7. Quality Control

IT6206 - Software Quality Assurance

Level III - Semester 6

Overview

7. Quality Control

7.1 Test Monitoring and Control

7.2 Metrics Used in Testing

7.3 Purposes, Contents, and Audiences for Test Reports

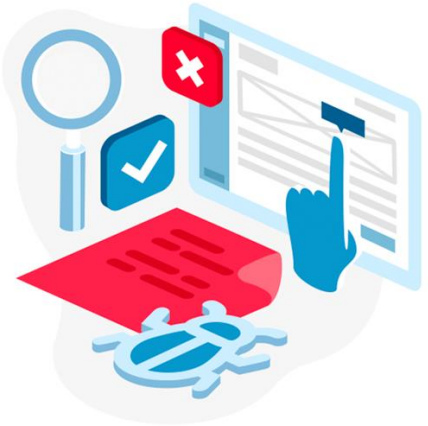
Intended Learning Outcomes

At the end of this lesson, you will be able to;

- Understand the main focuses of test monitoring and control
- Learn about test and other metrics which provide visibility into key areas of the organization and to show how metrics are used to facilitate improvement.
- Understand the purpose of a test report and the responsibilities of the intended audience.

7.1 Test Monitoring and Control

- Test monitoring and control are concerned with monitoring test execution in order to;
  - Provide feedback and visibility on test operations
  - Provide corrective action when performance deviates from expectations.
- The test manager is responsible for test monitoring and control, and for ensuring that appropriate corrective action is taken to address risks and issues.
- The status of the testing will be reported to the stakeholders in regular status reports.



7.1 Test Monitoring and Control

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  - Provide feedback and visibility on test operations
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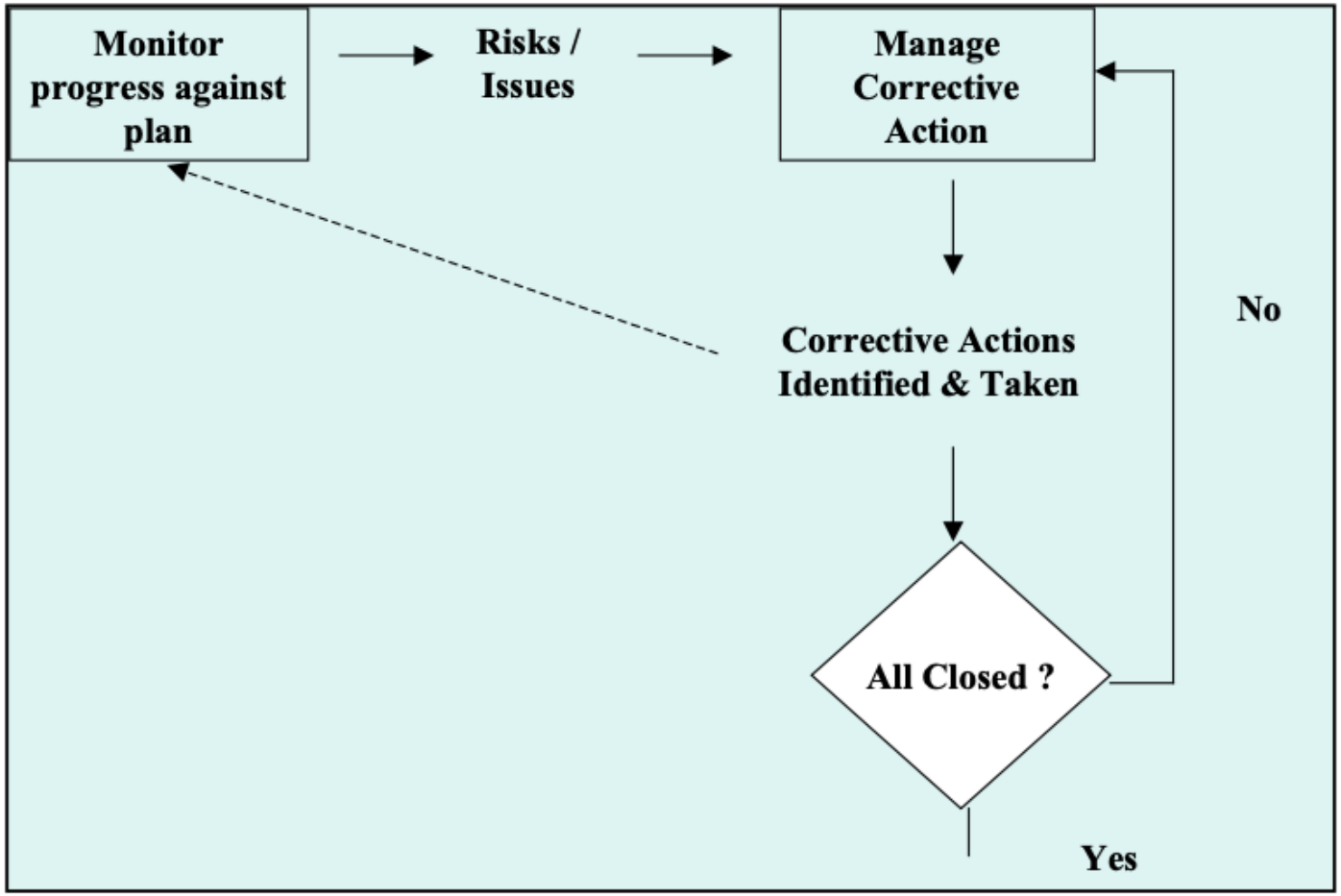
7.1 Test Monitoring and Control

The main objective of test monitoring and control is to:

- Monitor the test plan and schedule and keep on track.
- Monitor the key project parameters.
- Conduct progress and milestone reviews to determine the actual status. – Re-plan as appropriate.
- Monitor risks and take appropriate action.
- Analyse issues and change requests and take appropriate action.
- Track corrective action to closure.
- Monitor resources and manage any resource issues.
- Report the test status to management.

7.1 Test Monitoring and Control

Below is a sample process map for test monitoring and control.



O'Regan, G. (2019) Concise guide to software testing, SpringerLink. Springer International Publishing. Available at: https://link.springer.com/book/10.1007/978-3-030-28494-7.

7.2 Metrics Used in Testing

- Metrics are measurements that give a quantitative answer to the particular question, and they provide an objective picture of the extent to which the goal is currently satisfied.
- A variety of test and other metrics are available to offer visibility into key areas of the business and to demonstrate how metrics are utilized to facilitate improvement.

7.2 Metrics Used in Testing

- Many organizations have monthly quality or operational reviews in which measurements are presented and improvement patterns in the metrics may be noticed over time.
- In this section, we present sample metrics for
  - Customer satisfaction
  - Project management of testing
  - Execution of testing
  - Customer care
  - Cost of quality

7.2 Metrics Used in Testing

Customer Satisfaction Metrics

O'Regan, G. (2019) Concise guide to software testing, SpringerLink. Springer International Publishing. Available at: https://link.springer.com/book/10.1007/978-3-030-28494-7. pp. 157-158

7.2 Metrics Used in Testing

Customer Satisfaction Metrics

- The chart in the previous slide depicts the customer survey arrival rate per customer each month.
- It demonstrates that the firm has a customer satisfaction procedure in place, that consumers are surveyed, and the extent to which they are surveyed.
- It does not provide any information as to whether the customers are satisfied, whether any follow-up activity from the survey is required, or whether the frequency of surveys is sufficient for the organization.

