

Bob Crews
President - Checkpoint Technologies, Inc.
President – TBQAA (Tampa Bay QAA)
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The Pitfalls of Automation

And How to Avoid Them

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About Checkpoint Technologies

- HP Business Partner (Reseller)
- HP Authorized Training Partner
- Provide software and services to organizations throughout the United States
- Services include staff augmentation, consulting, training, and mentoring
- Developers of HP training courses and HP certification exams



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Objectives

- ▶ This presentation will address:
 - ▶ A definition of “Test Automation”
 - ▶ The benefits of test automation
 - ▶ Common reasons for failure in successfully implementing automation
 - ▶ Criteria to identify test cases that should and should not be automated
 - ▶ Strategies to increase your test automation effectiveness

TEST AUTOMATION DEFINED

Pitfalls of Automation

Test Automation Defined

Test automation is the use of software (a script, program, etc.) to handle:

- ▶ the execution of tests
- ▶ the comparison of actual outcomes to expected, predicted outcomes
- ▶ the setting up of test preconditions
- ▶ other test control and test reporting functions

Commonly, test automation involves automating a manual process already in place that uses a formalized testing process. This is where some key mistakes are made.

Stop & Think

- ▶ What would you expect to be some limitations and challenges with test automation?

WHY USE TEST AUTOMATION?

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Software Testing Back to Basics

"Program testing can be used to show the presence of bugs, but never to show their absence!"

[Edsger Dijkstra](#)

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Limits and Objectives of Testing

- ▶ You can't test a program completely!
- ▶ The purpose of testing is to find problems in the software.

Full credit and acknowledgement to "Testing Computer Software" by Cem Kaner, Jack Falk, and Hung Nguyen

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"You can't test a program completely."

- ▶ There are three reasons that complete testing is impossible:
 - ▶ The domain of possible inputs is *too large* to test.
 - ▶ There are *too many possible* paths through the program to test.
 - ▶ The user interface issues (and thus the design issues) are *too complex* to completely test.
- ▶ The point is – there are **numerous** scenarios and conditions which must be validated.

"Testing Computer Software" by Cem Kaner, Jack Falk, and Hung Nguyen

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LIMITATIONS AND BENEFITS

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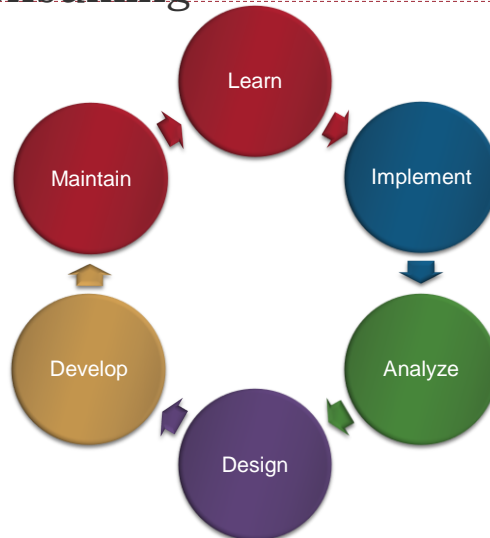
Limitations of Automation

- ▶ Time
 - ▶ Learning curve
 - ▶ Implementation
 - ▶ Analysis
 - ▶ Design
 - ▶ Develop
 - ▶ Maintain
- ▶ Automation tool has no intelligence
- ▶ Automation tool is only as good as the people using it

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Time Consuming



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Lack of Intelligence

- ▶ No intuition or gut instinct (an automated script can't have a "hunch")
- ▶ Can't learn so it can't do it "better" the next time
- ▶ Lacks ability to evaluate and use express subjective opinion
- ▶ Tools are no substitute for intelligence

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Only As Good as the Users

- ▶ The more experienced and knowledgeable the users – the less time to implement
- ▶ Beneficial experience and knowledge:
 - ▶ Subject matter (of system being tested)
 - ▶ Software testing
 - ▶ Programming (especially if in same language as solution)
 - ▶ Automation

Benefits of Automation

- ▶ Speed
 - ▶ Time of execution
 - ▶ Can disperse execution and execute remotely
- ▶ The 3 R's - Reusability, Repeatability, and Reliability
- ▶ Coverage
 - ▶ Can validate greater number of requirements
 - ▶ Can validate with greater number of scenarios
- ▶ Can execute unattended (tester can perform other tasks)
- ▶ Can execute remotely (and disperse among numerous machines)

Actual R.O.I. Example

Real case scenario: Fortune 500 Financial Firm

- ▶ B.A. validates random selection of 60 (out of 600) mortgage records. Each record with 56 fields.
 - Analysis performed monthly (no end in sight)
 - High calculation
 - 18 – 24 hours to perform analysis
 - Tedious and error prone
 - Perfect candidate for automation
-



Automation Process and R.O.I.

