Innovations in Test Automation
When Regression Testing is Not Enough

John Fodeh
Cognizant Technology Solutions
john.fodeh@cognizant.com

HP Test Brugergruppen
Konference d. 11-4-2013
Outline

• Innovation and testing
• The promise of automation
• Going beyond regression testing
• Test Monkeys
• Model-Based and Behaviour-Driven approaches
• The human factor in automation
The Challenge

- Financial pressures
- Technology shift
- Business complexity
- Compliance & regulations
- Customer awareness
- Rapid development cycles
Innovation?

- The word “innovation” derives from the Latin word *innovatus*
- The noun form of *innovare* is "to renew or change," stemming from *in*—"into" + *novus*—"new"
- It is the process to renew an existing idea
The Promise of Test Automation

- Replacing repetitive and tedious manual tasks
- Ensuring the consistency and repeatability of tests
- Performing tests that are difficult to run manually
- Accelerating test execution
Traditional Test Automation

Typically
Automation of regression tests

Purpose
Testing of a previously tested program following modification to ensure that defects have not been introduced or uncovered in unchanged areas of the software, as a result of the changes made. It is performed when the software or its environment is changed. [ISTQB Glossary, v2.1]
Regression Testing?

“Insanity is doing the same thing over and over again and expecting different results”
Characteristics of Traditional Test Automation

- Static
- Simple
- Synchronized
- Vulnerable
- Unfeasible
Automatic vs. Manual Testing

- But automated tests are different (timing, verification, operation)
- Will only perform what they’ve been programmed to
- Require maintenance
Isn’t ‘Expensive Automation’ an oxymoron?

Test Automation (SwissQ Survey Testing Trends & Benchmarks Schweiz 2012)

- 80% of respondents automated tests but 48% automated less than 10%.
- Potential of cost savings through automation are assumed as being rather small.
- In one third of the cases no statement is possible.
Testing Beyond the GUI

- GUI
- Business Logic
- Middleware
- Data

- UAT
- System & Integration Testing
- Unit Testing
**Why**

- Shifting the work to higher intellectual levels
- Let testers test
- Kills monotony
- Motivation
- Improved productivity
- Consistency
- Shorter test cycles
- Early testing

**What**

- Smoke testing with auto reports
- Environment and data setup
- Comparison with test oracle
- Random test execution
- Model-based testing
- Synchronization macros to update test data
- Routine project backups
- Result gathering and status reporting
- Input message generation
- Data generation
Evolution in Test Automation

- From automated test execution to automated testing lifecycle
  - Continuous integration
  - Holistic quality approach
  - Virtualization
  - Data management
Return On Investment

• Return on Investment is achieved on 2\textsuperscript{nd} release. This is achieved as the input message generation is also done by Virtualization Tool.
  
  • Lower Cost of Test Script Creation
  • Competitive and extremely low maintenance cost (cost of script update with application enhancements)
  • Decrease test cycle execution time
  • Reduce testing costs

• 90\% of Regression suite is automated, saving 70\% of execution time of manual execution in the consecutive tranches.
• 19 interfaces are automated and the mapping of each interface is verified and validated.
• Input messages are generated by the Virtualization Tool and nearly 85\% of manual efforts are saved in

![Execution Effort Comparison: Manual Vs Automation](image-url)
Monkey Testing refers to the process of randomly exercising a software program by means of an automated test tool.
Action List

#script file: Test4.asc
KEY L;
KEY 5, LONG;
CP_KEY FOCUS_UP;
#KEY BOX_SIZE_UP
KEY 8;
TRACKBALL 0, 64;
KEY SHIFT, R;

Log file

#script file: Test4.asc
CP_KEY FOCUS_UP;
TRACKBALL 0, 64;
KEY L;
KEY 5, LONG;
KEY 8;
CP_KEY FOCUS_UP;
Basic Features

A test monkey should:
- Select randomly from input range
- Enter input to AUT through the user interface
- Detect “life signs” of AUT
- Have robust logging facility
- (Re-) start and initialize AUT
- Have limited application knowledge but general environment awareness
Metrics – Application Reliability

