Quality-Focused Software Testing in Critical Infrastructure

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Better

Faster

Cheaper
Ranking Features By Criticality

- Decision factors
- Factors weighed by importance
- Feature evaluation
Kim and Kang Method

1. Create decision factors
2. Give them weight
3. Rank each feature
4. Calculate testing rank
5. Assign testing based on rank

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Example of Critical Infrastructure

Safety (1.0)
If this feature fails, how dangerous would this be?

Reach (0.8)
If this feature fails, how many end users will this affect?

Usability (0.7)
If this feature fails, will end users lose trust in the product?

Complexity (0.7)
How complex is this feature?
### Example of Critical Infrastructure

<table>
<thead>
<tr>
<th>Decision factor</th>
<th>Predetermined weight</th>
<th>Rank (0–5)</th>
<th>Weighted rank (weight • rank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>1.0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Reach</td>
<td>0.8</td>
<td>3</td>
<td>2.4</td>
</tr>
<tr>
<td>Usability</td>
<td>0.7</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>Complexity</td>
<td>0.7</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Feature risk</strong></td>
<td></td>
<td></td>
<td><strong>10.2</strong></td>
</tr>
</tbody>
</table>
Example of Critical Infrastructure

**Tiered testing**
– Preset quality rank tiers
– Test to calculated tier

**Percent coverage**
– Determine quality rank percentage
– Test to meet total coverage
Time

Test process

Lessons learned from manufacturing

Automation

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Lessons Learned from Manufacturing

- Experienced feedback
- Cross training
- Fast issue evaluation
- Well-defined processes

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Test Process

- **Inputs**
  - Specification
  - Code

- **Test process**

- **Output**
  - Test result

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Suppliers and End Users

Trust

Understanding

Ownership

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Test Process

Specification

Write -> Setup -> Execute

Code

Results creation -> Results

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Test Write Improvements

Automation  Better communication
Test Write for Repeated Software Elements

- Machine-readable specification
- Consistent testing
- Assured quality
Test Setup Improvements

Prebuilt setups

Organization
Test Execute Improvements

Automation

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Test Results Creation

Consistency

Automatic creation
Hidden Costs of Automation

- Training
- Maintenance
- Documentation
Cost

Cost of failure

Fewer defects

Metrics
Business Value Delivered

Preemptive metric

Estimate of improvement
Test Satisfaction

- Use real-time user feedback
- Survey users after receiving device or service
- Give surveys trackable numbers
Change Failure Rate

Is calculated percentage of release to failures

Can only be completed after release
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Questions?