TOO MUCH AUTOMATION OR NOT ENOUGH?

WHEN TO AUTOMATE TESTING

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Brittle UI or Robust Model

Badly automated UI tests
  Test team says 2 weeks after 1 hour change
    *Too much automation?*
Manually hacking a system
  Attempting a few illegal values to break security
    *Not enough automation?  Fuzz testing*
Well automated model tests
  Test team takes 15 minutes after 2 day change
PRIMARY DRIVERS

Cost to
1. Create - Depends on methodology
2. Run - Automated usually less expensive
3. Maintain - Depends on Design / Technology
ROI\textsubscript{automation} (in time \( t \)) = \frac{\Delta B_a}{\Delta C_a}

= \frac{\Delta (\text{Benefits from automation over manual})}{\Delta (\text{Costs of automation over manual})}

\( \Delta B_a \): the incremental benefits from automated over manual testing.

\( \Delta B_a \) (in time \( t \))

= \sum (\text{improvement in fixed costs of automated testing times } \frac{t}{\text{Useful Life}})

+ \sum (\text{variable costs of running manual tests } n_2 \text{ times during time } t)

- \sum (\text{variable costs of running automated tests } n_1 \text{ times during time } t)

\( \Delta C_a \): the incremental costs of automated over manual testing.

\( \Delta C_a \) (in time \( t \))

= \sum (\text{increased fixed costs of automated testing times } \frac{t}{\text{Useful Life}})

+ \sum (\text{variable costs of creating automated tests})

- \sum (\text{variable costs of creating manual tests})

+ \sum (\text{variable costs of maintaining automated tests}) \times \frac{n_1}{N}

\( n_1 \): Number of automated only test executions

\( n_2 \): Number of manual test executions

\( N \): Average number of runs for automated tests before maintenance is needed

From Hoffman99 Cost Benefits Analysis of Test Automation

Should You Automate?  Keith Stobie, Microsoft  2004-06-20
Ignoring other differences, like metrics.
WHY REPEAT?

- Change of
  - Inputs (Data driven testing)
  - Environment (Language, OS, Browser, etc.)
  - Software (Regression)
    - Old feature no longer working
- New feature not working?
Writing and running tests both cost.
Run same tests, reduce regression defects. Automation mostly helps here
Create new tests, reduce latent defects. Manual testing can most help here
HYBRID EXAMPLE
VERSIONS 2, 3, 4, 5

V2
tests automated

Old
(V3)
ships

V3 tests automated

V4 Planning

V4 Design

V4 Coding

V4 Execution

V4 ships

V5 Planning

New V3 manual tests

New V manual tests

Should you Automate? - Keith Stobie, Microsoft

2009-08-20

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Example for 10 iterations when new code has 10% errors and old code 2% regression errors.
TEST CREATION

Level of detail?

- **Manual**: High level (e.g. Exploratory Charters) detailed scripts (at level of code)

- **Automated**: Model based testing keyword action testing scripting and compiled code

Less detail is cheaper to create and maintain.

Designed for Change? Coding to Design Patterns
**Charter**
- Login

**Outline**
- Enter Username and Password

**Specific**
- Click mouse in username field to place cursor in username field. Type “testuser”.
- Click mouse in password field to place cursor in password field. Type “Pa$$w0rd”
- Click on login button
Should you Automate?

Keith Stobie, Microsoft

Action

• LoginEnteringUsernameAndPassword(
  string username, string password)

Specific

• Mouse.Position(username).Click
  Username.Enter(“testuser”)
• Mouse.Position(password).Click
  Username.Enter(“Pa$$w0rd”)
• LoginButton.Click
S.E.A.R.C.H.

- Setup           Environment config or check
- Execution       Running the software
- Analysis        Verification with Oracle
- Reporting       Roll ups of Analysis
- Cleanup         Teardown, restoration, etc.
- Help            Doc to Run, Analyze & Maintain

You can automate or leave manual each part.
Analysis

- **Automated:**
  Failure analysis by log comparison

- **Manual:**
  UI comparisons - blink comparisons
UI COMPARISONS

NATIONAL ALERT REGISTRY

Does a sexual offender live in your neighborhood?

Free search for sex offenders in your area:

Registered Sex Offender Search
Enter Zip Code: 
Email Address: 

Perform Sex Offender Search
(average search takes less than 5 seconds)

You have the right to know

Source: Marketing Experiments
http://www.marketingexperiments.com
Automated Setup/Cleanup, Virtual machines auto scheduled in lab
Manual Execution and Analysis
Exploratory testing with Charter

Manual Setup/Cleanup,
Hand craft unique environment,
Automated Execution and Analysis
Coded tests with expected results

Automated Execution with Manual Analysis
Frame capture for review
Many unique conditions, perhaps test manually only once

Unit tests frequently repeated - thus automated
MAJOR CONSIDERATIONS

- $\Delta$ Rate of change (SW, Env, etc.)
- $\omega$ frequency of Execution
- Purpose of automation (Latent vs Regression)

Thus:
Automated Unit Tests ({$\Delta$, High $\omega$, Regression})
Automated Build Verification Tests (High $\Delta$, High $\omega$, Regression)
Manual Usability tests (medium $\Delta$, medium $\omega$, Latent)

Automated API tests - natural environment for automation
Automated Performance & Stress - High amount of execution
RISK COVERAGE

- Prioritize Product and release goals
  - More stable release or focus on new features?
- Work around known errors
  - Making progress while waiting for fixes
- Anticipate likely errors
  - Easy to automate error finding vs Likely to fail or Important if fail
- Choose evaluation methods [Kaner 2001]
  - Comparison with previous results or with specifications
  - Self-verifying data
  - Oracle-Based Testing
  - Heuristic consistency
SUMMARY

- **How** repeat?  Humans or Software
- **When** repeat?  How Often?
- **Why** repeat?  Change of Env? SW? Data (e.g. boundaries)? Variance to give confidence
- **What** repeat?  Same Env? SW? Data (e.g. perf)? Same to give confidence
REFERENCES


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