

SOFTWARE QUALITY MANAGEMENT



Marwadi
University

**Computer
Engineering Diploma**

**Unit 7:-
Software Quality
Management
(09CE2402)**

WHAT IS QUALITY?

- ❑ **Quality** – developed product meets it's specification
 - **Quality Management**- Ensuring that required level of product quality is achieved
 - Defining procedures and standards – **Quality Assurance**
 - Applying procedures and standards to the product and process – **Quality Planning**
 - Checking that procedures are followed – **Quality Control**
 - Collecting and analyzing various quality data

SOFTWARE QUALITY ASSURANCE (SQA)

- Software Quality Assurance (SQA) is simply a way to assure quality in the software. It is the set of activities which ensure processes, procedures as well as standards suitable for the project and implemented correctly.
- Software Quality Assurance is a process which works parallel to development of a software.
- It focuses on improving the process of development of software so that problems can be prevented before they become a major issue.

SOFTWARE QUALITY ASSURANCE HAVE:

- A quality management approach
- Formal technical reviews
- Multi testing strategy
- Effective software engineering technology
- Measurement and reporting mechanism

MAJOR SOFTWARE QUALITY ASSURANCE ACTIVITIES:

(1) SQA Management Plan:

- Make a plan how you will carry out the sqa through out the project.
- Think which set of software engineering activities are the best for project.
- check level of sqa team skills.

(2) Set The Check Points:

- SQA team should set checkpoints. Evaluate the performance of the project on the basis of collected data on different check points.

MAJOR SOFTWARE QUALITY ASSURANCE ACTIVITIES:

(3) Multi testing Strategy:

- Do not depend on single testing approach. When you have lot of testing approaches available use them.

(4) Measure Change Impact:

- The changes for making the correction of an error sometimes re introduces more errors keep the measure of impact of change on project.
- Reset the new change to change check the compatibility of this fix with whole project.

MAJOR SOFTWARE QUALITY ASSURANCE ACTIVITIES:

(5) Manage Good Relations:

- In the working environment managing the good relation with other teams involved in the project development is mandatory.
- Bad relation of sqa team with programmers team will impact directly and badly on project. Don't play politics.

Software development
process

D1

D2

D3

D4

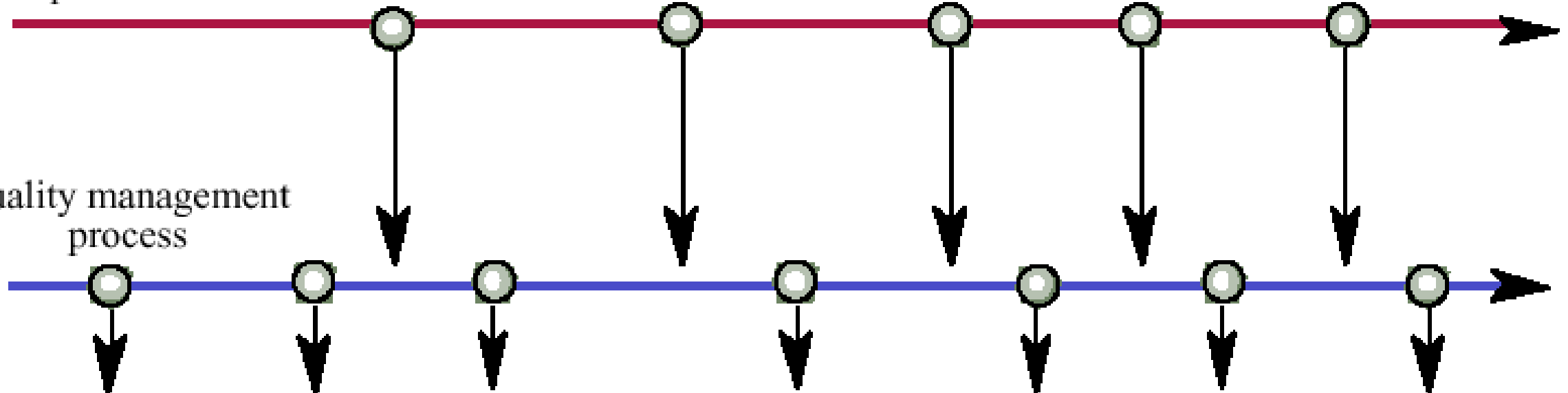
D5

Quality management
process

Standards and
procedures

Quality
plan

Quality review reports



SQA TECHNIQUES

- Statistical **quality assurance** implies the following steps:
 1. **Information** about software **defects** is collected and categorized
 2. **An attempt** is made to **trace each defect** to its underlying **cause**
 - Ex., non-conformance to specifications, design error, violation of standards, poor communication with the customer

