Cost Benefits Analysis of Test Automation

STAR West ’99

Douglas Hoffman
Software Quality Methods, LLC.
24646 Heather Heights Place
Saratoga, California 95070-9710
Phone 408-741-4830
Fax 408-867-4550
Why Are We Doing This?

• Management needs numbers
• Management needs justification
• We want to know where to invest
Intangibles

- Not all members of the test team will want to change
- Immediate reduction in perceived productivity of the test organization
- Quality of tests
- Professionalism of test organization
- Expansion into advanced test issues
- Hands-off testing
- Number of product rolls (test cycles) before release
- Test coverage
Falsely Expected Benefits

- All tests will be automated
- Immediate payback from automation
- Automation of existing manual tests
- Zero ramp up time
- Automated comprehensive test planning
- Capture/Playback for regression testing
- One tool that fits perfectly
- Automatic defect reporting (without human intervention)
Background to Costing

• Many changes would equally benefit manual testing
• Most automation benefits come from discipline in analysis and planning
• Payback from automation is usually in the next project or thereafter
• Automating usually causes significant negative schedule and performance impacts at introduction
• Automated tests require more programming and design skills from testers
• Automated tests frequently require maintenance
• Software metrics aren’t unbiased statistics
ROI Factors

• Dependent upon factors besides costs and savings:
  • Fixed costs need to be amortized over useful life
  • Investments last only as long as they remain in service
  • Variable benefits depend on the number of tests and test runs
  • Expected number of runs of tests is most important factor in relative ROI computations

• Computed for a given time period \((t)\)

• Incremental return on incremental investment vs. manual testing
ROI Computations

\[ E_n = \frac{A_a}{A_m} = \frac{(V_a + n*D_a)}{(V_m + n*D_m)} \]
\[ E_n = \frac{A_a}{A_m} = \frac{(V_a + n_1*D_a)}{(V_m + n_2*D_m)} \]

\[ \text{ROI}_{\text{automation}} \text{(in time } t \text{)} = \frac{(\text{Savings from automation})}{(\text{Costs of automation})} \]
\[ \text{ROI}_{\text{automation}} \text{(in time } t \text{)} = \frac{\Delta(\text{Savings from automation})}{\Delta(\text{Costs of automation})} \]

Relative ROI

• Changes in benefits and costs
• Tangible savings and costs
• Fixed and variable elements
Common Cost Examples

• SUT analysis
• Test planning
• Base test design
• Defect reporting
• Management reporting (results)
Fixed Cost Examples

- Hardware (additional or upgrades to existing)
- Testware software licenses
- Testware software support
- Per seat licenses
- Automation environment design, implementation
- Scripting tools
- Tool and environment licenses
- Tool training
- Tool introduction and ramp up
Variable Cost Examples

- Test case design for automation
- Test case implementation
- Test maintenance
- Oracle creation
- Test running and analysis
Usual Benefits

- Test execution savings
- After-hours testing by systems (not people)
Changed Cost Examples

• Automation environment maintenance
• Test case execution
• Test results analysis
• Defect reporting
• Test results reporting
• Test data generation
ROI Computation

- Computing costs
- Computing savings
- ROI
Cost Computation

• $\Sigma$ (fixed costs of automated testing) times ($t/Useful\ Life$)
• Plus $\Sigma$ (variable costs of creating automated tests)
• Less $\Sigma$ (variable costs of creating manual tests)
• Plus $\Sigma$ (variable costs of maintaining automated tests) times ($n/N$)
• Plus increased Changed Costs values
Alternate Cost Computation

- $\Sigma$ (fixed costs of automated testing) times ($t$/Useful Life)
- Plus $\Sigma$ (costs of people creating automated tests)
- Less $\Sigma$ (costs of people creating manual tests)
- Plus $\Sigma$ (costs of people maintaining automated tests)
- Plus increased Changed Costs values
Benefit Computation

• $\Sigma$ (variable costs of running manual tests $n_2$ times during time $t$)

• Less $\Sigma$ (variable costs of running automated tests $n_1$ times during time $t$)

• Plus Changed Costs savings values
Conclusions

• Figures don’t lie, but …
• Understand why you need ROI
• Planning can increase ROI
• Identify costs and savings
ROI Computation Example

- Daily builds and test runs (5 times a week)
- Manual tests take 5 days to design, 2 hours to run
- Only half the manual tests would be run on any given day (1 hour) with the other half run the following day
- Automated tests take 15 days to design and implement, automatically run (zero cost)
- Automation is done with batch scripts and integrated into the build process, requiring $1,000 in added hardware, with a useful life of 3 years
- Automated tests need to be maintained every 25 runs, one day of work required
- Periods of time ($t$) selected: 6 months (125 days) and 18 months (375 days)
- People cost $100,000 per year = $400 per day = $50 per hour
ROI Computation Example

- A new product with all new tests
- 5 people-years developing manual tests, 15 for automated tests
- 1 person maintenance after 1\textsuperscript{st} year for automated tests
- 10 people full time running manual tests, 1 person for automated
- Fixed costs for automated tests of $90,000 with useful life of 3 years
- Periods of time (t) selected: 12 months (250 days) and 24 months (500 days)
- People cost $100,000 per year = $400 per day = $50 per hour