7.2 Metrics Used in Testing

Customer Satisfaction Metrics

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7.2 Metrics Used in Testing

Customer Satisfaction Metrics

- The chart in the previous slide gives the customer satisfaction measurements for a particular customer.
- It contains several categories such as quality, timeliness in meeting the committed dates, ability to deliver the agreed content, the ease of use of the software, the expertise of the staff and the value for money.
- The numerical interpretation is:
  - 8 – 10 Exceeds expectations
  - 7 Meets expectations
  - 5 – 6 Fair
  - 0 – 4 Below expectations

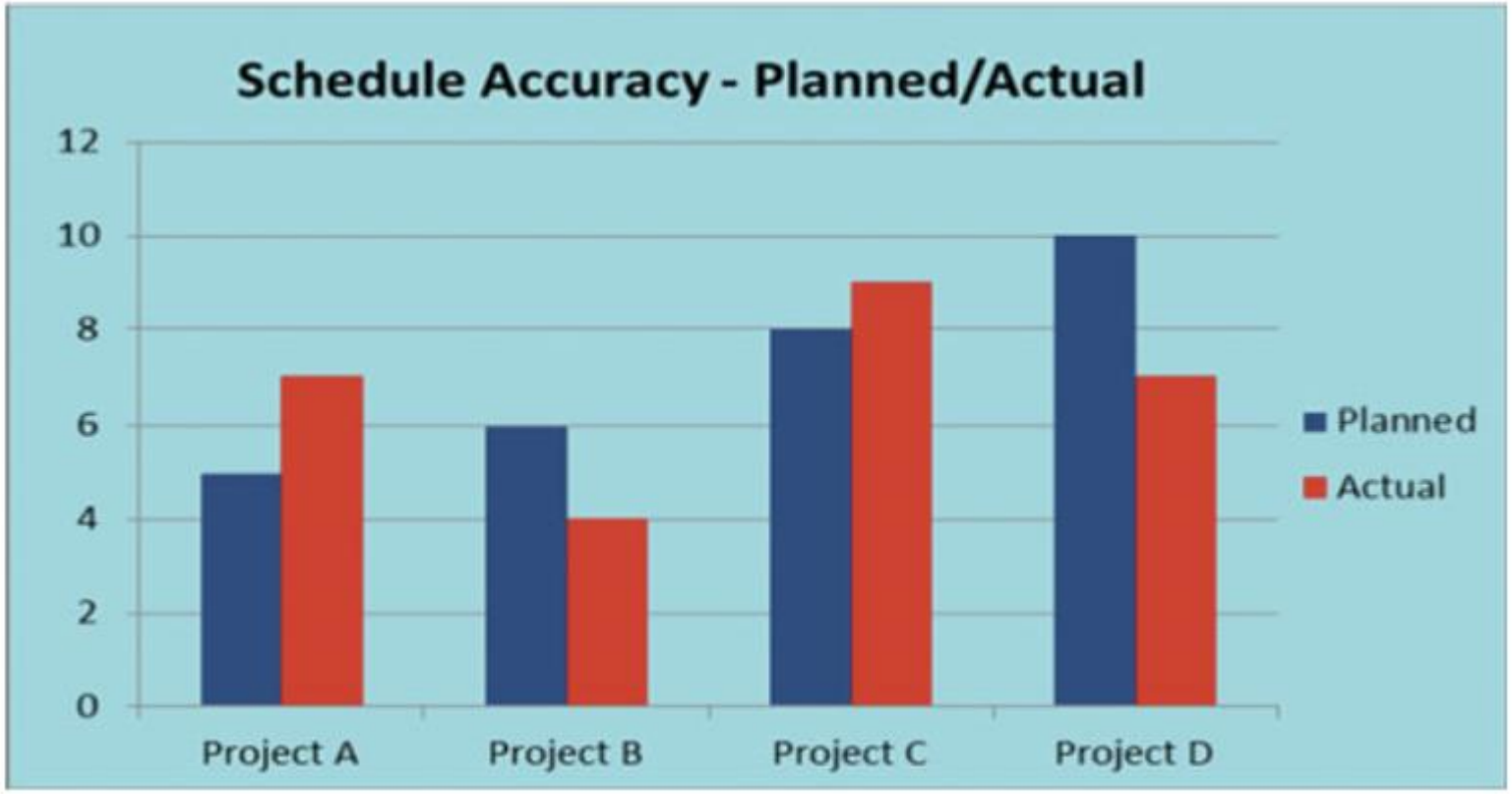
7.2 Metrics Used in Testing

Project Management Metrics for Testing

- The metrics for project management of the testing is to provide visibility into the effectiveness of the test manager in completing the testing on time, on budget, and with the right quality.