- ▶ 36 hours to automate
 - ▶ *Direct R.O.I.*
 - 30 minutes to execute and 1 – 3 hours to analyze for total of 1.5 – 3.5 hours monthly.
 - Can be scheduled to run remotely and unattended! (Therefore not requiring B.A.'s time.)
 - Validates – not 60 random records but ALL 600 records!!!
 - ▶ *Indirect R.O.I.*
 - B.A. can perform other tasks.
 - Decrease in errors.
 - More records validated – greater coverage!
-



R.O.I. Realized (1st Year)

Before Automation

Task	Cost
Analysis: \$30 (hourly salary) * 24 (hrs) * 12 (yearly executions)	\$8,640

After Automation

Task	Cost
Automation: \$90 (Consult. rate) * 30 (hrs)	\$2,700
Analysis & Maintenance: \$30 (hourly salary) * 3 (hrs) * 12 (yearly analysis)	\$1,080
Software allocation: 10% of cost	\$1,000
Total	\$4,780



R.O.I. Calculated

- ▶ The manual process validated 60 random records at an estimated cost of \$8,640
- ▶ To manually validate 600 records would cost an estimated \$86,400 (\$8,640 * 10)
- ▶ The automated process validates 600 records at an estimated cost of \$4,780



COMMON TEST AUTOMATION MISTAKES

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Common Errors

Unrealistic expectations

Same methodology used for automated as manual

Create overly complex framework

Fail to utilize basic features of automated testing

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1. Setting Unrealistic Expectations

They believe...

- ▶ They can automate **100%** of testing process
- ▶ There's no need to plan for automated script maintenance
- ▶ Testing team can learn solution
 - ▶ Without *training*
 - ▶ Without *technical (programming) knowledge*
 - ▶ Without having *knowledge of application they're testing*

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2. Using Manual Methodology

- ▶ Use same methodology for automation as for manual
 - ▶ Checks performed in the manual tests scripted into the automated test unnecessarily. Automated test is now more complex than necessary and took longer to develop than necessary.
 - ▶ If no analysis is done easy to create redundant tests
 - ▶ Example: A login test with multiple conditions to test:
 1. Valid username and password
 2. Blank username
 3. Blank password
 4. Invalid username
 5. Invalid password
 6. Both username and password blank

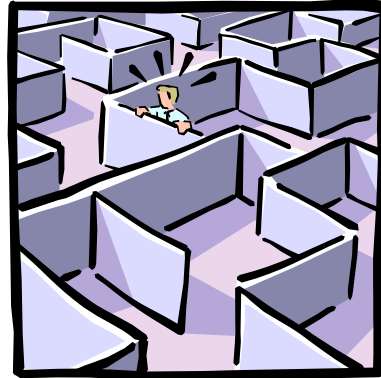
Can be verified with one automated test rather than six.

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3. Designing Overly Complex Framework

- ▶ Increases development time
- ▶ Difficult to use and implement
- ▶ Difficult to maintain
- ▶ Does not provide ROI while being developed



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4. Ignoring Full Features of Automation

- ▶ They fail to take advantage of:
 - ▶ Data-driving capabilities
 - ▶ Reusability
 - ▶ Modularity
 - ▶ Ability to run unattended (and in some cases remotely)

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STRATEGIES TO IMPROVE EFFECTIVENESS

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Strategic Automation Approach

- ▶ Set realistic expectations
- ▶ Automate each test case on its own merit
- ▶ Emphasize importance of reusability and data-driving
- ▶ Expand use of automation
- ▶ Let the framework *evolve*

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Set Realistic Automation Expectations

- ▶ Important aspect of test automation is *partial* test automation, or automating parts but not all of the software testing process
- ▶ If you can realistically automate **60% - 70%** of your test cases your doing great
- ▶ Know how to automate and what to *automate* (and what to leave *manual*)

