Experiences in Root Cause Analysis and Defect Prevention Methods

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Case for Action

Deliver Quality and Reduce Costly Rework!

Six Sigma Specialist Project that focused in reducing escaping defects. Design defects that escape to Integration are 10 times more expensive than if they were caught in the Design stage. Another thing to note is that one of the biggest problems we have found with cost and schedule is in integration.
Set the Foundation

• Define and agree to the following:
  – Defect
    ➢ A flaw or imperfection that results in *incorrect software*. A defect may or may not be detected during software use.
    ➢ A deficiency which has the potential of producing *incorrect response or undesired effect*.
  – Comment Type
    ➢ Assignment, checking, performance, etc.
  – Comment Priority
    ➢ 1 through 5
When to Count a Defect

- Count a defect if:
  - The *requirements documentation* could lead to incorrect source code
    - By being incorrect
    - Or by leading to incorrect design
    - Etc.
  - The *design documentation* could lead to incorrect source code
    - By being incorrect itself
    - Or by being easy to misunderstand
  - The *source code* is incorrect
Defect Analysis and Prevention

- **Defect Analysis** is the process of analyzing a defect to determine its root cause.

- **Defect Prevention** is the process of addressing root causes of defects to prevent their future occurrence.
Process Focus

- **Defect Containment focus**
  - Finding defects in the stage they were introduced and as early in the lifecycle as possible
  - Eliminating escaping defects

- **Defect Prevention focus**
  - Preventing the occurrence of an individual defect or group of defects
Defect Analysis and Prevention Process

Select Defects for Further Analysis

CCBs, Peer Reviews, Defect Containment Metric Pareto Charts

Select Defects

Get Detailed Defect Data from Defect Logger and Synergy

Perform Causal Analysis

Identify Root Causes and Solutions

Defect Analysis and Prevention

Monitor Against Planned Measurement

Implement Action Plan

Develop Action Plan and Measurement for Success

Submit Improvement to Organization

Identify and Prioritize Improvement Opportunities

Continuous Improvement

Next Priority

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Select Defects for Further Analysis

- The program metrics analysis team regularly reviews defect data to determine if defect analysis is necessary
  - Defect metric has exceeded threshold
  - Defect data shows a trend
  - Individual defect is flagged for analysis
Analysis Tools

**Fishbone**

Get Detailed Defect Data from Defect Logger and Synergy → Perform Causal Analysis → Identify Root Causes and Solutions

**Pareto**

http://homext.ray.com/sixsigma

**Defect Containment Matrix**

<table>
<thead>
<tr>
<th>Stage Detected</th>
<th>Requirements</th>
<th>Design</th>
<th>Code &amp; Test</th>
<th>SW Integration</th>
<th>Qual Test</th>
<th>SYS Integration</th>
<th>Post-Release</th>
<th>Totals</th>
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<td>2</td>
<td>5</td>
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Continuous Improvement (1 of 3)

- Identify and prioritize improvement opportunities based on the potential solutions to defect root cause
- Submit improvement opportunities to the organization via the Organizational Improvement Website
Organizational Improvement Website

- A proposal is a request to have the SWEC organization evaluate, select, and adopt a recommended improvement and to provide a funding and evaluation path for the proposal.

- An advisory is an informational message to the SWEC organization advising that a program is providing a funding and evaluation path for an improved process, method, tool, technology, etc to support its own business/project goals. However, this improvement may have relevance to the organization at large and have strategic importance to the enterprise.
Continuous Improvement (3 of 3)

- Work as a Six Sigma Project
  - Create an action plan for the improvement
    - Include how to measure success of the improvement
  - Implement the action plan
  - Monitor the progress of the action plan
    - Track progress for measurement of success
  - Communicate the results to the program & organization
Defect Prevention

- Examples
  - New checklists
  - Modified processes
  - Updated plans
  - Scheduled training
  - Tool support
Defect Prevention

Check to mark a defect

Check to analyze

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Results

SWEC Defect Containment Trend

- Upper DROV
- Nominal value
- Lower DROV
- Mean Performance

Upper DROV: 84%
Lower DROV: 81%
Mean Performance: 70%
Defect Density

Improved Defect Density by 44 percentage points, and reduced variation by 31%
Summary

- Out of phase defects cause expensive rework
- Use common definitions and counting approach
- Focus on defect detection and prevention
- Analyze metrics at least monthly using R6σ tools
- Prioritize and implement defect prevention activities
- Promote lessons learned to the organization