7.2 Metrics Used in Testing

Project Management Metrics for Testing



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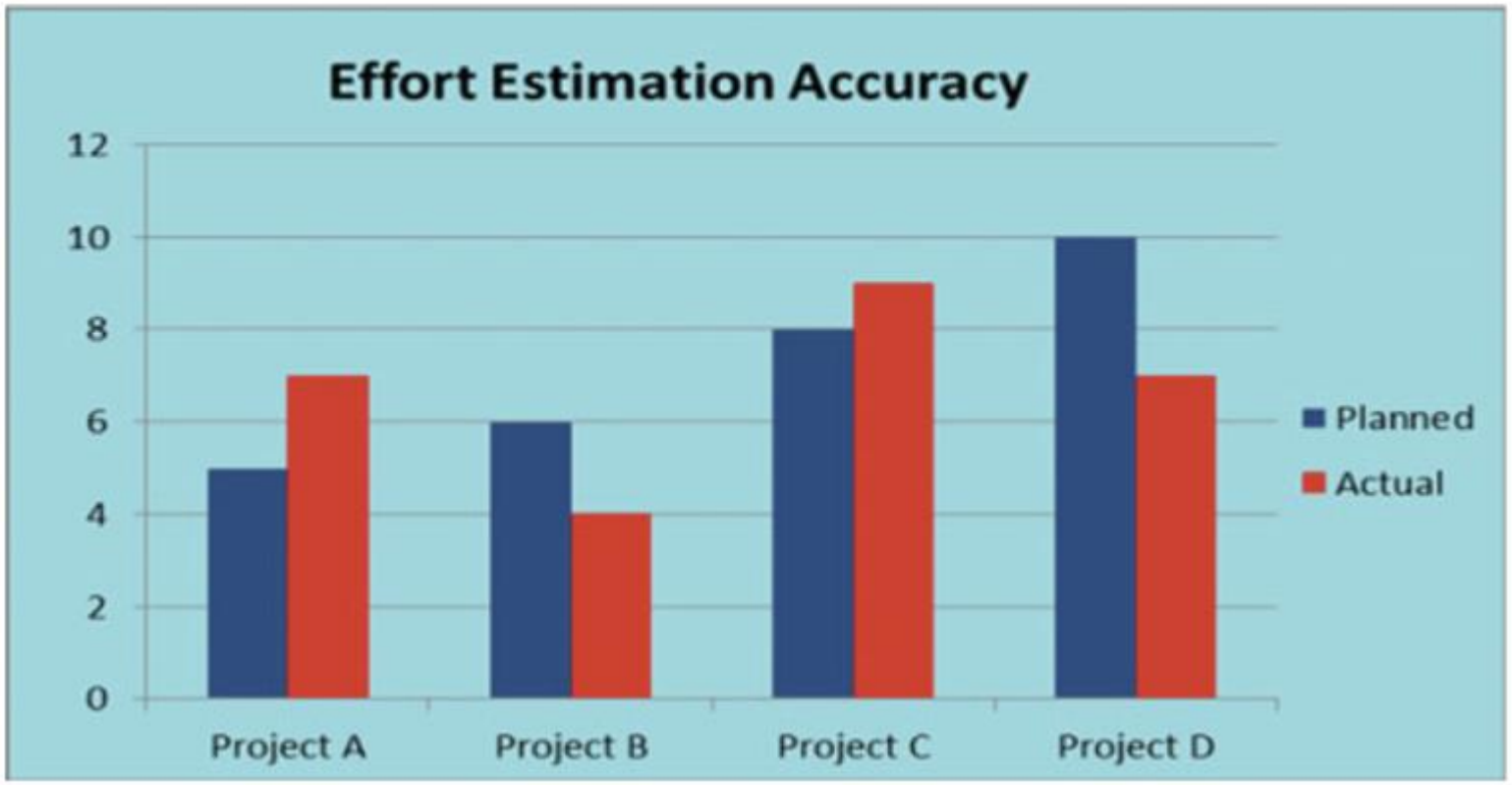
7.2 Metrics Used in Testing

Project Management Metrics for Testing

- The timeliness metric provides visibility into the extent to which the testing has been delivered on time (previous slide), and the number of months over or under schedule per project in the organization is shown.
- The schedule timeliness metric is a lagging measure, as it indicates that the testing has been delivered within schedule or not after the event.
- The on-time delivery of testing during a project requires careful tracking of the various activities in testing, and corrective actions need to be taken to address slippage in development or delays that occur during testing.

7.2 Metrics Used in Testing

Project Management Metrics for Testing



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7.2 Metrics Used in Testing

Project Management Metrics for Testing

- The chart in the previous slide provides visibility into the effort estimation accuracy of the testing.
- Effort estimation is a key component in calculating the cost of testing and in preparing the schedule, and accurate estimation is a challenge.
- The effort estimation chart is similar to the schedule estimation chart, except that the schedule metric is referring to time as recorded in elapsed calendar months, whereas the effort estimation chart refers to the planned number of person months required to carry out the work, and the actual number of person months that it actually took.

7.2 Metrics Used in Testing

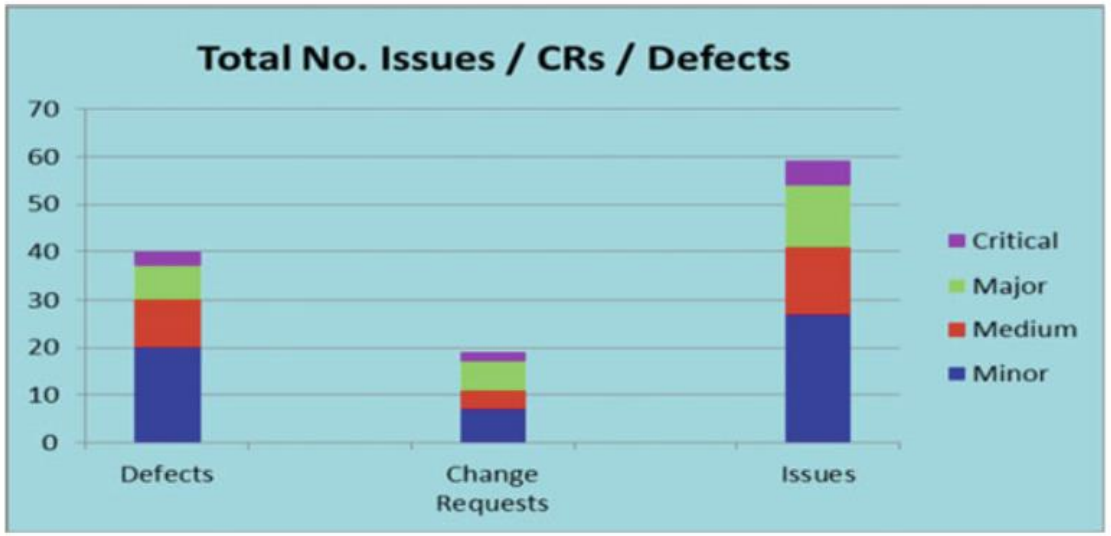
Test Execution Metrics

- These metrics give visibility into the testing.

7.2 Metrics Used in Testing

Test Execution Metrics

- Below chart gives an indication of the quality of the software produced, and the quality of the definition of the initial requirements.
- It shows the total number of defects and change requests raised during the project, as well as details on their severities.
- The presence of a large number of change requests suggests that the initial definition of the requirement was incomplete, and that there is room for improvement in the requirements process.



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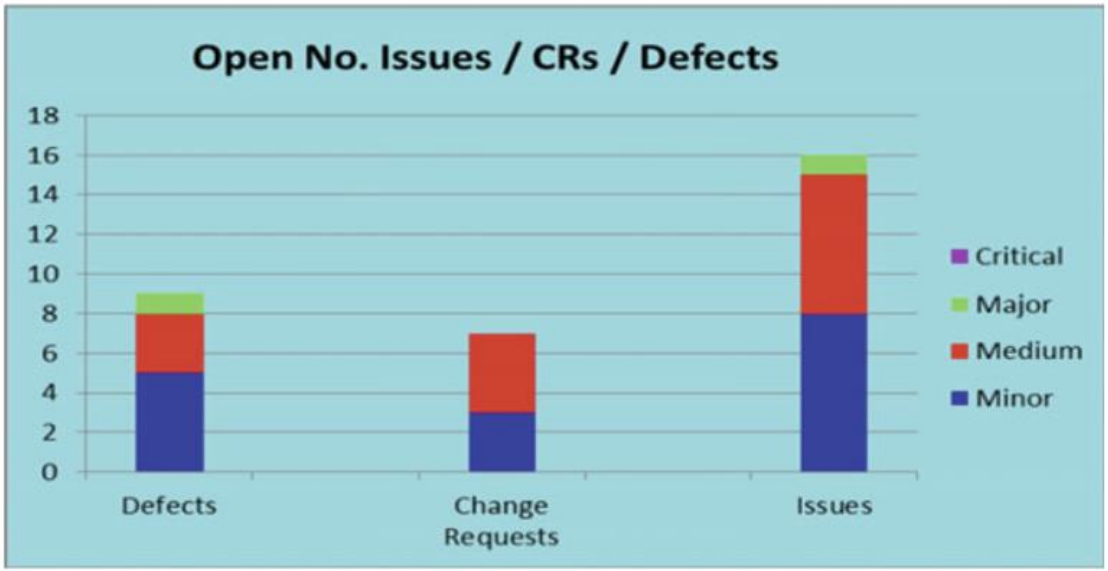
7.2 Metrics Used in Testing

Test Execution Metrics

- Below chart gives the status of open defects and change requests with the project, which gives an indication of the current quality of the project, and the effort required to achieve the desired quality in the software
- This chart is not used in isolation, as the test manager will need to know the arrival rate of problems to determine the stability of the software product.