Criteria to Automate

- ▶ Tests run for every build of an application
- ▶ Tests using multiple sets of data and validating numerous conditions
- ▶ Tedious and prone to human error
- ▶ Manual execution time will be **greater than** “time to automate + time to execute automated test”

Criteria to Leave Manual

- ▶ One-time testing
- ▶ Ad-hoc testing
- ▶ Emergency testing
- ▶ Usability testing
- ▶ Tests without predictable results
 - ▶ Exploratory testing is great but it's not a good candidate for automation



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Automate Based on Merit

- ▶ Automate if you know that:
 - ▶ a test case will be executed repeatedly
 - ▶ automation can:
 - ▶ duplicate the actions necessary to perform the test
 - ▶ verify the same expected results as the manual test
 - ▶ you can automate and execute in less time than total manual execution time (manual execution time X number of executions)
- ▶ Analyze from an automation perspective
- ▶ Perform automation assessment

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How many manual test cases? How many automated test cases?

- ▶ Valid login
- ▶ Invalid login
 - ▶ *Blank* agent name / *valid* password
 - ▶ *Blank* agent name / *blank* password
 - ▶ *Blank* agent name / *invalid* password
 - ▶ *Invalid* agent name / *valid* password
 - ▶ *Invalid* agent name / *blank* password
 - ▶ *Invalid* agent name / *invalid* password
 - ▶ *Valid* agent name / *blank* password
 - ▶ *Valid* agent name / *invalid* password

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Automation Assessment

- ▶ Remember the “good candidates for automation” criteria
- ▶ Look at next 12 months
 - A. Assess manual process “time”
 - ▶ How many times will requirement(s) be tested?
 - ▶ How much time does it take to execute test manually?
 - ▶ Multiply the two
 - B. Assess automation process “time”
 - ▶ How much time will it take to automate?
 - ▶ How much time will it take to execute automated test?
 - ▶ Multiply the two
 - C. Compare A and B – if A is greater it’s probably smart to automate

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Automation Assessment

- ▶ Don't forget benefits of:
 - ▶ Remote and unattended execution
 - ▶ Greater number of conditions can be tested (in less time)
- ▶ Difficult to assign a value

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Unattended and Remote Execution

Manual

- ▶ Tester executes 24 manual tests (1 hour each) on one workstation
- ▶ Total execution time = **24 hours**
- ▶ Total tester time = **24 hours**

Automated

- ▶ Tester "kicks off" 24 automated tests (10 minutes each) on two workstations to run at 1:00 am.
- ▶ Total execution time = **2 hours**
- ▶ Total tester time = **5 minutes**

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Emphasize Reusability and Data-Driving

▶ Data-driving

- ▶ Increases the scenarios (requirements) an automated test can verify – can test more with less!
- ▶ Greatly enhances its *reusability!*
- ▶ Parameterize inputs, outputs, and expected results.
- ▶ Feed values into those parameters by either:
 - ▶ Passing from one test into another
 - ▶ Obtaining dynamically from the system or application (data driving if multiple sets of data)
 - ▶ Reading from a data file (data driving)

Use Data-Driven Approach

You can parameterize your expected results as well as input data to make your data-driven test more robust. Creating one automated login test and using the data table below will take the place of creating five different tests.

AgentName	Password	ExpResult
bcrews	Tampa6%	success
	Tampa6%	error
		error
bcrews	123456	error
bcrews		error

Expand Automation Use

- ▶ Testing tools can help automate tasks such as:
 - ▶ Data loading
 - ▶ Test preparation
 - ▶ Database restore
 - ▶ Test data creation (input and stored values)
 - ▶ Set system conditions (date and time)
 - ▶ Test clean-up
 - ▶ Product installation

