WATCH YOUR STEP
A TEST PROCESS IMPROVEMENT FRAMEWORK

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AGENDA

- TESTING TIMES...
- STEP OVERVIEW
- STEP PROCESS AREAS
- STEP FLAVORS
- FEEL AGILE. NOT FRAGILE!
- STEP & THE OTHERS
- CASE STUDY
TESTING TIMES...

- Are our Quality Control and Assurance practices comprehensive?
- Do we know the maturity of our testing?
- Are we comfortable in improving our test processes?
- Are we comfortable in sustaining mature test processes?
- Are our Test Processes immune to the volatile nature of Enterprises?

More often than not, the answer is ‘**NO**’ or ‘**DON’T KNOW**’

**STEP is a Process Improvement Framework that helps you answer ‘Yes’ (At least trend towards Yes)**
STEP OVERVIEW

- **BUSINESS GOALS**: Key Drivers that enable scoping of Test Spectrum [Eg: Reduce CoQ by 30%]
- **PROCESS GOALS**: Qualitative/Quantitative Goals derived from Business Goals [Eg: Reduce defect leakage by 25%]
- **TEST SPECTRUM**: Comprises of band of Test Dimensions needed to make Testing Comprehensive
- **TEST DIMENSIONS**
  - i. Type [Functional, Non-Functional]
  - ii. Phase [Unit Test, System Test, SIT(System Integration Test), UAT(User Acceptance Test)]
  - iii. Technique [Black Box, Grey Box, White Box]
  - v. Extent [Release Specific, Regression]
**STEP OVERVIEW**

- **TEST PROCESS AREAS:** STEP Consists of 17 Process Areas
- **GUIDELINES:** Suggestions and Recommendations for Successful implementation of the Process Area
- **CHECKLISTS:** Ensure satisfaction of Process Area Requirements
- **CAPABILITY LEVEL:** Indicates capability of a single Process Area [Scale A to D]
- **MATURITY LEVEL:** Indicates Maturity of the entire Test Spectrum
- **STEPS**
  - STEPS = Maturity Level STEPS + Capability Level STEPS
  - Where, Maturity level STEPS and Capability Level STEPS are normalized to 5.00 Each
  - Maximum STEPS possible = 10.00
**STEP PROCESS AREAS**

1. Test Strategizing
2. Test Specification
3. Test Execution
4. Test Planning
5. Test Monitoring & Control
6. Test Environment
7. Defect Management
8. Test Organization
9. Test Training Program
10. Test Ware Management
11. Test Lifecycle & Integration
12. Verification
13. Metrics Program
14. Knowledge Management
15. Test Process Management
16. Defect Prevention
17. Test Optimization

The 17 Process Areas are primarily inspired from TMM/TMMi. But following changes have been made based on experience in implementing them.

<table>
<thead>
<tr>
<th>#</th>
<th>Process Area in TMM/TMMi</th>
<th>Equivalent Process Area in STEP</th>
<th>Change Type and Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Design and Execution</td>
<td>Test Specification Test Execution</td>
<td>[MODIFICATION] Process Areas have been separated as they have the capability to influence different aspects of Testing</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Defect Management</td>
<td>[ADDITION] Process Area has been added as a Process Area as defects directly relate to quality</td>
</tr>
<tr>
<td>3</td>
<td>Peer Reviews</td>
<td>Verification</td>
<td>[MODIFICATION] Peer Review is a type of Verification and there are many other verification techniques that can be adopted. For example, Inspection, Delphi technique are commonly used review techniques</td>
</tr>
<tr>
<td>4</td>
<td>Software Quality Evaluation</td>
<td>-</td>
<td>[DELETION] Process Area objectives have been covered as a part of Verification [Level 3]</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>Knowledge Management</td>
<td>[ADDITION] Managing knowledge is important for a level 4 company</td>
</tr>
<tr>
<td>6</td>
<td>Quality Control</td>
<td>Test Process Management</td>
<td>[MODIFICATION] The process area has been renamed to avoid confusion with CMMI Quality Control. Also, the process area has been moved from level 5 to level</td>
</tr>
<tr>
<td>7</td>
<td>Test Process Optimization</td>
<td>Calibrated Test Improvement</td>
<td>[MODIFICATION] The process area has been renamed to place emphasis on the need for calibration</td>
</tr>
</tbody>
</table>

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STEP FLAVORS

TWO FLAVORS
Inspired From CMMi

CONTINUOUS

Flexible Improvement Option with Process Areas distributed across 3 broad categories

STAGED

Structured levels of Improvement with predefined Process Areas in each level

TEST MANAGEMENT

- Test Planning
- Test Monitoring & Control
- Defect Management
- Test Ware Management
- Metrics Program