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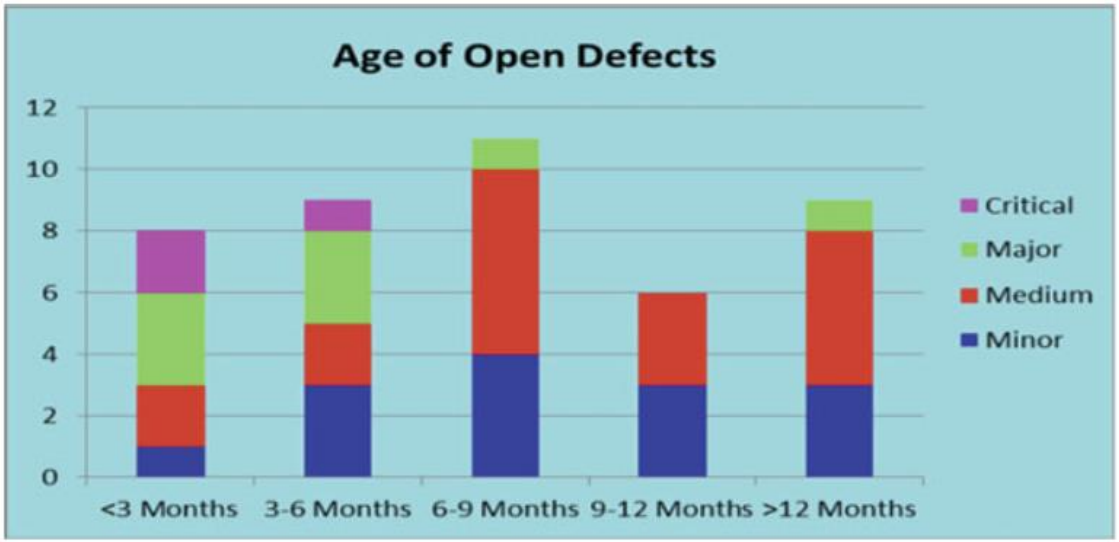
7.2 Metrics Used in Testing

Test Execution Metrics

- The test manager will need to know the age of the open problems to determine the effectiveness of the project team in resolving problems in a timely manner.
- Below chart presents a metric to present the age of the open defects, and it highlights the fact that there is one major problem that has been open for over one year.
- The project manager needs to prevent this situation from arising, as critical and major problems should be swiftly resolved.



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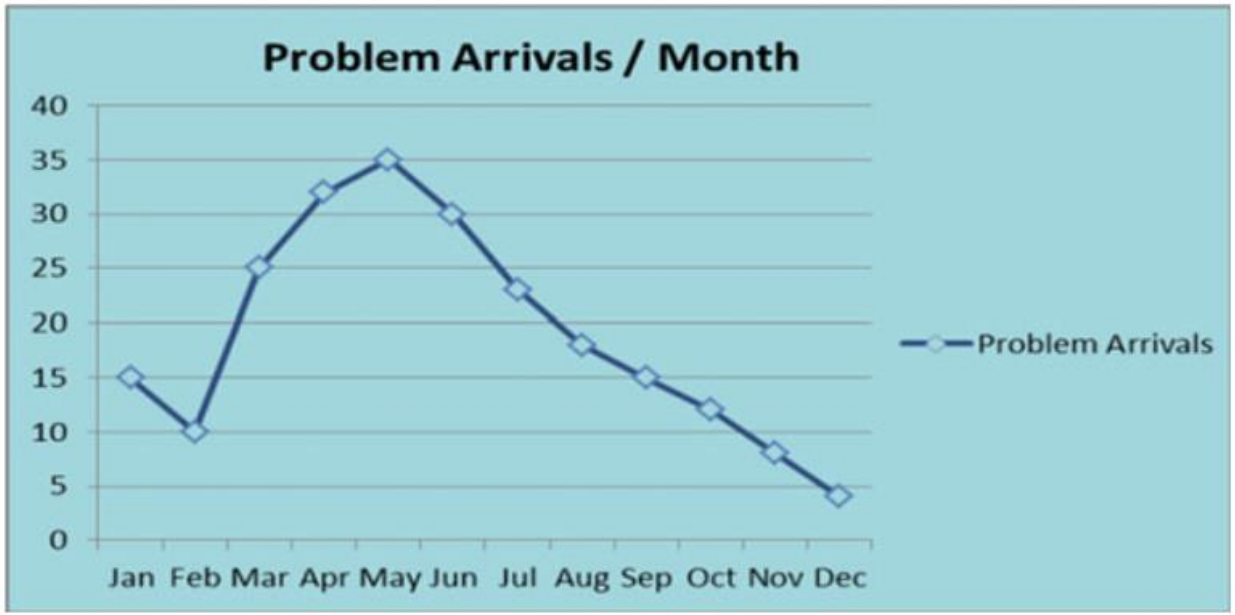
7.2 Metrics Used in Testing

Test Execution Metrics

- Below figure presents a sample problem arrival chart, which indicates positive trends with the arrival rate falling to very low levels.
- The test manager will need to do an analysis to determine if there are other causes that could contribute to the fall in the arrival rate.



