Software Testing and Quality Assurance in Company with Distributed and Multidimensional Teams: How to Improve?
Agenda

CQG’s

• Software Testing and Quality Assurance Process
• Unified Testing Process
• Unified Test Plan
• Metrics
• Benefits
Celebrating 30 Years
Innovating for thirty years... and counting.
CQG Geography
SQA Department Structure

Distributed and Multidimensional

- Distributed by location & time zone
- Distributed by development systems
- Experts in the team
- Each functional area has at least 2 experts
- Traders team as a testing team
- Automated and Manual testing
- Flexible working schedule
Projects

Development projects:

• new functionality
• reengineering of problem

Maintenance projects:

• fix, investigate and repair
• small improvements
# CQG Product Development Process

## CQG PD Implementation Process

<table>
<thead>
<tr>
<th>Inception</th>
<th>Launch</th>
<th>Execution</th>
<th>Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Analysis</td>
<td>Architectural Analysis &amp; Business Requirements</td>
<td>Project Planning &amp; Scheduling</td>
<td>Functional Requirements &amp; MLD</td>
</tr>
<tr>
<td><strong>Quality Assurance and Testing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing Planning</td>
<td>Test Plan Creation, Test Data Preparation, Test Scripts Development</td>
<td>Unit Testing &amp; Results Review</td>
<td>Integration Testing &amp; Results Review</td>
</tr>
</tbody>
</table>

**Defects Tracking**
SQA Early Involvement

Results & Benefits

• SQA Team is fully educated on the project
• Better understanding the aim of the project
• Familiarity with the project Reqs and ITP
• Opportunity to prevent defects before code is written
• Gain an understanding of the complexity
• Better SQA activities planning/prioritizing
• Adequate time to prepare for the testing
• Good working relationship with the development team
• Better communication between all participants
Testing Levels

**Unit Testing**
- Automatic verification of individual units of source code

**Integration Testing**
- Manual/automatic verification of integrated units

**System Testing**
- Manual/automatic verification of complete, integrated system

**Regression testing**
- Manual/automatic verification of bugs fixes
- Manual/automatic verification that old functionality is not broken

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**Testing Levels**

**Testing Planning**

**Test Plan/Test Cases /Test Scripts Development**

**Tests Execution**

**Results Analysis, Reporting, Go/Not Go**

**Major Testing Steps in Each Level**
Unified Testing Process

Goal

• To ensure and guarantee high quality of software Product, Feature, Component, Unit.
UTP – Unified Testing Process

Results & Benefits

• We have a process that could be “instantiated” in any particular testing process in any dev system.
• UTP defines major roles and artifacts used in testing.
• UTP summarizes the most common parts and steps in testing.
• UTP is used as a template for processes in specific system or product;
• UTP provides process flexibility that is essential for multisystem projects.
Testing & Documentation

Test Documentation

- Test Strategy
- Test Plan / Test Cases
- Test Check Lists
- Test Reports
Test Plan

Test Plans by Phases

- Integration Test Plan
- System Test Plan
- Regression Test Plan

Unified Test Plan

- Everyone is aware
- Reduction of work duplication
- All tests are in one place
Updated Process

**Changes**

- SQA early involvement into the project
- Developers involvement into the testing process
- More automation, less manual testing
- Unified Test Plan
- Risky areas are being tested first

**Benefits**

- Reduction of the project completion phase
- Increased testing speed
- Increased test coverage
- Reduction of time spent on different level Test Plans creation
- Critical issues are found first
Process support via set of tools
Data Visibility
Project Quality Evaluation

Methods

- Project Metrics Review
- Regular Project Checkpoints
- Project Postmortem with lessons learned session
Software Measurements

Data to measure

- **Time** (spent for different activities and phases)
- **Size** (product size produced)
- **Defects** (or issues) data
Metrics

Categories

- Consistency & compliance
- Progress
- Planning accuracy
- Productivity
- Software quality
- Process quality (e.g. inspection metrics)
Metrics (CQG specific)

Levels

- Whole PD
- System
- Development Project
- Maintenance Project
- Office
- Team
- Team - Project
- Individual
Quality Metrics

Project Level

- Integration defects density
- Actual Integration defects vs. Estimated Integration defects
- System defects density
- Actual System defects vs. Estimated System defects
- Integration defects vs. System defects
- Amount of code rework
- Total Numbers of found defects of different types should comply to the formula:

  • **Inspection DE # > Integration DE # > System DE # > Late DE #**
Project Activities and Defects Metrics

Activity Distribution:
- Inspection, 13%
- Integration (+ Defect Fix), 20%
- System Testing (+ Defect Fix), 2%
- Requirements, 1%
- Architecture, 3%
- Test Cases Development, 1%
- Design, 5%
- Code & Unit Test, 52%
- Environment Setup, 1%
- Management, 2%

Defect Metrics:

<table>
<thead>
<tr>
<th>Defect Type</th>
<th>Total (#)</th>
<th>Density (#/KLOC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection (F) Defects</td>
<td>65</td>
<td>2,880</td>
</tr>
<tr>
<td>Integration Defects</td>
<td>50</td>
<td>2,216</td>
</tr>
<tr>
<td>System Defects</td>
<td>5</td>
<td>0,222</td>
</tr>
<tr>
<td>Late Defects</td>
<td>1</td>
<td>0,044</td>
</tr>
</tbody>
</table>
Metrics on Project Dashboard

Effort by Activity

Defects found
SQA Team Level Metrics

Quality Metrics

- Reported D/S/I distributed by priorities
- Total Suggestions reported and prioritized
- Initial Inquires reported
- % of relevant (P0-P3) suggestions among total number of reported for a month
- % of defects closed as "Created in Error" or "Cancelled"
- % of inquiries converted to defects/suggestions
- Number of Failed Testing defects and suggestion
SQA Team Dashboard

**Quantity - D/S/I Reported**
- 26-Aug: 2 Inquiries, 1 Suggestions, 7 Defects, 1 <blank>, 1 PO
- 2-Sep: 0 Inquiries, 1 Suggestions, 1 Defects, 1 P1
- 9-Sep: 0 Inquiries, 1 Suggestions, 1 Defects, 0 P1
- 16-Sep: 0 Inquiries, 0 Suggestions, 0 Defects, 0 P1
- 23-Sep: 0 Inquiries, 0 Suggestions, 0 Defects, 0 P1

**Quantity - Testings Done**
- 26-Aug: 3 Tested D&S
- 2-Sep: 0 Tested D&S
- 9-Sep: 2 Tested D&S
- 16-Sep: 0 Tested D&S
- 23-Sep: 4 Tested D&S
Maintenance Project

Added/Modified/Deleted LOCs
- Deleted: 14%
- Modified: 16%
- Added: 70%

LOCs by Category
- Maintenance - Inquiries LOCs: 1%
- Maintenance - Suggestions LOCs: 48%
- Maintenance - Defects LOCs: 51%

Created & Fixed D&S&Is
- Created D&Ss
- Fixed D&Ss

All Open D&S&Is by Priority
- P0
- P1
- P2
- P3
- P4

Dates:
- Aug. 12: 33
- Aug. 19: 34
- Aug. 26: 35
- Sep. 2: 36
- Sep. 9: 37
- Sep. 16: 38
- Sep. 23: 39
- Sep. 30: 40
- Oct. 7: 41
Analyze & Improve!
How to Improve?

Act!

- Communicate & Discuss
- Review & Inspect
- Monitor & Control
- Measure & Analyze
- Update the process
- Pilot updates
- Provide feedback
- Adjust the process
Process

Improvements Specifics

• Different development systems
• Different Testing teams
• Different product types
• Features implemented by different teams and combined into the end product
• Teams distribution and availability
• Testing approaches
Software

Quality

- Mostly depends on quality of software processes, like
  - Requirements
  - Inspections
  - Testing & Quality Assurance
  - Defects & Suggestions
  - Etc.
- Can be defined in terms of defects.
- Must be controlled through metrics.

Always search for ways of software quality and software processes improvement!
Learning on Mistakes

Data

- Project postmortems
- Project and Team level metrics
- Releases analysis
- Post-SQA defects review
- Customer Experience data analysis

Outputs

- Process analysis and update
- Updated Test Plans with new test cases
- Test coverage increase
- Performance and productivity increase
Benefits of SQA Early involvement into the project

Unified Testing Process and its customization
  • For any level of testing
  • For any development system
  • For any testing team

Unified Test Plan and its benefits

Improvements based on
  • Process and product quality measurement
  • Project and Team level metrics used in CQG
Thank You!

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