TEST ENGINEERING

- Test Strategizing
- Test Specification
- Test Execution
- Test Environment
- Test Lifecycle & Integration
- Verification

TEST SUPPORT

- Test Organization
- Test Training Program
- Test Process Management
- Knowledge Management
- Defect Prevention
- Calibrated Test Improvement

OPTIMIZING

- Calibrated Test Improvement
- Defect Prevention

QUANTIFIED

- Metrics Program
- Knowledge Management
- Test Process Management

INSTITUTIONALIZED

- Test ware Management
- Verification
- Test Lifecycle & Integration

DEFINED & MANAGED

- Test Planning
- Test Specification
- Test Execution

INITIAL

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‘SPECTRUM’IZED TEST STRATEGY

Defining the test spectrum considering all possible dimensions will definitely help strategize in a structured and quick way.

PROCESS AREAS ADDRESSED:
- Test Strategizing (Maturity Level 2)

KEY BENEFITS:
- Structured & Comprehensive Test Strategy with ease

For example, let us assume a test strategy is being developed for an application with the following characteristics.
- The Application has not existed before
- It is internal to the organization
- There will be no more releases or enhancements to this application
- The Application interfaces with many internal applications

The test dimensions to be addressed by the strategy will be as follows:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FUNCTIONAL TEST</th>
<th>Non-Functional Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHASE</td>
<td>UNIT TEST</td>
<td>System Test</td>
</tr>
<tr>
<td></td>
<td>SIT</td>
<td>UAT</td>
</tr>
<tr>
<td>TECHNIQUE</td>
<td>WHITE BOX</td>
<td>Grey-Box</td>
</tr>
<tr>
<td>MODE</td>
<td>MANUAL</td>
<td>Automated</td>
</tr>
<tr>
<td>EXTENT</td>
<td>RELEASE SPECIFIC TESTING</td>
<td>Regression Testing</td>
</tr>
</tbody>
</table>

Legend >>>
- FOCUSED IN TEST STRATEGY
- Not Focused in Test Strategy

SPECTRUM’IZED TEST STRATEGY

FEEL AGILE. NOT FRAGILE!

9 PROVEN WAYS TO REMOVE FRAGILITY & INDUCE AGILITY

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2 VERIFIABLE TEST ESTIMATION

It is very important to verify Test Estimation before beginning to Plan. The job will be simplified by choosing a primary and secondary estimation technique.

PROCESS AREAS ADDRESSED:
- Test Planning (Maturity Level 2)

KEY BENEFITS:
- Higher level of confidence in the estimates
- Accurate Test Estimates therefore less chances of budget overrun
- Quicker and Easier way to compute test estimates

Depending on the form of requirements at hand it would be prudent to choose a primary and secondary estimation technique from the list below:
- Function Point Analysis
- Test Point Analysis
- Use Case Point Analysis
- Program Complexity
- Activity based Estimation

Creation and use of simple software tools that implement these estimation techniques would simplify the task further.
Feel Agile. Not Fragile!
9 Proven Ways to Remove Fragility & Induce Agility

3 IN-LINE TEST AUTOMATION

Quicker realization of ROI on Test Automation by tweaking the SDLC and planning the automation accordingly

PROCESS AREAS ADDRESSED:
- Test Execution (Maturity Level 2)

KEY BENEFITS:
- Quicker realization of ROI on Test Automation
- Significant reduction in Test Cycle time and proportional reduction in Time to Market

Normal Scenario: Test Automation Scripts are prepared for Release 'N' and the same can be executed no sooner than Release 'N+1'

Agile Scenario: If the Code for Release 'N' is released in iterations then, the Automation scripts can be executed as soon as the next iteration in Release 'N'
FEEL AGILE. NOT FRAGILE!
9 PROVEN WAYS TO REMOVE FRAGILITY & INDUCE AGILITY

4 NEAR ZERO EFFORT TEST REPORTING
Cost Effective automation of Test Reports will help feel agile!

PROCESS AREAS ADDRESSED:
- Test Monitoring and Control (Maturity Level 2)
- Defect Management (Maturity Level 2)
- Metrics Program (Maturity Level 4)

KEY BENEFITS:
- Zero Reporting Overhead
- Better control of the Software Testing Activities
- Easier implementation of Metrics Program

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TEST MANAGER DASHBOARD

DASHBOARD GENERATOR

EXECUTIVE DASHBOARD

DEMONSTRATION

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SELL INTERNALLY

Any improvement initiative (involving change) must be sold to the people implementing and not just at the executive level

PROCESS AREAS ADDRESSED:
- All process Areas (Maturity Levels 2 to 5)

KEY BENEFITS:
- Process Improvement will not be looked at as Documentation overhead
- Process will quickly transition to habit

EXAMPLES
- 'Review the Requirements Document'. Employees are usually reluctant to indulge in this. If you can say 10 Requirements Defects have the potential to cost at least USD 50,000, then the seriousness would be understood
- Conducting Road Shows and Game Shows on Process Improvement will help rather than just publishing the artifacts on a portal
FEEL AGILE. NOT FRAGILE!