SQA TECHNIQUES

3. **Using the Pareto principle** (80 percent of the defects can be traced to 20 percent of all possible causes), **isolate the 20 percent** (the "vital few").
4. Once the vital few causes have been identified, **move to correct the problems** that have caused the defects.
 - Some of the defects are uncovered as software is being developed.
 - Other are encountered after the software has been released.

SQA PLAN

SQA PLAN

- The goal of SQA plan is to craft planning processes and procedures to ensure products manufactured, or the service delivered by the organization are of exceptional quality.
- During project planning, Test Manager makes an SQA plan where SQA audit is scheduled periodically.

SQA PLAN

- In the SQA Plan, the Test Manager should do as following

Identify the role and responsibilities of SQA team



List of the work products that the SQA auditors will review and audit



Create the schedule to perform the SQA tasks



STEP 1.1) IDENTIFY THE ROLE AND RESPONSIBILITIES OF SQA TEAM

- In a project team, every member must have responsibility for the quality of his or her work.
- Each person has to make sure their work meet the QA criteria.
- The SQA team is the group of person who plays the major role in the project.
- Without QA, no business will run successfully.
- Therefore, the Test Manager has to make clear the responsibility of each SQA member in SQA plan as below:
 - 1) Review and evaluate the quality of project activities to meet the QA criteria
 - 2) Coordinate with management board and project teams to assess requirements and engage in project review and status meetings.
 - 3) Design track and collect metrics to monitor project quality.
 - 4) Measure the quality of product; ensure the product meet the customer expectations.

STEP 1.2) LIST OF THE WORK PRODUCTS THAT THE SQA AUDITOR WILL REVIEW AND AUDIT

- The Test Manager should
 - List out all the work products of each Test Management Process
 - Define which facilities or equipment the SQA auditor can access to perform SQA tasks such as process evaluations and audits.

STEP 1.3) CREATE THE SCHEDULE TO PERFORM THE SQA TASKS

- In this step, the Test Manager should describe the tasks to be performed by SQA auditor with special emphasis on SQA activities as well as the work product for each task.
- Test Manager also creates the scheduling of those SQA tasks.
- Normally, the SQA schedule is driven by the project development schedule.

STEP 1.3) CREATE THE SCHEDULE TO PERFORM THE SQA TASKS

Date	SQA Tasks	Personal in charge	Description	Output
30-Oct-2021	Evaluate project planning, tracking and oversight processes	James	<ul style="list-style-type: none"> - Software Specification Review - Estimation, Master Schedule and Project Plan Review 	SQA planning report, SQA review minute
15-Dec-2021	Review requirement analysis	James	<ul style="list-style-type: none"> - Review the software requirement development 	Process audit report
30-Mar-2022	Review and Evaluate Test Design	James	<ul style="list-style-type: none"> - Review the Test Design document 	SQA report, SQA review minute
30-Mar-2022	Review release	Bean	<ul style="list-style-type: none"> - Process Audit: Final Release 	SQA process audit report
02-Apr-2022	Review Project closing	Bean	<ul style="list-style-type: none"> - External review after final delivery to customer 	SQA process audit report

SQA PLAN – SUMMARY

- **The standard recommends a structure that identifies:**
 - The purpose and scope of the plan
 - A description of all software engineering work products (e.g., models, documents, source code).
 - All applicable standards that are applied during the software process
 - SQA actions and their placement throughout the software process
 - The tools and methods that support SQA actions and tasks

FORMAL TECHNICAL REVIEWS

SOFTWARE REVIEWS (FORMAL TECHNICAL REVIEWS)

- A formal technical review (FTR) is a software quality control activity performed by software engineers (and others)
- The objectives of an FTR are:
 1. To uncover errors in function, logic, or implementation; for any representation of the software
 2. To verify that the software under review meets its requirements

