Risk-Based Testing In Practice

Never speculate on that which can be known for “certain”

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- Founder and major shareholder ImproveQS
- In testing since 1989 working for many different clients and in many different roles
- Author “TMap”, “The Testing Practitioner” and many other books and papers
- Vice-President International Software Testing Qualifications Board (ISTQB) 2005 - 2008
- Vice-Chair TMMi Foundation
- Keynote speaker, e.g. EuroSTAR, STAREast
- Winner of the European Testing Excellence Award (2007)
Improve Quality Services BV

www.improveqs.nl

- Service organization in the area of Testing, Requirements Engineering and Quality Management
- Consultancy, Subcontracting and Training

Testing (TMap, TMMi)
- Test Process Improvement Certification (ISTQB)
- incl. Advanced !! Inspections / Reviews

SW Process Improvement
Quality Assurance
IT-Auditing
Requirements Engineering & management (IREB)
What is Risk?

- “A factor that could result in a future negative consequence; usually expressed as impact and likelihood” (ISTQB Glossary)

- Testers ‘only’ have the responsibility to identify the risks and provide information on their status

- “to dare to undertake”
  - management attitude and style…..
Testing = Risk Management

- Objective: most feasible coverage
  - Effective usage of limited resources
- Resources
  - Staffing
  - Infrastructure
  - Time!
- The right level and type of coverage on the right parts at the right time
The challenge....

if only we knew!!

Testing Ted

Industry metrics show that unit testing finds serious problems in one in five modules.

Great! We can save lots of money then.

Simple. We only test the modules with the bugs in!

Gilchrist & Downing
Risk-Based Testing

- **Risk identification** looks at ways of establishing what the risks are and where they are.
- **Risk analysis** looks into the critical, complex and potential error prone areas.
- Then we build tests to **mitigate** the risk.
- Subsequently we **monitor** and **report** regarding the risks.
Based on practical experiences
Risk Identification

- Split up in functional and/or technical items
- Higher level test according to requirements
- Lower levels test according to architecture
- May also be based on a brainstorm session
- Maximum number of appr. 35 risk items

<table>
<thead>
<tr>
<th>Risk item</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk item 1</td>
<td>Functionality</td>
</tr>
<tr>
<td>Risk item 2</td>
<td>Security</td>
</tr>
<tr>
<td>Risk item 3</td>
<td>Functionality</td>
</tr>
<tr>
<td>Risk item 4</td>
<td>Interoperability</td>
</tr>
</tbody>
</table>
Risk Analysis

- Risk = impact x likelihood
  - What is the impact for the business?
  - What is the likelihood that there are defects?

- Determine factors based on previous projects, e.g. defect patterns

Impact – Business risk

You already know this! Exercise: Risk Factors
Factors From Practice

- **Likelihood**
  - complexity
  - new development (level of re-uses)
  - interrelationship (# interfaces)
  - size
  - technology
  - geographical spread
  - inexperienced (of development team)

- **Impact**
  - business importance ("selling item")
  - financial (or other) damage (e.g. safety)
  - usage intensity
  - external visibility
  - cost of rework
  - legal sanctions

**Defect patterns / history**

**Customization needed**

**Weightings can be applied**
Stakeholder Analysis

- A stakeholder is anyone who is interested in the product (both internal and external)
  - Who is responsible?
  - Who has a problem when things go wrong?
  - Who needs the system at their work?

- Document the knowledge areas of the stakeholders
  - e.g. factors, domain, requirements type

- Missing stakeholders means missing risks!!

- Assign factors to stakeholders
## Individual stakeholders scoring

<table>
<thead>
<tr>
<th>Item</th>
<th>Business importance</th>
<th>Usage intensity</th>
<th>Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>5</td>
<td>5</td>
<td>Critical</td>
</tr>
<tr>
<td>Item 2</td>
<td>4</td>
<td>4</td>
<td>High</td>
</tr>
<tr>
<td>Item 3</td>
<td>5</td>
<td>4</td>
<td>Moderate</td>
</tr>
<tr>
<td>Item 4</td>
<td>2</td>
<td>5</td>
<td>Moderate</td>
</tr>
<tr>
<td>Item 5</td>
<td>4</td>
<td>2</td>
<td>Low</td>
</tr>
</tbody>
</table>

