Unit 8

Software Quality Assurance and Testing

5TH

Introduction

- Quality is generally means to be a 'good thing'.
- Practically, the quality of system should be ~~vague~~, robust, precise and maintainable
  if we don't stay careful, the quality of system will be vague, undefined. ~~et~~

- Testing is an iterative process that is carried out in conjunction with implementation.
- Take measures to check quality, performance, reliability etc. before putting it into widespread.
- It is the most common way of checking that it meets its specification and does what the customer wants.

WHY TESTING:

To improve quality
To verify and validate
For reliability estimation

Objectives of Testing:

- To demonstrate to the developer and customer that the s/w meets requirements.
- To discover faults or defects in the s/w where the behaviour of the s/w is incorrect, undesireable or does not confirm its specification.

Principles of Testing:

* All tests should be traceable to customers requirements.

* Tests should be planned long before testing begins.

* The Pareto principle states that, "80% of all errors uncovered during testing will likely be traceable to 20% of all program ( ) components. Thats why a testing should be done thoroughly.

* Testing should begin "in the small" and progress toword testing "in the large".

Test Plan:

* Test plan is a document detailing a systematic approach to testing a system such as a machine / software.

* Plan typically contains detailed understanding of what the workflow will be.

* It documents the strategy "that will be used to verify and ensure that a product or system ~~needs~~ meets its design specs and other requirements".

. Test plan is typically prepared by significant input from Test Engineers.

IT INCLUDES

* Intro to test plan document

* Assumptions, when to test application

* List of cases included in testing the application

* List of features to be tested

* List of Deliverables to be tested

* Resources allocated for testing application etc.

Types of Testing:

Manual Testing	Automation Testing
⊛ Done manually by QA analyst (humans)	⊛ Testing done by using script, code and automation tool (computer)
⊛ Not accurate and reliable	⊛ Reliable and accurate
⊛ Time Consuming process	⊛ Very Fast
⊛ Can be done even if you don't have any programming knowledge.	⊛ You need to have proper good knowledge of programming.
⊛ Allows Random testing	⊛ Does not allows random testing

Methods of Testing:

(a) Black Box Testing:

* A technique to testing without having any knowledge of interior working of application
* User does not have any acces to source code.
* A tester is user who interacts with systems user interface by providing inputs and examining outputs.

(b) White Box Testing:

* Detailed investigation of internal logic and structure of code
* AKA glass box or open box testing
* For this, tester needs to have a look inside the

source code and find out which unit of code is behaving inappropriately.

© Grey Box Testing:

* A technique to test the app. with limited knowledge of the internal workings of app.
* Here, the more the "term" you know, the better carries a lot of weight while testing an app.

Levels of Testing:

Levels of testing includes different methodologies that can be used while conducting s/w testing.

ⓐ Functional. ⓑ Non-functional. Testing

(A) Functional Testing:

* Based on the specs. of s/w that is to be tested.
* Tested by providing input and then results are examined that need to conform the functionality it was intended for.
* Performed in complete, integrated system to evaluate systems compliances.

Types

ⓐ Unit Testing:

- Performed by developers before setup is handled over to testing teams.
- Performed by respective developers who are working on that particular unit of source code.

- Main goal is that it isolates all units and show that each part of program are correct in terms of their functionality.

(b) Integration Testing:

- Two or more interconnected parts (units) are used for testing and checked if they function correctly together.
- Bottom Up Integrated testing begins with unit testing followed by test of higher level combinations of units called modules.
- Top Down Integrated Testing is vice versa.

(c) ~~Ex~~: System Testing:

- Tests whole system as one at once.
- All the components are integrated and then tested to see if that meets Quality Standards.
- The app. is test in an env^n which is very close to production env^n where app. will be deployed.

(d) Acceptance Testing:

- Most imp. and conducted by QA team who looks if the app. meets intended specs. and satisfies the client's requirements.

(i) Alpha Testing

* First stage of testing, done by teams (developer & QA)
* Checks broken links, spelling mistakes, cloudy directions etc.

(ii) Beta Testing

- Users (selected one) tests the sample of the application.
- AkA pre-release testing
- Focuses on:
  - ⊛ Users run, install the app. and send their feedbacks
  - ⊛ Typographical errors, ~~ebro~~ crashing problems etc.

(B) Non-Functional Testing:

- Based upon the testing of app. from its non-functional attributes
- Involves the testing of s/w from the requirements which are non-functional in nature related but important as well such as performance, Security, user, interface etc.

TYPES

(a) Performance Testing (b) Usability Testing (c) Security Testing
(d) Portability Testing

Test Strategies

- A strategy for s/w testing must accomodate low level tests that are necessary to verify that a small source code segment has been correctly implemented as well as high level tests that validate major functionalities.
- A strategy must provide guidance for the practitioner and a ~~set~~ of milestones for the manager.

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Strategic Approach to Testing:

- Testing begins ~~th~~at component level and works outward towards the integration of entire computer based system.
- Different testing technique are appropriate at different points in time.
- The role of tester is to remove the conflicts of interests.
- Testing and debugging are different activities
- Make a distinction b/w verification and validation.

(V and V)

# Verification	Validation
Includes checking docs, design, codes & program	Includes testing and validating the actual product.
It is static testing	It is dynamic testing
No execution of any code	Code is executed
Methods of verification are reviews, inspections, and desk checking.	Methods of validation are Black Box, White Box and Non-functional Testing
QA team does it.	Testing team does it.
Comes before validation.	Comes after verification.