SOFTWARE REVIEWS (FORMAL TECHNICAL REVIEWS)

3. To ensure that the software has been represented according to predefined standards
4. To achieve software that is developed in a uniform manner
5. To make projects more manageable

REVIEW REPORTING & RECORD KEEPING

- During the **FTR**,
 - a **reviewer** (the recorder) actively **records** all **issues** that have been raised
- These are **summarized at the end of** the review **meeting**, and a reviewed issues list is produced
- In addition, a formal technical **review summary report** is **completed**

REVIEW GUIDELINES

Guidelines for conducting formal technical reviews **must be** established in advance, **distributed** to all reviewers, **agreed** upon & then followed

Review the product, not the producer

Set an agenda and maintain it

Limit debate and denial

Speak problem areas, but don't attempt to solve every problem noted

Take written notes

Conduct meaningful training for all reviewers

Limit the number of **participants** and insist upon advance preparation

Develop a **checklist** for each product that is likely to be reviewed

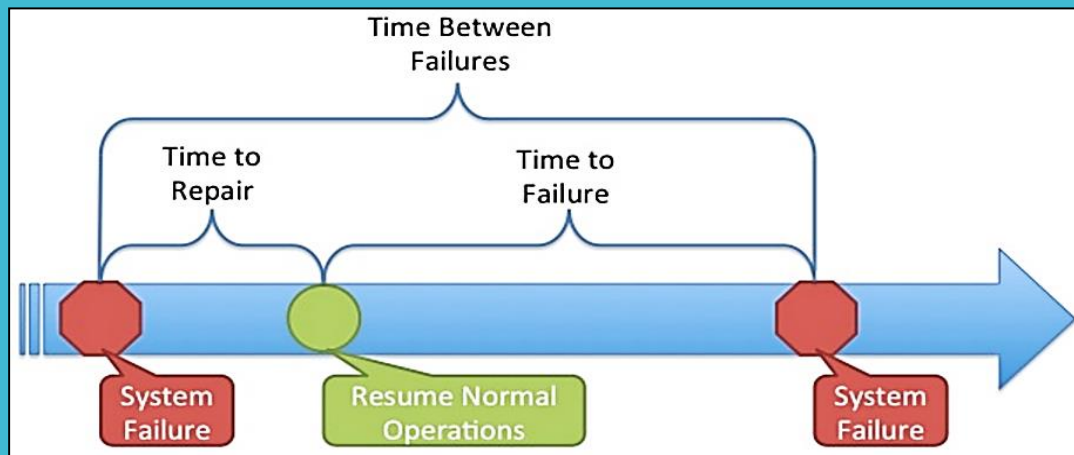
Allocate resources and **schedule** time for **FTRs**

Review your **early reviews**

SOFTWARE RELIABILITY

SOFTWARE RELIABILITY

- Software reliability is defined in statistical terms as The probability of failure-free operation of a computer program in a specified environment for a specified time
- A simple **measure of reliability** is **meantime-between-failure (MTBF)**:



$$\text{MTBF} = \text{MTTF} + \text{MTTR}$$

MTTF = mean-time-to-failure

MTTR = mean-time-to-repair

THE QUALITY STANDARDS ISO 9000 AND 9001, SIX SIGMA

ISO 9000

- The International Organization for Standardization (ISO) is an independent, non-governmental organization made up of members from the national standards bodies of over 160 countries that set international standards related to products and services.
- ISO has published over 13,000 standards.
- The ISO 9000 series of standards, related to quality management, is perhaps the most widely known and impactful of any standards issued by ISO.

ISO 9000

- The ISO 9000 definition is a description of a quality management system.
- The object of the ISO 9000 family of standards is to provide organizations with the guidance and tools needed to ensure that their products and services meet external requirements and drive consistent quality improvement.

ISO 9001

- In order **to bring quality in product and service**, many organizations are **adopting Quality Assurance System**
- ISO standards are issued by the International Organization for Standardization (ISO) in Switzerland
- **Proper documentation** is an important part of an ISO 9001 Quality Management System.

ISO 9001

- ISO 9001 is the international standard for a quality management system (“QMS”).
- In order to be certified to the ISO 9001 standard, a company must follow the requirements set forth in the ISO 9001 Standard.
- The standard is used by organizations to demonstrate their ability to consistently provide products and services that meet customer and regulatory requirements and to demonstrate continuous improvement.
- ISO 9001 standard is applicable to all engineering discipline.

