
Cost Benefits Analysis of Test Automation

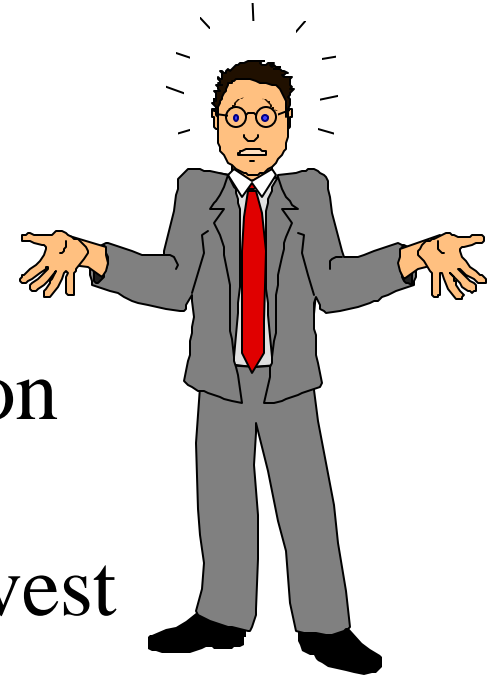
STAR West '99

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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

$$E_n = A_a/A_m = (V_a + n*D_a) / (V_m + n*D_m) \dagger$$

$$E_n = A_a/A_m = (V_a + n_1*D_a) / (V_m + n_2*D_m)$$

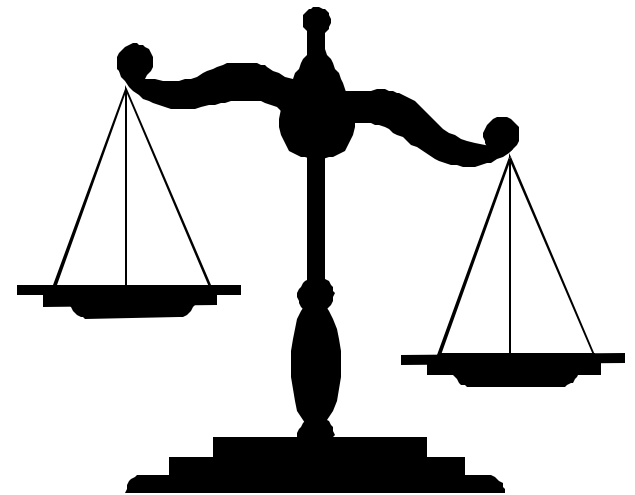
$$\text{ROI}_{\text{automation}}(\text{in time } t) = (\text{Savings from automation}) / (\text{Costs of automation})$$

$$\text{ROI}_{\text{automation}}(\text{in time } t) = \Delta(\text{Savings from automation}) / \Delta(\text{Costs of automation})$$

[†] Linz, T, Daigl, M. “GUI Testing Made Painless. Implementation and results of the ESSI Project Number 24306”, 1998. Analysis in Case Study: Value of Test Automation Measurement, p. 52⁺ of Dustin, et. al., *Automated Software Testing*, Addison-Wesley, 1999.

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

- Σ (fixed costs of automated testing) times ($t/Useful\ Life$)
- Plus Σ (variable costs of creating automated tests)
- Less Σ (variable costs of creating manual tests)
- Plus Σ (variable costs of maintaining automated tests)
times (n/N)
- Plus increased Changed Costs values

Alternate Cost Computation

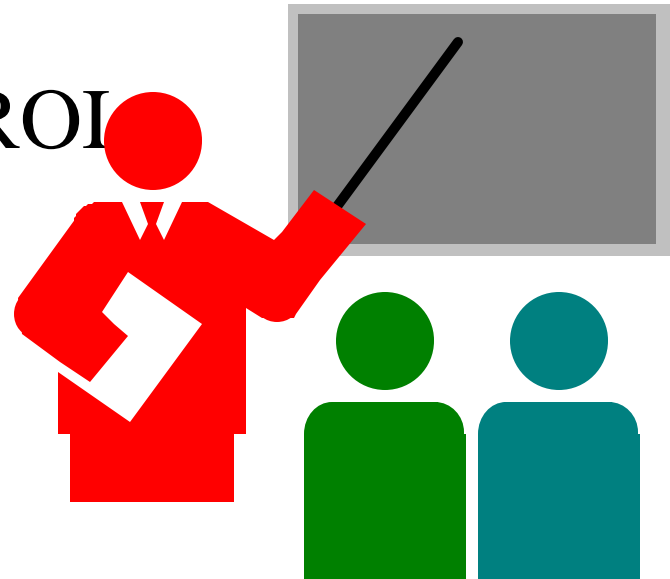
- Σ (fixed costs of automated testing) times ($t/Useful\ Life$)
- Plus Σ (costs of people creating automated tests)
- Less Σ (costs of people creating manual tests)
- Plus Σ (costs of people maintaining automated tests)
- Plus increased Changed Costs values

Benefit Computation

- Σ (variable costs of running manual tests n_2 times during time t)
- Less Σ (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 1st 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