Testing Concepts

Lesson 5: Testing Metrics

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Lesson Objectives

To understand the following topics

- Monitoring the Progress
- Metrics of Test Progress
- Reporting Test Status
- Test Control
- Configuration Management & Configuration Control
- Products for Configuration Management in Testing
- Definition of Metrics
- Need of Metrics
- Metrics for Testing
- Types of Metrics
- Types of Metrics – Project Metrics
- Types of Metrics – Process Metrics
- Types of Metrics – Productivity Metrics
- Types of Metrics – Closure Metrics

Monitoring the Progress

Why Test monitoring is necessary?

- To know the status of the testing project at any given point in time
- To provide visibility on the status of testing to other stake holders
- To be able to measure testing against defined exit criteria
- To be able to assess progress against Planned schedule & Budget

IEEE 829 Standard: Test Log Template Content

- Test Log identifier
- Description (items being tested, environment in which the testing is conducted)
- Activity and event entries (execution description, procedure results, environmental information, anomalous events, incident report identifiers)

Metrics of Test Progress

Metrics should be collected during and at the end of a test level. They are also valuable input into process improvement. Common metrics for test progress monitoring include:

- The extent of completion of test environment preparation
- The extent of test coverage achieved, measured against requirements, risks, code, configurations or other areas of interest
- The status of the testing compared to various test milestones
- The economics of testing, such as the costs and benefits of continuing test execution in terms of finding the next defect or running the next test.

Reporting Test Status

Reporting test status is about effectively communicating our findings to other project stakeholders. It is usually done through Test Summary Report

IEEE 829 Standard: Test Summary Report Template
- Test summary report identifier
- Summary
- Variances
- Comprehensive assessment
- Summary of results
- Evaluation
- Summary of activities
- Approvals

Test Control

Test control is the response to Test Monitoring and Test Reporting that allows us to be IN CONTROL of the project

Issues need to monitored and reported

The process of control is the corrective actions required to put a testing effort (project) back on track

For Example:

- Re-prioritize tests when an identified risk
- Change the test schedule based on availability of a test environment

Configuration Management & Configuration Control

Configuration Management:

- A discipline applying technical and administrative direction and surveillance to identify and document the functional and physical characteristics of a configuration item

Configuration Control or Version control:

- An element of configuration management, consisting of evaluation, coordination, approval or disapproval and implementation of changes to configuration items after formal establishment of their configuration identification

Products for Configuration Management in Testing

Test plans

Test designs

Test cases:

- Test input
- Test data
- Test scripts
- Expected results

Actual results

Test tools

What would not be under configuration management?

- Live data

Definition of Metrics

Metrics - definition

- A metric is the measurement of a particular characteristic of a program's performance or efficiency.
- A quantitative measure of the degree to which a system, component or process possesses a given attribute.

Why Measure

- Tracking Projects against plan
- Take timely corrective actions
- Getting early warnings
- Basis for setting benchmarks
- Basis for driving process improvements
- Tracking process performance against business

Metrics for Testing

Defect Density

- Total Defect density = (Total number of defects including both impact and non-impact, found in all the phases + Post delivery defects)/Size

Average Defect Age

- Average Defect age = (Sum of ((Defect detection phase number – defect injection phase number) * No of defects detected in the defect detection phase))/(Total Number of defects till date)

- Defect Removal Efficiency

- DRE = 100 * No. of pre-delivery defects / Total No. of Defects

Metrics for Testing (Cont.)

Review Effectiveness

- Review Effectiveness = 100 * Total no. of defects found in review / Total no. of defects

Cost of finding a defect in review(CFDR)

- Cost of finding a defect in reviews = (Total efforts spent on reviews / No. of defects found in reviews)

Cost of finding a defect in testing(CFDT)

- Cost of finding a defect in testing = (Total efforts spent on testing / defects found in testing)

Metrics for Testing (Cont.)