Mean number of random operations between Failures

Release Criterion

Entry Criterion

Build no.
Added Value

• Early testing
• Cost effective
• Negative testing
• Long and complex test runs
• Reliability indicator
Limitations

- Misses obvious defects
- Does not emulate real use situations
- Long tests runs can be difficult to debug
- For a reliable statistical basis, long and multiple test runs are needed

Monkey Testing is a supplement to your manual and automated testing - not a replacement!
Advanced Test Monkeys

- Wide application knowledge
  - Application modeled in state table
  - Illegal input to test error handling and recovery
  - Emulate real and complex use scenarios
- Effective in finding defects
- Higher development and maintenance cost
State Transition Testing

State table

<table>
<thead>
<tr>
<th>Start state</th>
<th>Action</th>
<th>Probability</th>
<th>Input range</th>
<th>End state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning</td>
<td>Adjust frequency</td>
<td>45</td>
<td>3</td>
<td>20 Scanning</td>
</tr>
<tr>
<td></td>
<td>Adjust brightness</td>
<td>20</td>
<td>1</td>
<td>100 Scanning</td>
</tr>
<tr>
<td></td>
<td>Abort</td>
<td>5</td>
<td></td>
<td>Displaying (abort)</td>
</tr>
<tr>
<td></td>
<td>Edit preferences</td>
<td>10</td>
<td></td>
<td>Editing preferences</td>
</tr>
<tr>
<td></td>
<td>Increment depth</td>
<td>20</td>
<td></td>
<td>Scanning</td>
</tr>
</tbody>
</table>

Log file

Random Test Tool

Application Under Test

Utilities
Intelligent Randomness

- Probability Tables
- Focus on selected areas
- Weight on specific use scenarios
- Continuous expansion and improvement
- Possibility to exclude certain parts

* source: Whitmill, Kelly
Model-Based Automation

Model

Test Tool

Application Under Test

Utilities

Log file

Script

Start

State

Action

End

State

Script

Model

©2013, Cognizant
Model-Based Testing

<table>
<thead>
<tr>
<th>Scenario Id</th>
<th>Scenario Name</th>
<th>Node</th>
<th>Criticality</th>
<th>Risk</th>
<th>Data</th>
<th>Prerequisite</th>
<th>Step#</th>
<th>Test Step</th>
<th>Expected Result</th>
<th>Status</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Scenario 1</td>
<td>s1</td>
<td>Very High</td>
<td>None</td>
<td>Data</td>
<td></td>
<td>1</td>
<td>Integration point from Service Desk</td>
<td>Ticket has been assigned to EUC / Desk Side / Infra Support / ADM / 3rd Party / Partner / OEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>p0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>Ticket is assigned to EUC</td>
<td>Ticket is under Investigation &amp; Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>d0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Decision:</td>
<td>If issue has been resolved THEN ELSE N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>d1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>N: The Ticket has NOT been resolved</td>
<td>Process/flow enters a new decision point</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>Decision:</td>
<td>If Desk Side Support is needed THEN ELSE N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>f0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>Y: Ticket has been resolved</td>
<td>Service Desk Support is NOT needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example
Behavior-Driven approach

• Based on Behavioral specifications
• User Stories defined using ubiquitous language
• Principles of Test Driven Development
• Collaborative approach for business analysts, Software development & testing
• Shared tools and process

Feature: ship orders
   As an orders clerk
   I want to acknowledge and ship the order
   So that we fulfill a book order

Scenario: ship a single book from stock
   Given I select a valid order
   And the ordered book is in stock
   When I choose ‘acknowledge and ship’
   Then order status is changed to ‘shipped’
   And an address label is printed

* source: Gerrard, Paul
People Issues

• Test automation depends on the competence, creativity and motivation of your team
• Dedicated resources are required
• Management support is essential
Summary

• No “one size fits all” solution
• An integrated and holistic approach is needed
• Maturity is about analyzing the current practice and finding ways to do evolve
• Are you ready for your innovation journey?
Konference

Softwaretest

Fra teori til praksis 2013

Torsdag den 30. maj 2013, kl. 8.30 - 17.30

på Scandic Copenhagen (ved Planetariet)
Vester Søgade 6, 1601 København V

www.dstb.dk
Innovation in Test Automation

Thanks for your attention