9 PROVEN WAYS TO REMOVE FRAGILITY & INDUCE AGILITY

6 TEST EARLY. TEST OFTEN
This is a clichéd recommendation. But works!
Try and implement V-Model to reap significant benefits

PROCESS AREAS ADDRESSED:
- Test Lifecycle and Integration (Maturity Level 3)

KEY BENEFITS:
- Significant Cost and Effort Savings
- Reduced Time to Market and Defect Leakage

Indicative Facts,
Fact: Average Cost to fix one defect [Roger S Pressman 2003] rises significantly through the SDLC

<table>
<thead>
<tr>
<th>Phase</th>
<th>Duration</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Phase</td>
<td>1 Hour</td>
<td>USD 82</td>
</tr>
<tr>
<td>Construction Phase</td>
<td>6 Hours</td>
<td>USD 537</td>
</tr>
<tr>
<td>Testing Phase</td>
<td>15 hours</td>
<td>USD 1240</td>
</tr>
<tr>
<td>Production</td>
<td>60 Hours</td>
<td>USD 4959</td>
</tr>
</tbody>
</table>

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FEEL AGILE. NOT FRAGILE!
9 PROVEN WAYS TO REMOVE FRAGILITY & INDUCE AGILITY

7 MAXIMIZE COVERAGE <> MAXIMIZE DOCUMENTATION
Focus more on ensuring coverage than on ensuring documentation

PROCESS AREAS ADDRESSED:
- Test Specification (Maturity Level 2)

KEY BENEFITS:
- Effort Savings by Reuse of Test Artifacts across phases
- Enhanced Test Coverage and Reduced Defect Leakage

EXAMPLES
- Each test case can be crisp and to the point of validation instead of starting all over from ‘login screen’
- Accomplish reuse of test artifacts across testing phases so as to increase coverage and reduce documentation
INCREASE ENVIRONMENT AVAILABILITY

Ensuring high availability of Test Environment is as important as ensuring a ‘production-like’ test environment

PROCESS AREAS ADDRESSED:
- Test Environment (Maturity Level 2)
- Test Execution (Maturity Level 2)
- Test Lifecycle & Integration (Maturity Level 3)

KEY BENEFITS:
- Reduction of impact caused by Test Environment Non-Availability

EXAMPLES
- **Build Stubs and interfaces to simulate the components that are not available**
- **Use virtualization tools to simulate application instances**
FEEL AGILE. NOT FRAGILE!
9 PROVEN WAYS TO REMOVE FRAGILITY & INDUCE AGILITY

9 CALIBRATED TEST PROCESS IMPROVEMENT
Quantitatively improve testing processes across factors like performance, stability, capability, compliance in a calibrated fashion

PROCESS AREAS ADDRESSED:
- Calibrated Test Improvement (Maturity Level 5)

KEY BENEFITS:
- Focused and Prioritized Improvement
- Quicker realization of ROI

<table>
<thead>
<tr>
<th>Sub Processes</th>
<th>Performance</th>
<th>Compliance</th>
<th>Stability</th>
<th>Capability</th>
<th>Process Rank %</th>
<th>Sub Process Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Preparation</td>
<td>32.1</td>
<td>90.6</td>
<td>40</td>
<td>75</td>
<td>30</td>
<td>15.8</td>
</tr>
<tr>
<td>Test Execution</td>
<td>90.1</td>
<td>86.4</td>
<td>25</td>
<td>20</td>
<td>50</td>
<td>27.8</td>
</tr>
<tr>
<td>Test Planning</td>
<td>76.8</td>
<td>58.3</td>
<td>100</td>
<td>60</td>
<td>20</td>
<td>14.9</td>
</tr>
<tr>
<td>Factor Rank %</td>
<td>40</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>100%</td>
<td>Process Health</td>
</tr>
<tr>
<td>Factor Scores</td>
<td>28</td>
<td>8.2</td>
<td>8.9</td>
<td>13.4</td>
<td>58.5</td>
<td>Process Health</td>
</tr>
</tbody>
</table>

Not enough functional / domain experts to understand the application
Effort Variance = 23.4%
Test Case Correctness = 32%
Lack of clear documented inputs about the system
Actor
Artifacts