Components of CoQ – Prevention Cost, Appraisal Cost, Failure Cost

Prevention Cost: (Green Money)

- Cost of time spent in DP meetings
- Cost of time spent by DPR/PM/TL on analysis of defect entries/discussions with team members
- Cost of time spent by the team in implementing the preventive actions identified from project start date to till date

Appraisal Cost: (Blue Money)

- Cost of time spent on review and testing activities from the project start date to till date

Failure Cost: (Red Money)

- Failure costs include internal and external failure costs
- Cost of time taken to fix the pre and post delivery defects
- Expenses incurred in rework – Customer does not pay for this

Money spent beyond what it would cost to build a product right first time

Cost of Quality

- % Cost of Quality = (Total efforts spent on Prevention + Total efforts spent on Appraisal + Total efforts spent on failure or rework)*100/(Total efforts spent on project)
- Failure cost = Efforts spent on fixing or reworking the pre-delivery defects + (3 * efforts spent on fixing or reworking the post-delivery defects)

Metrics for Testing (Cont.)

Test Case Effectiveness

- Test Case Effectiveness = # of defects detected using the test cases * 100/ total # of defects detected in testing
- This metrics defines the effectives of the test cases which is measured in terms of the number of defects found in testing with using the test cases
- Source of Data
  - Defect data and number of test cases from test execution report

P.S.: - These metrics are mainly applicable to V&V projects

Metrics for Testing (Cont.)

Test Case Adequacy

- Test Case Adequacy = No. of actual Test cases * 100 / No. of test cases estimated
- This metrics defines the number of actual test cases created vs. the estimated test cases at the end of the test case preparation phase
- The estimated No. of the test cases are based baseline figures and then added to test plan
- Number of Actual Test cases is also derived from project plan

P.S.: - These metrics are mainly applicable to V&V projects

Defect Detection Index

- Defect Detection Index = # of defects detected in each phase / total # of defects planned to be detected in each phase
- This is a measure of actual vs. planned defects at the end of each phase
  - Defect data from execution report

P.S.: - These metrics are mainly applicable to V&V projects

Metrics for Testing (Cont.)

Test Coverage: The following are the test coverage metrics:

Test Design:

- # Of Requirements or # Of Use Cases covered / # Of Requirements or # Of Use Cases Planned

Test Execution:

- # Of Test scripts or Test cases executed/# Of Test scripts or Test cases Planned

Test Automation:

- # Of Test cases automated/# Of Test cases

Metrics for Testing (Cont.)

Test Effectiveness

- # Of Test Cases failed (found defects)/# Of Test Cases executed

Delivered Defect Rate (Per 1000 Person Hours)

- (# Of Defects * 1000)/ Actual Effort

Defect Injection Rate (No of Defects / 100 Person Hours)

- No of Defects[phase wise] * 100/ Actual Effort[phase wise]

Defect Removal efficiency

- (# of Defects found internally / Total # Of(internal + external) Defects found) * 100

Types of Metrics

There are several types of metrics

- Project Metrics
- Process Metrics
- Productivity Metrics
- Closure Metrics

Types of Metrics – Project Metrics

The following are the Project Metrics

- Test Coverage
- Defect Density
- Defect arrival rate

Types of Metrics – Process Metrics

The following are the Process Metrics
- Test Effectiveness
- Effort Variance
- Schedule Variance
- Cost of Quality
- OTD
- Delivered Defect Rate
- Defect Slippage or Test escape

Types of Metrics – Process Metrics (Cont.)

The following are the Process Metrics
- Defect Injection Rate
- Rejection Index
- Resource Utilization
- Review Effectiveness
- Test Case Design Rework Index
- Defect Removal Efficiency

Types of Metrics – Productivity Metrics

The following are the Productivity Metrics

- Test case design productivity
- Test case execution productivity

Types of Metrics – Closure Metrics

The following are the Closure Metrics Effort distribution

- Test Design Review Effort
- Test Design Rework effort
- KM Effort

Summary

In this lesson, you have learnt:

- Various testing metrics like
  - Defect Density
  - Average Defect Age
  - Defect Removal Efficiency
  - Review Effectiveness
  - Cost of finding a defect in review
  - Cost of finding a defect in testing
  - Cost of Quality
  - Test Case Effectiveness
  - Test Case Adequacy
  - Defect Detection Index

Question 1: The defect impacting the functionality are _____.(Indirect/Direct/Standard)

Question 2: CFDR metric tells us the effort spent in finding a defect in testing

- Option: True / False

Question 3: Metrics are used to evaluate the effectiveness of the testing process

- Option: True / False

Review – Match the Following

1. Minimum	
2. Maximum	

A. Average Defect Age
B. Defect Removal Efficiency
C. Cost of finding a defect in testing
D. Review Effectiveness
E. Cost of Quality
F. Test Case Adequacy