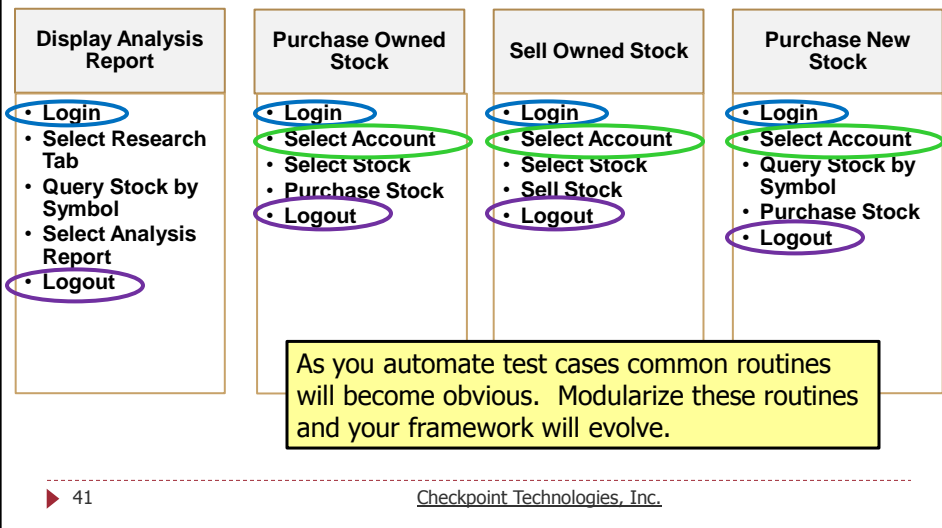
- ▶ Use automation features such as scheduling for remote execution

Framework Obsession

- ▶ A framework is important and beneficial - but don't become obsessed.
- ▶ Framework does not need to be 100% complete in order to reap benefits of automation. (BTW – it will never be 100% complete.)
- ▶ Realize benefits sooner by letting the framework evolve.

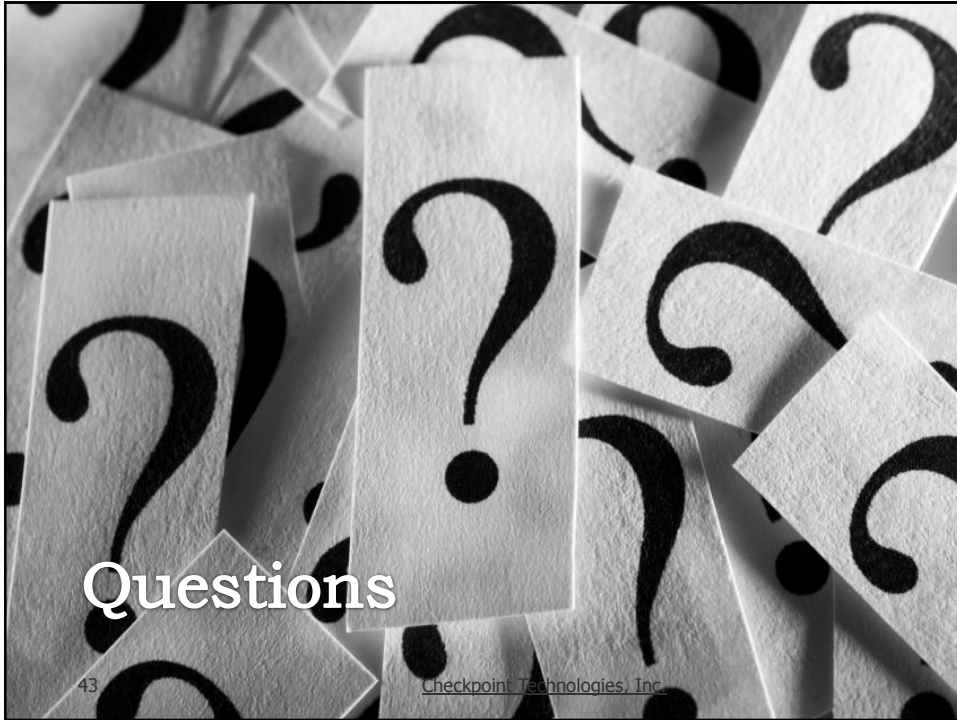


Evolution of a Framework



Summary

- ▶ Automation
 - ▶ Definition
 - ▶ Benefits & Limitations
 - ▶ Challenges
- ▶ Strategies to increase effectiveness
 - ▶ Set realistic expectations
 - ▶ Automate each test case on its own merit
 - ▶ Emphasize importance of reusability and data-driving
 - ▶ Expand use of automation
 - ▶ Let the framework *evolve*



Questions

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Thank you!

Bob Crews

Checkpoint Technologies, Inc.

Email: bcrews@checkpointtech.com

Office: 813.818.TECH (8324)

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