, Measure, Analyze, Design, Verify)

→ used when new processes or dramatic improvement in existing processes are desired.

O: Define :- Identify and state the Practical Problem.

1. Initiate the project.
2. Write the project charter.
3. identify the customer & translate the voice of the customer into requirements
4. create high level process diagram/design.

M: Measure :- Validate the Practical Problem by Collecting Data.

1. Gather data on i/p, o/p & processes.
2. Discover & prioritize customer need.
3. Identify facts & data that offer clues to quality issue.
4. create early sigma measure of the process.

A: Analyze :- Convert the Practical Problem to a Statistical One Define statistical Goal & identify Potential Statistical Solution.

1. Analyze the data, using advanced statistics & tools as needed.
2. Find the root cause of quality issues.
3. Develop design alternatives.

Improve :- Confirm & test statistical Solution.

1. Solve the problem & act on it
2. May go back to charter to modify problem.
3. May confirm with management.
4. May modify the scope of project.
5. Implements manage & test solutions.

C: Control $\Rightarrow$ convert Statistical Solⁿ to Practical Solⁿ.

- 1) Develop & implement monitoring process to track changes & results.

2. Create response plan.
3. Help management focus on appropriate metrics
4. Handoff responsibilities to day to day operations staff.
5. Ensure management support for long term goals.

D: Design :- Design the process to

- i) avoid the root causes of defects &
- ii) to meet customer requirements.

V: Verify :- Verify that process model will avoid defects & meet requirements.

* CMMI : Levels

(Capability Maturity Model Integration).

→ CMMI is a process improvement model used to assess the maturity & capability of an organizations software processes

Purpose

- improve s/w development & maintenance process
- Help organizations deliver high-quality s/w on time & within Budget.

* CMMI maturity levels.

it has 5 maturity levels.

- i) Initial ii) Repeatable iii) Defined iv) managed
v) optimizing.

Level 1. :- → At level 1, the Process is usually chaotic
(Initial) and adhoc

- A capability is characterized on the basis of the individuals and not of the organization.
- progress not measured.
- Products developed are schedule & over budget.
- wide variations in the schedule, cost, functionality & quality targets.

Level 2 :-
(Managed) - Requirement Management.

- estimate project parameters like cost, schedule and functionality.
- measure actual progress.
- Develop plans & progress
- Software project standards are defined.
- Identify & control products, problem reports changes
- Processes may differ betⁿ projects.

Level 3 :- → clarify customer requirement
(Defined)

- solve design requirements, develop an implementation process.
- make sure that product meets the requirements
- Analyze decisions systematically.
- Rectify and control potential problems.

Level 4 :-

(Quantitatively
Managed)

- Manages the projects processes & subprocesses statistically.
- Understand process performance, quantitatively manage the organization's project.

Level 5 :- Detects & remove the cause of defects
(optimizing) early

- Identify & deploy new tools & process improvements to meet needs & business objectives.

Question Bank

Unit-VI Software Quality Assurance

2 Marks Questions

1. List any two objectives of SQA. (W-25)
 2. Differentiate Quality Control and Quality Assurance. (Any two)
 3. Differentiate between Software Quality Management (SQM) and Software Quality Assurance (SQA) (S-24)
 4. List the phases of Software Quality Assurance (SQA). (W-23)
 5. Define Software Quality Assurance Plan (SQAP). (S-23)
 6. List the Phases/Activities of SQA.
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4 Marks Questions

7. Explain CMMI Levels with respect to:
 - i) Diagram
 - ii) Description of each level (W-25)
 8. Explain CMMI with neat diagram. (S-24)
 9. Compare Quality Assurance (QA) and Quality Control (QC) with suitable examples.
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6 Marks Questions

10. Explain DMAIC and DMADV in Six Sigma. Apply Six Sigma in Hotel Management System. (W-25)
11. Describe Six Sigma. State operations in DMADV/DMAIC. (W-24)
12. Describe Six Sigma Strategy in detail. (S-24,W-24)
13. Describe CMMI. Give the significance of each maturity level. (W-23)
14. Compare CMMI and ISO (Scope, Approach, Implementation).
15. Explain the phases/activities of Software Quality Assurance.