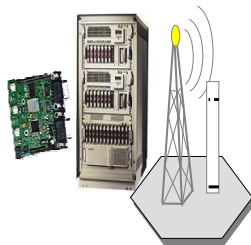




Test Efficiency and Effectiveness Tool



Bangalore
STEP-Auto
20 th Sept 2007

Presented by: Amalendu Hajra

Agenda

- Introduction of the Methodology
- Sequence of Method
- Test Efficiency Tool Implementation Details
- Test Effectiveness Tool Implementation Details
- Customer Focus Implementation Details
- Benefits
- Conclusion

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Introduction

- ❑ **Make regression test suite more effective.**
- ❑ **Make regression test suite more efficient.**
- ❑ **Find defects in the test cycle as early as possible.**
- ❑ **Align defect find with type of defect customer may face.**

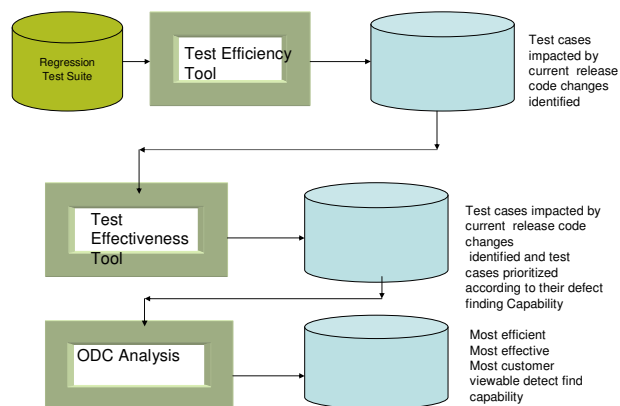
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METHOD SEQUENCE



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Test Efficiency Tool

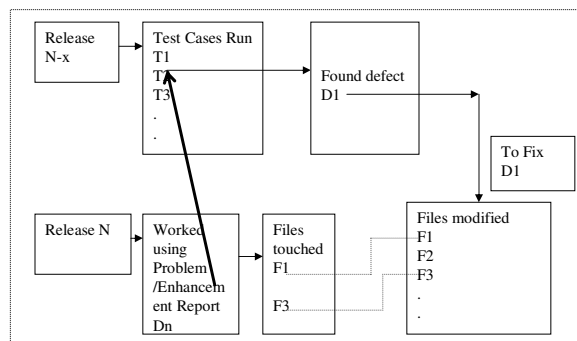
- ❑ Identify effective test cases to cover new code changes to do regression testing for a system with huge code base.
- ❑ Historical repository of all files that were modified due to defect linked to test cases.
- ❑ This mapping is then used to identify tests for the modified files in the code for the new load.
- ❑ This tool selects specific tests proven to cover a given area of code down to the file level
- ❑ Real time query and flexible query setting for reports

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Test Efficiency Tool Implementation details



Test case T2 will be selected to run as file coverage for the code modification due to PR work Dn

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Test Efficiency Tool Report

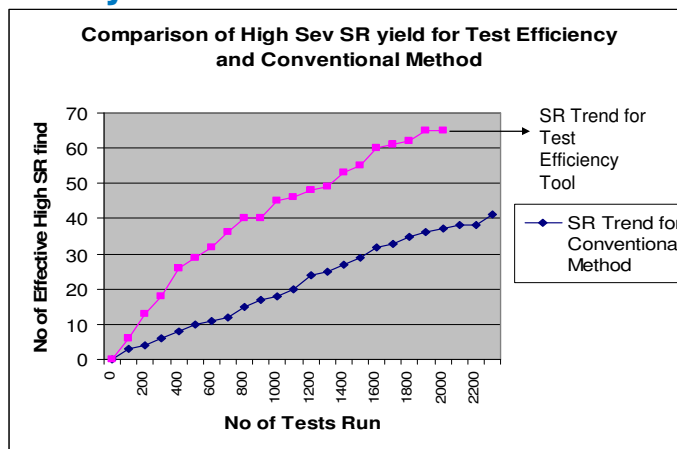
- List all cases in load line that provide 'File Coverage' for the modified files in a load.
- List all modified files in a load where there is no case attached in load line
- List all cases that can provide 'File Coverage' for all files that are not covered for a load in load line
- List all modified files that do not have any case in the entire Code Coverage Tool database to provide 'File Coverage'
- List files modified with File Risk Analysis