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### Attribute Comparison Table

<table>
<thead>
<tr>
<th>Attribute</th>
<th>CMMi</th>
<th>TMM</th>
<th>TMMi</th>
<th>TPI</th>
<th>STEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive focus on Software Testing</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Flexible Representations for Adoptions</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Continuous (Focus on Process Areas of Interest)</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Staged (well defined evolutionary plateau towards continuous improvement)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Enhanced Coverage with a Robust Multi-Test Dimensional Focus</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Granularly Calibrated Test Maturity Measurement Framework</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>
INSTITUTION OVERVIEW

- Over $276 billion in average liability balances
- Over $12.8 trillion in assets under custody
- Over $3+ trillion in worldwide transactions daily
- Serving 96% of the world's Fortune 500 companies
- 10 regional processing centers worldwide
- Multiple Domains: Cash Management | Trade Services | Securities & Fund Services
- 93 Software Applications across multiple technologies supporting the above business

PROBLEM STATEMENT

1. Increase In Production Incidents
2. Increase In Support And Maintenance Costs
3. Increased Unplanned Releases And Patches
4. Ineffective & Ad Hoc Testing
5. Increased Testing Turnaround Time

- INCREASED COST OF QUALITY
- INCREASED TIME TO MARKET
- DECREASED CUSTOMER SATISFACTION

AS-IS STEP SCORE: 1.66 [Out of 10]
CASE STUDY

SOLUTION OVERVIEW

**STEP 1: Determine STEP Flavor**

Upon careful analysis of business and process goals Continuous Representation (with focus on Test Engineering and Test Management) of STEP was chosen.

![Table showing problem areas and scores](image)

*X* - Indicates the which Problem Area(s) were primarily addressed by the Process Area

---

**STEP 2: Determine AS-IS & TO-BE STEP Score**

- **AS-IS Score**: 1.66
- **TO-BE Score**: 4.65

*Details of the score calculation are available on next slide*
CASE STUDY

SOLUTION OVERVIEW

STEP 3: Pursue TO-BE Score

- Goals were identified for the process areas considered
- Guidelines and Checklists were defined based on CMMI, TMM, TPI and past learning
- Following ‘feel Agile, not fragile’ concepts were implemented
  - ‘Spectrum’ized Test Strategy
  - Verifiable Test Estimation
  - Zero Effort Test Reporting
  - In-Line Test Automation
  - Sell Internally
  - Maximize Test Coverage not Documentation

STEP 4: Measure Results

<table>
<thead>
<tr>
<th>STEP CALCULATION</th>
<th>AS-IS SCORE</th>
<th>Target Score</th>
<th>Actual Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capability Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capability Level Points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Strategizing</td>
<td>A 1</td>
<td>D 4</td>
<td>D 4</td>
</tr>
<tr>
<td>Test Specification</td>
<td>A 1</td>
<td>D 4</td>
<td>D 4</td>
</tr>
<tr>
<td>Test Execution</td>
<td>B 2</td>
<td>D 4</td>
<td>D 4</td>
</tr>
<tr>
<td>Test Planning</td>
<td>B 2</td>
<td>D 4</td>
<td>D 4</td>
</tr>
<tr>
<td>Test Monitoring &amp; Control</td>
<td>A 1</td>
<td>D 4</td>
<td>D 4</td>
</tr>
<tr>
<td>Test Environment</td>
<td>A 1</td>
<td>D 4</td>
<td>D 4</td>
</tr>
<tr>
<td>Defect Management</td>
<td>A 1</td>
<td>D 4</td>
<td>D 4</td>
</tr>
<tr>
<td>Metrics Program</td>
<td>-</td>
<td>D 4</td>
<td>C 3</td>
</tr>
<tr>
<td>Test Training Program</td>
<td>-</td>
<td>D 4</td>
<td>C 3</td>
</tr>
<tr>
<td>Capability Steps</td>
<td>0.65</td>
<td>2.65</td>
<td>2.50</td>
</tr>
<tr>
<td>Maturity Steps</td>
<td>1.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>STEPS</td>
<td>1.66</td>
<td>4.65</td>
<td>4.50</td>
</tr>
</tbody>
</table>
CASE STUDY

KEY BENEFITS

- **70% Reduction in Sev 1 Outages** [Figure 10] which enabled reducing support costs by 21%
- Additional potential **annual savings of USD 500,000** via Automation of Test Metrics (for 75 Applications)
- **34% reduction in unplanned releases**
- **Streamlined & Robust** Test & Defect Management Processes
- **Around 15% Reduction in Maintenance & Support Costs**
THANK YOU!