ISO 9001

In order for a software organization to become registered to ISO 9001

1. It must establish policies and procedures to address each of the requirements just noted
2. Able to demonstrate that these policies and procedures are being followed

SIX SIGMA

- The word **Sigma** is a statistical term that measures **how far a given process deviates from perfection.**
- Six sigma is “A generic quantitative approach to improvement that applies to any process”
- **Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects in any process.**

SIX SIGMA

<https://www.youtube.com/watch?v=4EDYfSl-fmc>

Six Sigma is a business-driven, multi-dimensional structured approach for

- Improving Processes
- Lowering Defects
- Reducing process variability
- Reducing costs
- Increasing customer satisfaction
- Increased profits

SIX SIGMA

- To achieve six sigma, a process must not produce more than 3.4 defects per million opportunities
 - 4 Sigma → 6210 defects per million opportunities
 - 5 Sigma → 230 defects per million opportunities
- Six sigma have two methodologies.
 - DMAIC (Define, Measure, Analyze, Improve, Control)
 - DMADV (Define, Measure, Analyze, Design, Verify)

SIX SIGMA

Sigma Performance Levels – One to Six Sigma	
Sigma Level	Defects Per Million Opportunities (DPMO)
1	690,000
2	308,537
3	66,807
4	6,210
5	233

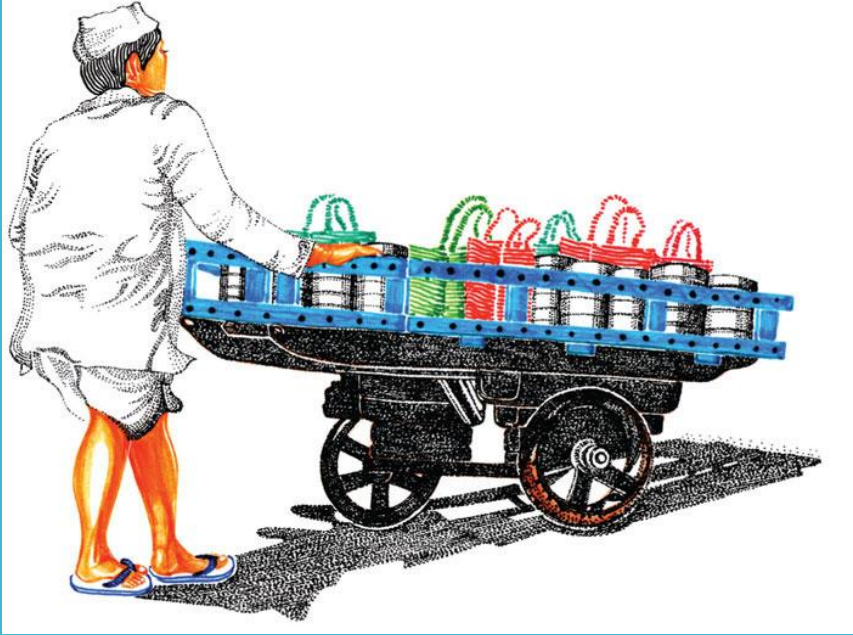
DMAIC - SIX SIGMA

- **Define:** Define the problem or process to improve upon related to the customer and goals
- **Measure:** How can you measure this process in a systematic way?
- **Analyze:** Analyze the process or problem and identify the way in which it can be improved. What are the root causes of problems within the process?
- **Improve:** Once you know the causes of the problems, present solutions for them and implement them.
- **Control:** Utilize Statistical Process Control to continuously measure your results and ensure you are improving

DMADV - SIX SIGMA

- **Define, Measure and analyze** are similar to above method
- **Design:** Avoid root causes of defects and meet the customer requirements
- **Verify:** To verify the process, compare the process with the standard plan and find differences.

EXAMPLE OF SIX SIGMA COMPANY



**Mumbai's
Dabbawalas**

For **over 100 years** they have **delivered food** to **every part of the city**, earning them a **Six Sigma rating** (a Forbes rating of 99.9 % which **means one error in 6 million transactions**).

THANK YOU!!!!