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Comparison of High Sev SR yield for Test Efficiency Tool and Conventional Method



SR yield for the test suite selected using Test Efficiency Tool is almost 50% more compared to conventional regression test suite selected by subject matter experts.

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Test Effectiveness Tool

- Few test cases are effective in finding defects where as others are not.
- Number of unique SRs found by the test case, and valuable ratio based on the test case information from Test Management System
- Defined Test Effectiveness Ratio as no of high severity defects found by any specific test case to no of times the test case was executed in previous releases
- With this ratio test cases are ranked according to their ability of finding defects
- Find historically “capable test cases” and prioritize them for execution earlier in the test cycle

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Test Effectiveness Tool Report

SR_Weight: A Weighted SR number by SR severity weight, the formula is:

$$\text{SR_Weight} = \text{sum}(\text{Weight_Pi} * \text{Number of Pi SR}) \text{ (i=1,2,3)} =$$
$$\text{Weight_p1} * \text{number of P1} + \text{Weight_p2} * \text{number of P2} +$$
$$\text{Weight_p3} * \text{number of P3. Currently the Weight_pi value is:}$$

the Weight_p1=1.0, Weight_p2=0.9, Weight_p3=0.7

Example: Test Case1 catch 1 P1 SR, 2 P2 SR, 2 P3 SR, so the Test Case1's effectiveness is $1.0*1 + 0.9*2 + 0.7*2 = 4.2$, if the SR_Weight is higher, the effectiveness will be higher too.

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Test Effectiveness Tool Report Contd.

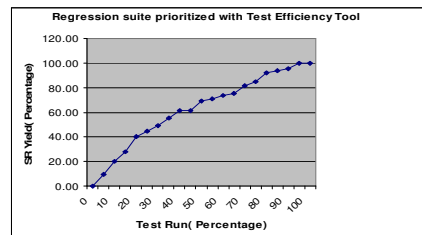
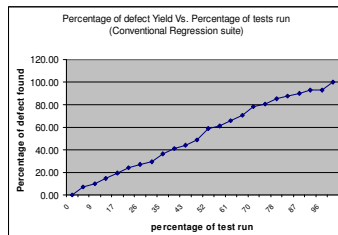
- ❑ TOTAL_EXEC_DURATION: Total Execution duration in seconds.
- ❑ TOTAL_INV_DURATION: Total Investigation duration in seconds.
- ❑ TOTAL_SET_DURATION: Total Setup duration in seconds.
- ❑ LATEST_EXEC_DATE: Date when this case is last executed.
- ❑ EXEC_EVAL_STRING: This is the execution evaluation string starting from most recent execution.
- ❑ HIGH_SEV_RATIO: Ratio of High Severity P1/P2 SR/PRs to the total instances of unique execution. This is the ratio that has shown good correlation for early defect detection when used in test case execution prioritization.
- ❑ ALL_SEV_RATIO: Ratio of All SR/PRs, including all severity SR/PRs, to the total instances of unique executions.
- ❑ HIGH_SEV_PER_EXEC_SEC: Ratio of High Severity P1/P2 SR/PRs to the total instances of unique execution
- ❑ TOTAL_EXEC_DURATION: Total execution time is described in seconds.

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Comparison of Defect Arrival rate



- ❑ Early defect arrival is very high towards the beginning of test cycle for suite prioritized with test efficiency tool .
- ❑ In case of conventional method 60% defects found after initial run of apprx 60% of total regression suite.
- ❑ where as test suite selected with Test efficiency Tool has 60% defect found after a run of almost 45% of the total regression suite.