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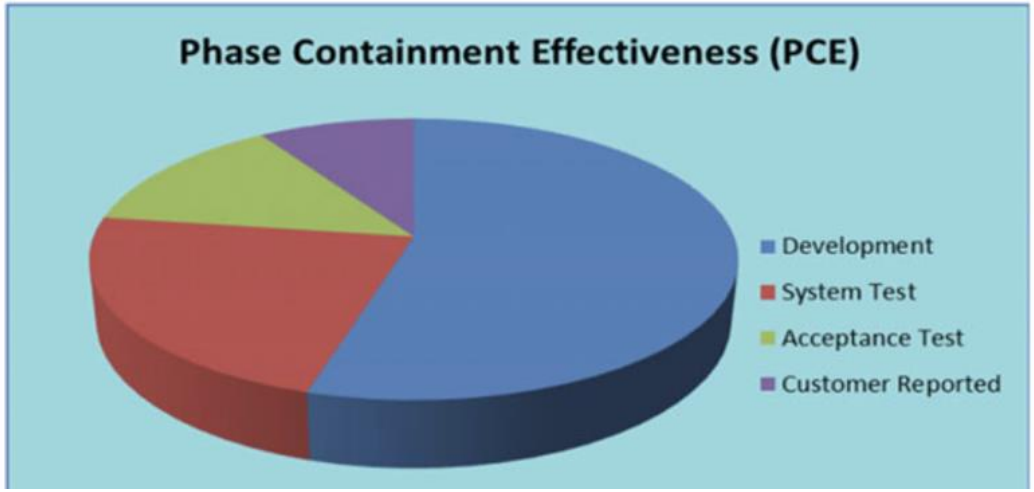
7.2 Metrics Used in Testing

Test Execution Metrics

- Below figure measures the effectiveness of the project in identifying defects in the development phase, and the effectiveness of the test groups in detecting defects that are present in the software.
- The development portion typically includes defects reported on inspection forms and in unit testing.
- The objective is that the number of defects reported at acceptance test and after the product is officially released to customer should be minimal.



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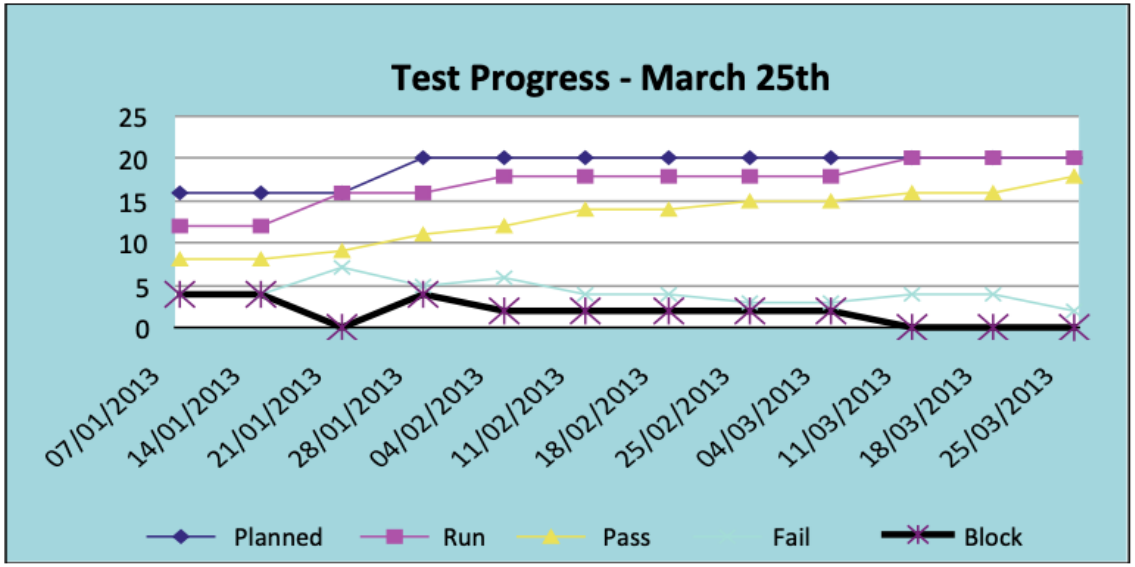
7.2 Metrics Used in Testing

Test Execution Metrics

- Below figure presents the test status of the project, including the number of tests planned, the number of test cases run, the number that have passed, and the number of failed and blocked tests.
- The test status is reported regularly to management during the testing, and extra resources are provided where necessary to ensure that the customer receives a high-quality product with all defects corrected.



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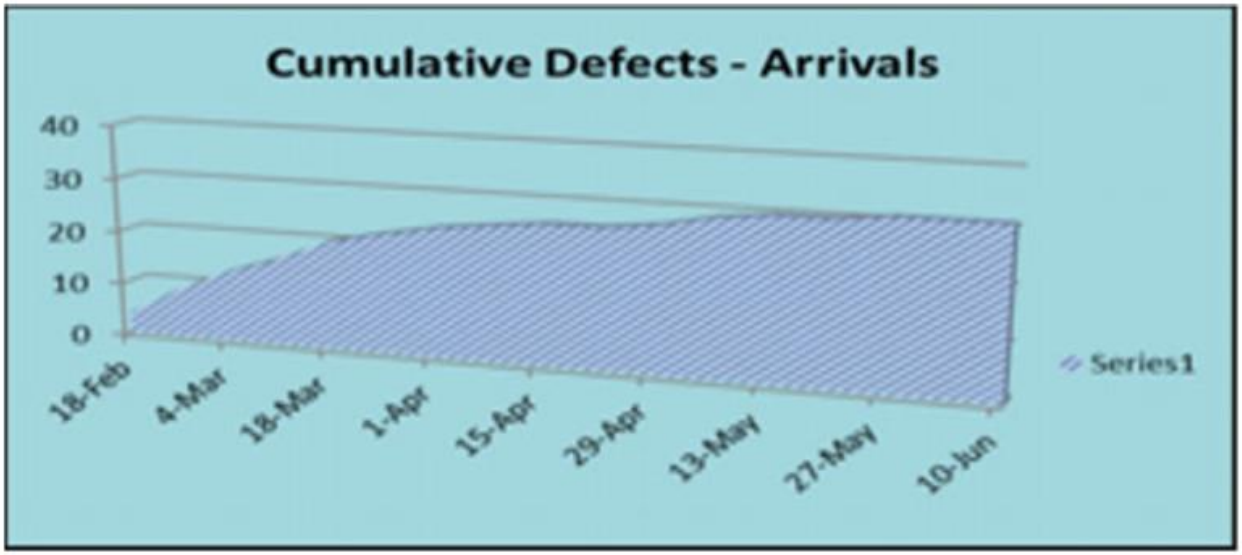
7.2 Metrics Used in Testing

Test Execution Metrics

- Below chart is the cumulative arrival rate curve.
- It gives an indication of the stability of the product. The expectation is that the curve will level off towards the end of testing, as most of the defects will previously have been identified.