Century

S/w Quality Assurance: (SQA)

The defn of V and V encompasses many of the activities that we have referred as SQA.

- The process of evaluating the quality of a product and enforcing adherence to s/w product standards and procedures.
- SQA consists of a means of monitoring the s/w engineering process and methods used to ensure quality.
- SQA is organized into goals, commitments, abilities, activities, measurements etc.
- S/w must conform functional as well as non-functional requirements.

Activities done during SQA

- * Formal Technical Review
- * Quality and Configuration audits
- * Performance monitoring
- * Algorithm Analysis
- * Simulation
- * Feasibility Study
- * Database Review
- * Docs. Review etc.

Software Engineering Institute (SEI):

SEI is federally funded Research and development center headquarted on the Carnegie Mellon University in Pittsburgh, Pennsylvania, US.

- It works closely with industry and academia through research collaborations.
- Mainly focuses on following areas:
  acquisition, process mgt, risk, security, s/w development and system design in different kinds of S/w project management systems.

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Missions of SEI

(a) Research : In advancing science and practice

(b) Collaboration : Bring together and building on works found in industry, academia etc

(c) Devlopment & Demonstration : Maturing promising technologies and practices and demonstrate their utility through prototypes

(d) Transition : Propagating proven technologies and practices through publication, standards & other venues.

Capability Maturity Model [CMM]
s/w

- A development model created after study of data collected from org. that contracted with US department of Defense
- The model's aim is to improve existing s/w development processes

Structure of CMM:

(A) Maturity Level: A 5-level process maturity continum where the uppermost (5th) level is a national ideal state where processes would be systematically managed by process optimization and process improvement.

(B) Key Proces Areas: It identifies cluster of related activities, those when performed together can achieve a set of goals.

(C) Goals: The goals signify the scope, boundaries and intent of each key process area.

(D) Common Features: Includes features like: commitment to perform, ability to perform, activities performed, measurement and analysis and verifying implementation.

(E) Key Practices: Describes the elements of infrastructure and practice that contribute most effectively to the implementation of the area.

QA Organizational Structure:

- The org. structure has to provide the QA manage with direct organizational paths into every department.
- Employees continue to report to their department manager for disciplinary & non QA matters.
- Small businesses can meet these requirements by assigning the QA responsibilities to someone in management.

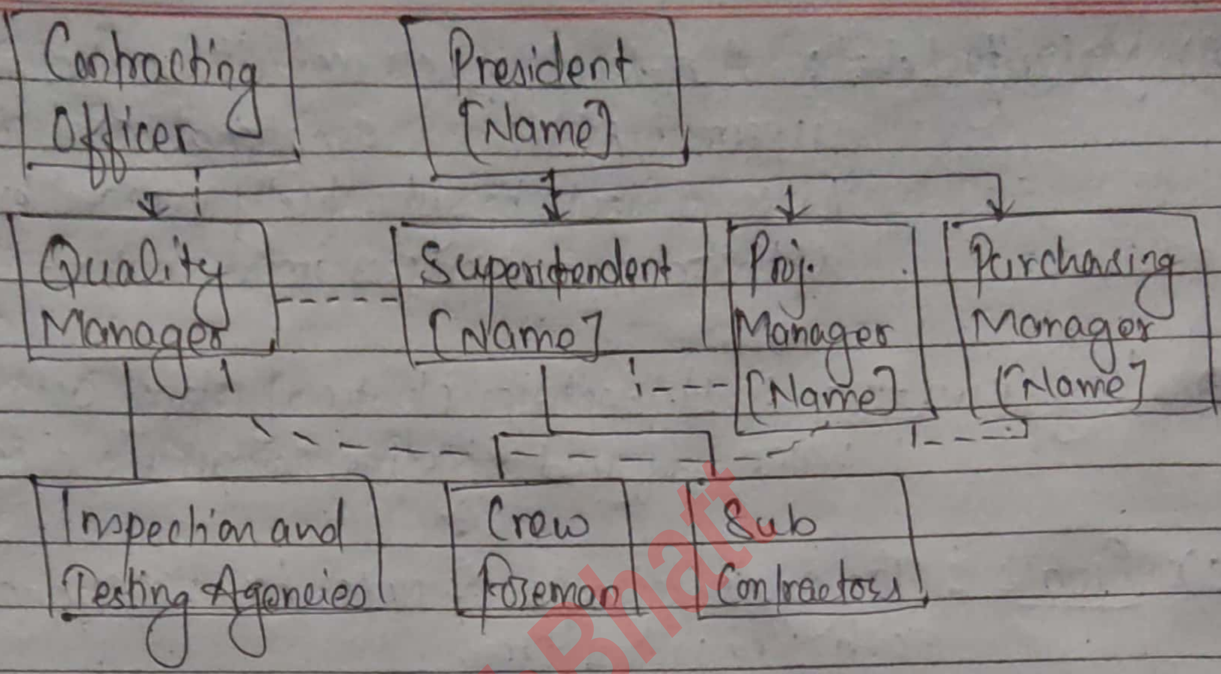

Fig: SQA org. Structure

SQA Plan:

ⓐ Mgt. Section: Describe place of SQA in structure of the org.

ⓑ Documentation Section: Describes each work product produced as part of the s/w process

ⓒ Standard, Practices, and Conventions Section: List of all applicable standards/practices applied during s/w process

ⓓ Reviews and Audits Section: Provides an approach to reviews and audits during project development

ⓔ Other: Tools, SQA methods, change control, keeping records, training etc.

ⓕ Test Section: Reference to test plan & procedure document and defines test record keeping requirements.

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