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Align defect find with type of defect customer may face.

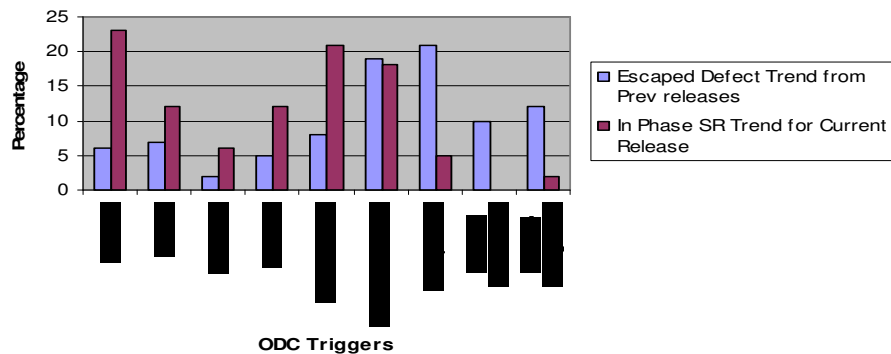
Are we finding defects which probably customer may find ?

- ODC provides a basic capability to extract signatures from defects
- Infer the health of the development and testing process.
- Defect triggers capture the circumstance that allowed the defect to surface.
- The verification stages could be the testing of code or the inspection and review of a design.
- These data can eventually provide feedback on the verification process
- ODC provides a very low cost method to bring issues to the table and rank orders them in terms of trigger and impact.

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Align Test To Find more Customer Visible Defects

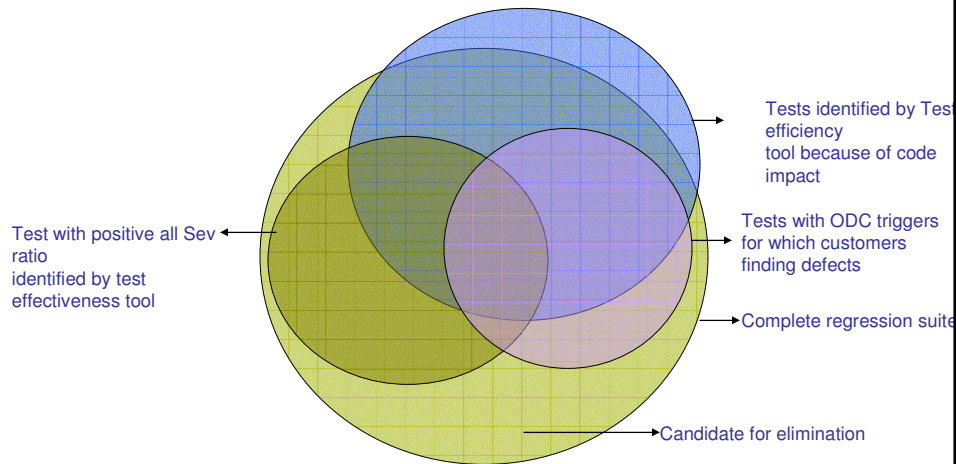


- In this example test scenarios having triggers Startup/Restart, Software Configuration and recovery/Exception needs additional focus :
- More detail analysis of testing done in these trigger areas
- More exploratory testing in these areas
- More test scenarios for these triggers

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Test Elimination approach



Test Elimination approach Contd.

Criteria for Test elimination:

- Test case is not impacted by any code change in current release
- and
- It has zero all severity ratio in previous releases
- and
- It is in the ODC category, where customer is finding almost zero defects)

Benefits from this Method

Test Efficiency Tool

- Finding more number of unique defects , More code coverage , Less escape defects.

Test effectiveness Tool

- Defects are found early in the test cycle
- Test suite consists of test cases capable of finding more unique defects.
- Eliminate test cases with zero effectiveness over several releases.

Customer Focus (Orthogonal Defect Classification)

- Test team found more defects which customer probably would have found . Less escape defects.

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