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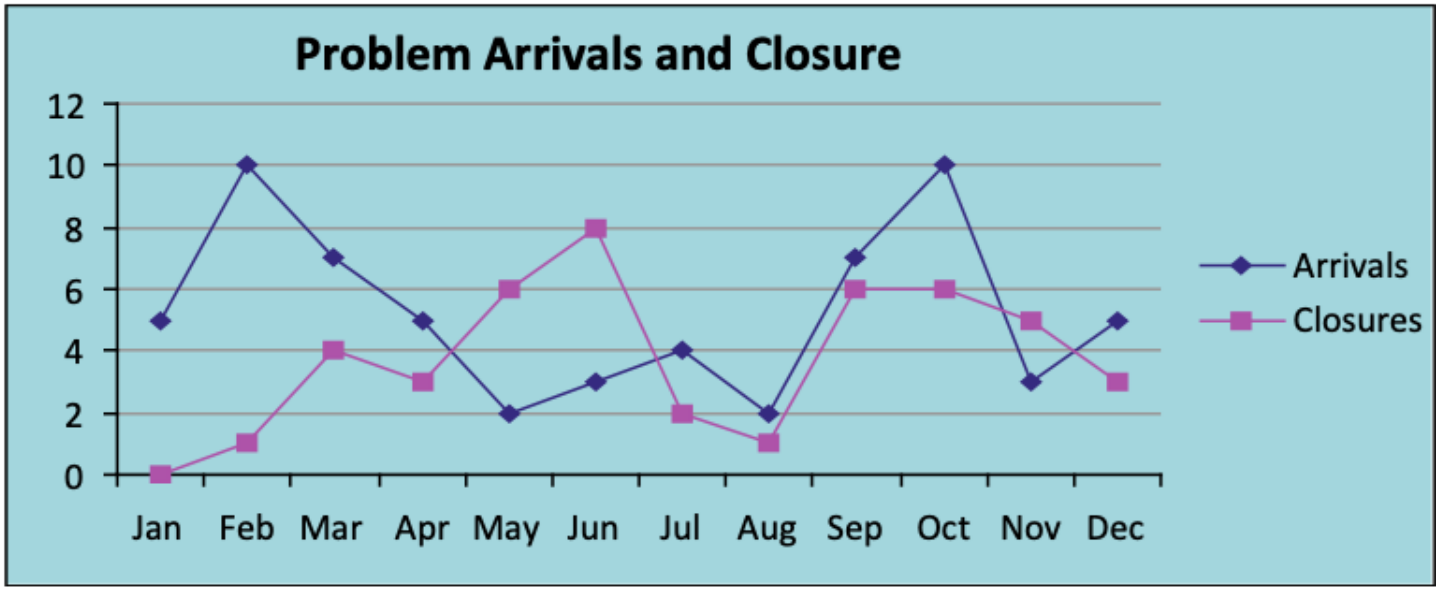
7.2 Metrics Used in Testing

Test Execution Metrics

- Below chart describes the arrival and closure rates of problems and gives an indication of the stability of the project as well as its effectiveness in resolving defects.
- The arrival rate of problems should be very low towards the end of the project.



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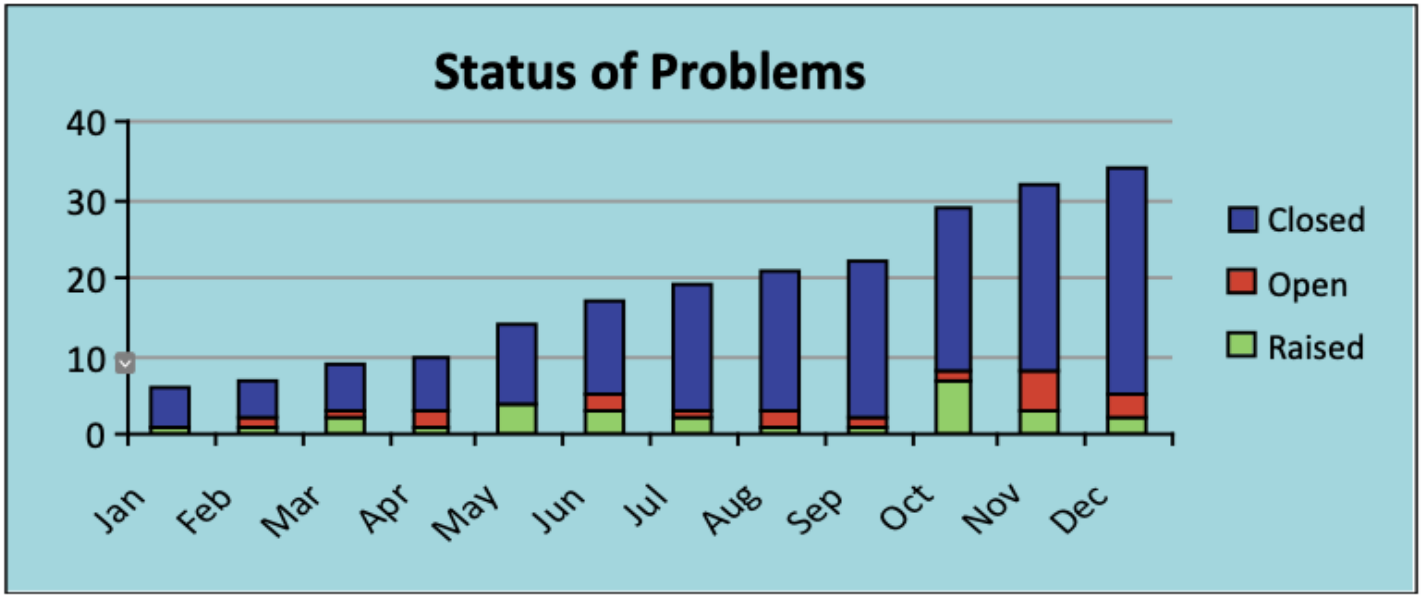
7.2 Metrics Used in Testing

Test Execution Metrics

- Below chart gives an indication of the number of raised, open and closed problems during the project.
- It does not give an indication of how serious the problems are.



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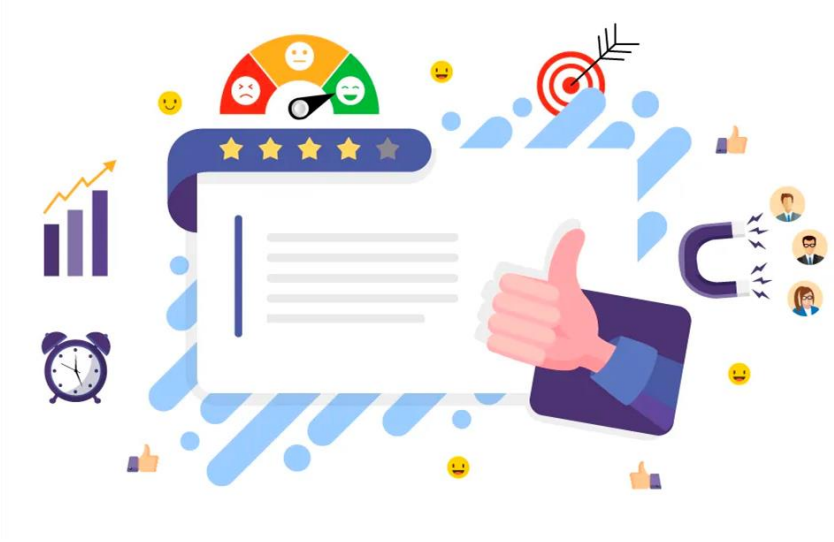
7.2 Metrics Used in Testing

Customer Care Metrics

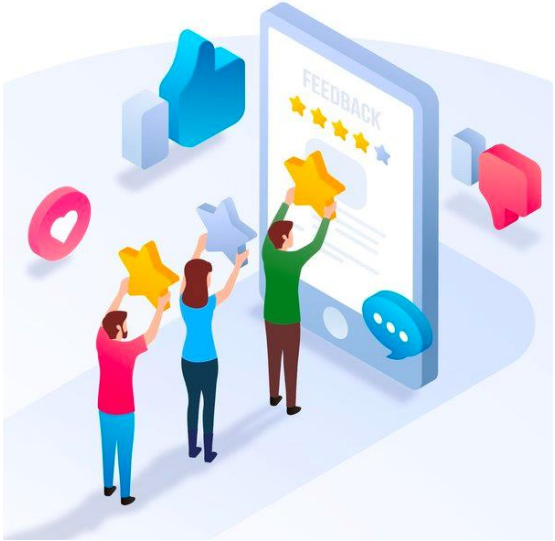
- The goals of the customer care group in an organization are
  - To respond efficiently and effectively to customer problems
  - To ensure that their customers receive the highest standards of service from the company
  - To ensure that its products function reliably at the customer's site.