They shall make choices

9: Critical
5: High
3: Moderate
1: Low
0: None
“Consensus” Meeting

- Discuss issue list - first defects found !!
- Result could influence development

<table>
<thead>
<tr>
<th>Item</th>
<th>Complexity</th>
<th>New development</th>
<th>Interfacing</th>
<th>Technology</th>
<th>Experience level</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Item 2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Item n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Likelihood:
- Complexity
- New development
- Interfacing
- Technology
- Experience level

Impact:
- Business import
- Usage intensity
- Safety

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The Product Risk Matrix

MoSCoW priorities

Likelihood

Impact
Example System Level Testing

Use Cases (basic flow) Equivalence Partitioning

Use Cases (incl. alternatives) Decision Table Testing

Likelihood

Use Cases (basic flow)

Use Cases (incl. alternatives) Equivalence Partitioning

Impact
Differentiated Test Approach!!

- Reviews & inspection
- Test design meetings
- Reviews of test design
- Level of detail of test cases
- Exit criteria
- Level of independence

*Must Test*

..... Test Approach .....

*Should test*

..... Test Approach ..... 

*Could Test*

..... Test Approach ..... 

*Would Test*

..... Test Approach .....
## Practical Guideline

### Table: Test Level, Quality Attribute, and Risk Level

<table>
<thead>
<tr>
<th>Test level</th>
<th>Quality Attribute</th>
<th>Low Risk</th>
<th>Medium Risk</th>
<th>High risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance test</td>
<td>Functionality</td>
<td>Isolation re-test</td>
<td>Isolation re-test</td>
<td>Full re-test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Basic flow UC Testers</td>
<td>Use cases Testers</td>
<td>Use cases Domain experts</td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System test</td>
<td>Functionality</td>
<td>Equivalence Partitioning</td>
<td>Equivalence Partitioning</td>
<td>Decision Table testing</td>
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<tr>
<td></td>
<td></td>
<td>No testware reviews</td>
<td>Internal Review TDs</td>
<td>External Review TDs</td>
</tr>
</tbody>
</table>

### Security
- Use cases
- Domain experts

### System test
- Partitioning
- No testware reviews
- Internal Review TDs

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Shall be company specific
Recognize this .... ?

- After months of testing the system finally goes life and …………. Fails
- Test manager says: ‘we already knew this would happen’
- Who is at fault?
- Risk based testing = Risk based reporting
Defect Reporting example

Does this support management to make the release decision?

![Graph showing open defects over weeks]

- wk1
- wk2
- wk3
- wk4
- wk5
- wk6
- wk7
- wk8
- wk9
- wk10
- wk11
- wk12

open defects
Communication Levels ...

Testing Ted

I WANT YOU TO GET ME SOME METRICS ABOUT THIS CODE, PLEASE TED

WHAT WOULD YOU LIKE? HALSTEAD_PURITY_RATIO? MOOSE_COUPLING BETWEEN OBJECTS?

NO, JUST DOES IT WORK?!
# Risk Based Reporting (1)

<table>
<thead>
<tr>
<th>Risk item 1</th>
<th>TS1</th>
<th>TS2</th>
<th>TS3</th>
<th>TS4</th>
<th>TS5</th>
<th>TS6</th>
<th>TS7</th>
<th>TS8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk item 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk item 3</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk item 4</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk item 5</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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Can we release the product?

Management view

Risk item 1
Risk item 2
Risk item 3
Risk item 4
Risk item 5
## Survey Results

<table>
<thead>
<tr>
<th>Category</th>
<th>Average</th>
<th>Median</th>
<th>(large σn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease-of-use</td>
<td>6,5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Usefulness</td>
<td>7,6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>7,4</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>7,2</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

"it’s simple but not easy"
Benefits: Defect Detection %

in addition to lead time reduction ...

introduction
risk-based testing

Y1 Y2 Y3 Y4 Y5

DDP Alpha Test
Key learning points

- A structured and **practical approach** for risk based testing is **available**
- **Re-discuss** the risk assessment on a regular basis
- Define a risk based **differentiated test approach**
- Provide risk-based **management reporting**
- … it doesn’t stop at the planning stage
Thank You !! Thank You !!

Full PRISMA white paper available at www.erikvanveenendaal.nl