7.2 Metrics Used in Testing

Customer Care Metrics

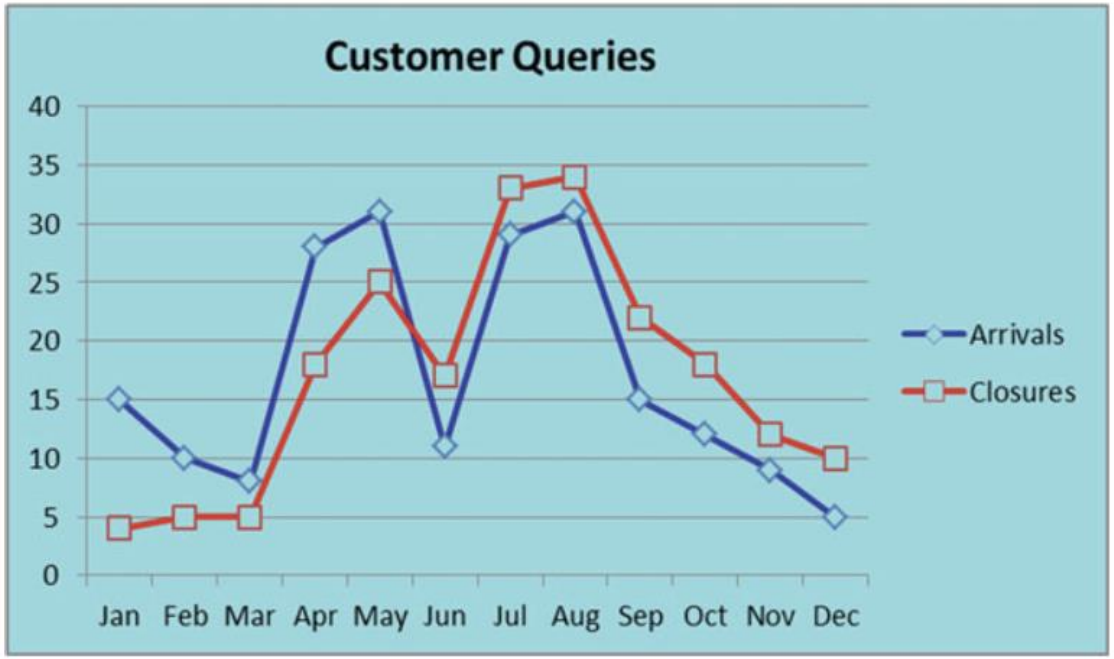
- The customer care group will need to know;
  - How effective it is in resolving customer queries
  - The number of customer queries raised during a period
  - The availability of its software systems at the customer site
  - The age of open queries.
- A customer query may result in a defect report in the case of a problem with the software.



7.2 Metrics Used in Testing

Customer Care Metrics

- Below chart presents the arrival and closure rate of customer queries.
- It shows that the arrival rate of queries in the early part of the year exceeds the closure rate of queries per month. This indicates an increasing backlog that needs to be addressed.



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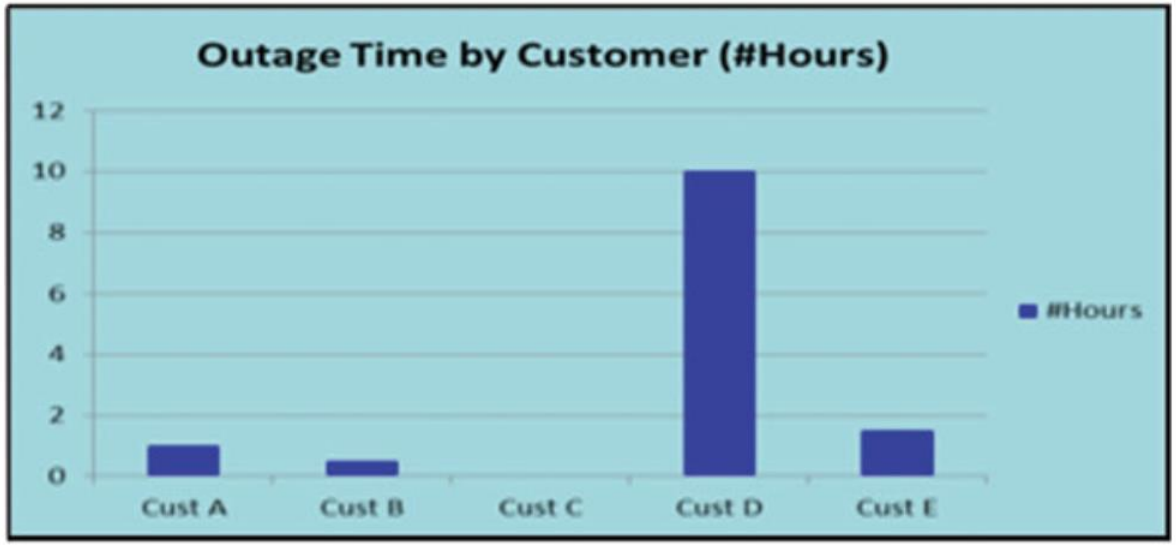
7.2 Metrics Used in Testing

Customer Care Metrics

- Below chart presents outage information on the customers impacted by an outage during the particular month and the extent of the impact on the customer.
- The customer care department will ensure that a post-mortem of the outage is performed to ensure that lessons are learned to prevent a re-occurrence.



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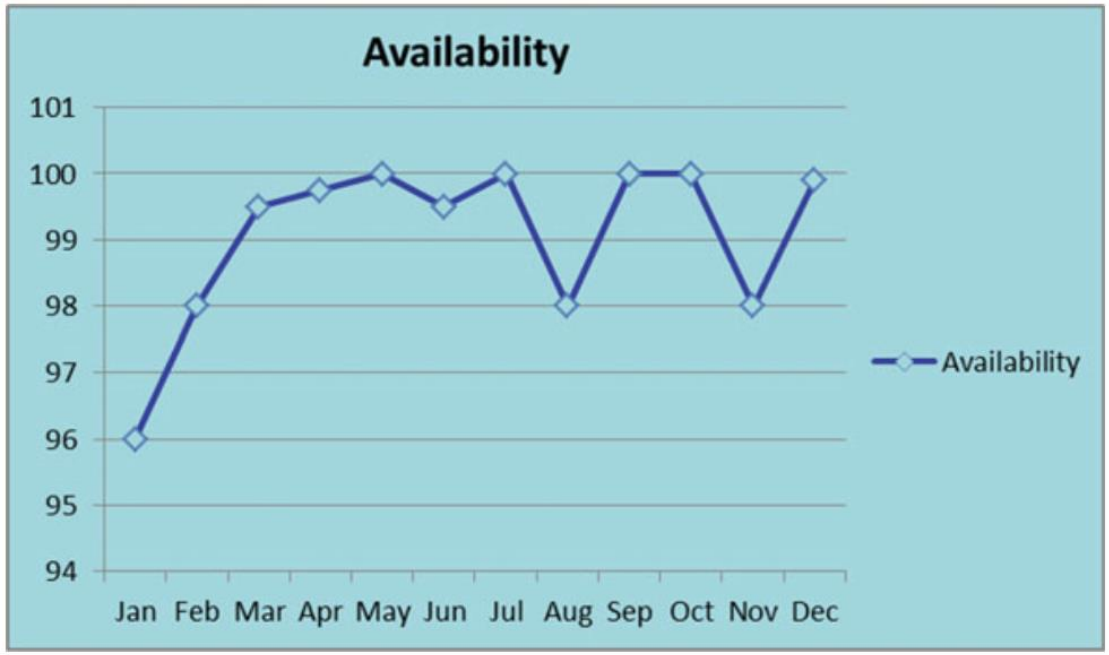
7.2 Metrics Used in Testing

Customer Care Metrics

- Metrics to record the amount of system availability and outage time per month will be maintained by the customer care group.
- Below chart provides visibility on the availability of the system.



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7.2 Metrics Used in Testing

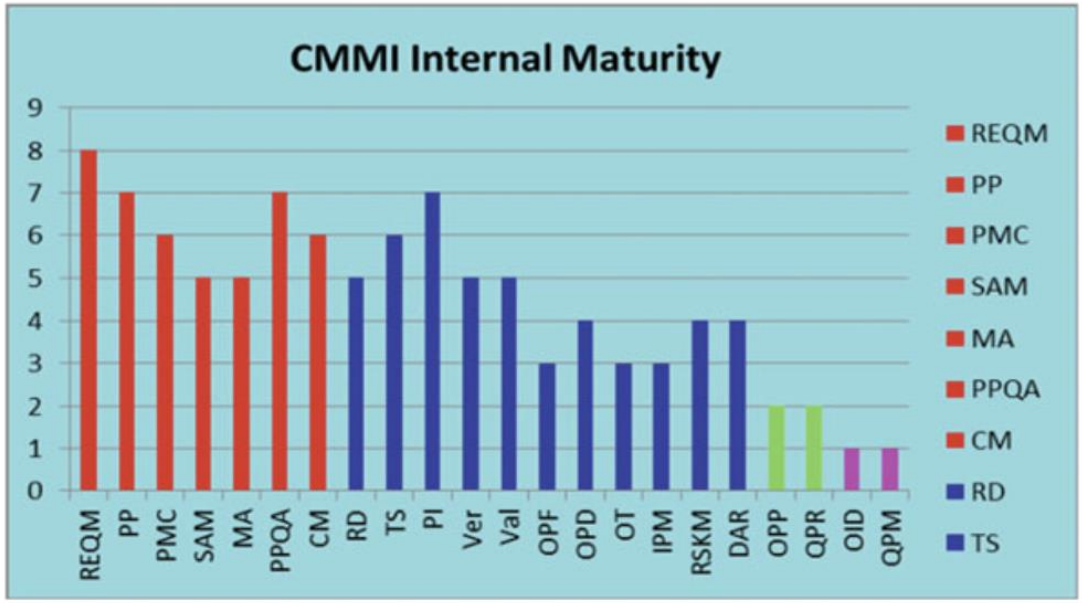
Cost of quality

- Metrics may be applied to many other areas in the organization.
- This section includes metrics on the CMMI maturity of an organization (where an organization is implementing the CMMI) and the cost of poor quality

7.2 Metrics Used in Testing

Cost of Quality

- Below chart presents the internal CMMI maturity of the organization and indicates its readiness for a formal CMMI assessment.
- A numeric score of 1–10 is used to rate each process area, and a score of 7 or above indicates that the process area is satisfied.



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7.2 Metrics Used in Testing

Cost of Quality

- According to Crosby, the most meaningful measurement of quality is the **cost of poor quality.**
- The emphasis on the improvement activities in the organization should therefore be to **reduce the cost of poor quality (COPQ)**.
- The cost of quality includes the cost of external and internal failure, the cost of providing an infrastructure to prevent the occurrence of problems, and the cost of the infrastructure to verify the correctness of the product.

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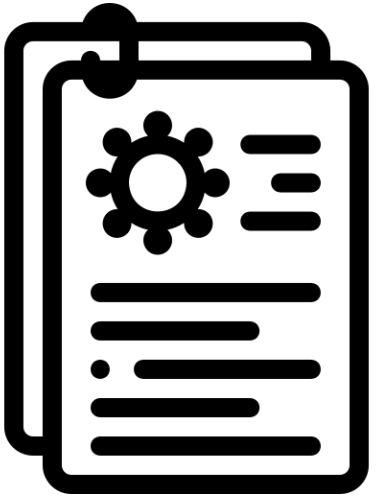
7.3 Purposes, Contents, and Audiences for Test Reports

- A test report is a document which contains a summary of all test activities and final test results of a testing project.
- The frequency of test reporting is defined in the project test plan or the communication plan and there is an IEEE standard (IEEE 829) for a test summary report.



7.3 Purposes, Contents, and Audiences for Test Reports

- The test report advises management and the key stakeholders of the current status of the testing and includes key project testing information such as:
  - Summary of testing activities and results
  - Completed deliverables (during period)
  - New risks and issues
  - Schedule, effort, and budget status
  - Test status
  - Key risks and issues
  - Milestone status
  - Activities and deliverables planned (next period).

7.3 Purposes, Contents, and Audiences for Test Reports

The below table denotes the responsibilities of the employees of the organization with regards to test reports.

Role	Responsibility
Test manager	Discuss the test report with management and present the current status of the testing as well as the key risks and issues. Explain how the key issues are being dealt with and how the key risks will be managed.
Management	Consider how the test manager plans to deal with key risks and issues, and will provide appropriate support.
Project manager	Present a recovery plan (exception report) to deal with the situation where the project has fallen significantly outside the defined project tolerance.

Summary

- Testing Metrics helps to estimate the progress and quality of a software testing process.
- Various quality metrics may be employed to measure the quality of the software, and the key risks and issues are considered.
- Metrics may be used to track the quality, timeliness, cost, schedule, and effort of software projects.
- They provide an internal view of the quality of the software product, but care is needed before deducing the behaviour that a product will exhibit externally.
- A test report is important in judging whether the software is ready to be released to the customer.