How to Optimize Your Web Testing Strategy

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The Theme

The key challenge in the practice of Web testing lies in adoption of a Web testing strategy and the allocation of resources behind it to support execution.

There are several different possible objectives for testing, such as identifying threats to customer satisfaction, certifying the product's behavior against a standard, minimizing technical support costs, or helping the project manager understand the risks of putting the software under test into production.

A strategy-focused company chooses a compatible set of processes (the ways the group gets things done), practices (test techniques and tools) and people who can use the techniques within the processes in order to achieve the objective.

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The Story

A division of company A

- Produces telecommunication servers and Web-based applications.
- 75 test engineers supporting several product lines, 40 are in the US in three different locations, and 35 are in India.
- US-based test engineers are very knowledgeable with their product lines.
- The business has been around for over a decade.
- Several tools including homegrown are in place to facilitate test automation, do performance and scalability testing, to perform code coverage, API testing and other product specific customized tests.
- Close to 50% of the test cases are automated.
- Dedicated performance and capability engineering team.
- Requirement-based testing is the main practice.
- Unit testing is done sporadically.
- External beta testing is unrealistic.
- Problem tracking and management, and configuration management systems are solid.
- While not strictly enforced, there are several good Software Development Life Cycle (SDLC) processes in place with a lot of documentation produced throughout the development phases.

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The Story

The problems

- Often, within 90 days of the release, the customers report an average of 15% of the total (valid) bug counts.
- A good number of bugs are user-scenario and configuration specific, but many others are functional and exception handling specific.
- It costs the company significantly to release patches and support the customers in resolving the bugs.

What's wrong?

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The Story

A division of company B

- Delivers various products catering to the financial industry.
- 50% of the products are on a mainframe platform with client/server supports, and the other 50% are on a Web platform. The goal is to deliver 80% of the products on a Web platform within the next two years.
- 60 test engineers supporting several product lines in two different US locations.
- Test engineers are very knowledgeable about their product lines.
- The business has been around for over a decade.
- Several tools are in place to facilitate test automation, and do performance and scalability testing.
- Requirement-based testing is the main test practice.
- Unit and API testing are done sporadically.
- User Acceptance Test (UAT) is done both internally and externally.
- Problem tracking and management, and configuration management systems are solid.
- CMM Level II certified, and is about get Level III certified.

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The Story

The problem

- Often, within 90 days of the release, the customers report up to 30% of the total (valid) bug counts.
- A good number of bugs are user-scenario and configuration specific, but many others are functional, configuration and exception handling specific.
- It costs the company to resolve the bugs.
- Performance of Web applications fails to meet customer expectations.
- Losing business to competitors because it takes the company too long to deliver a release (6 months versus a month by the competitors).

What's wrong?

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The Assignment

- To conduct an independent assessment on the test engineering's state-of-the-practice with the intention of reporting findings, recommending an action plan for improving performance and mitigating process and quality related problems.
- The objectives
  - Company A: To deliver a better testing program that leads to better quality releases.
  - Company B: To deliver a better testing program that leads to better quality and faster releases.

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Testing Strategy in Context

A test strategy is a holistic plan that starts with a clear understanding of the core objective of testing, from which we derive a structure for testing by selecting from many testing styles and approaches available to help us meet our objectives.

There are three focal points (SP3) that one can adjust for best results—People, process, and practice (methods and tools). “Process” means the ways of doing things that people have agreed to. “Practice” means a successful combination of testing methods and tools that help meet the agreed objectives. “People” means the human resources that are capable of applying the practice.

Combined with Strategy we call this SP3:

Strategy = People + Process + Practice

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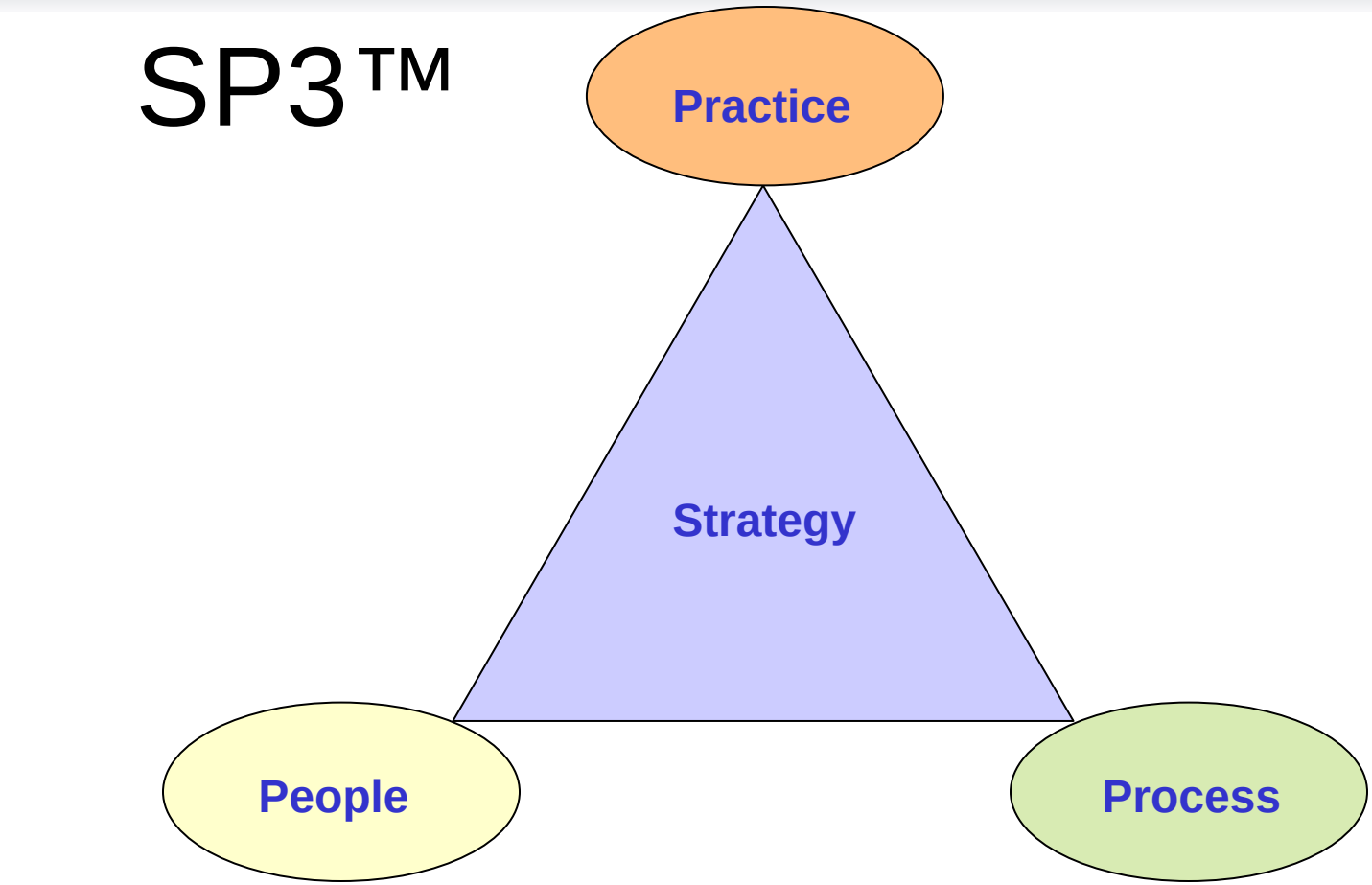
Testing Strategy in Context



Source: I developed this model by learning from Mitchell Levy, Value Framework® Institute

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Examples of Possible Improvements

☑: Yes
◘: Maybe
●: No

SP3: Strategy that consists of People, Process and Practice
Process: Life cycle
People: Skill sets, communication and morale
Practice: **Methods and tools**

Plausible Corrective Actions	Faster	Better	Cheaper	SP3
Automate test design	☑	◘	◘	Practice
Automate test documentation	☑	◘	◘	Practice
Automate test execution	☑	◘	◘	Practice
Deploy test automation strategy	☑	◘	◘	Practice
Focus testing on bug-finding rather than documentation	☑	◘	●	Process
Improve meaningful metrics with well defined correlation/corrective action	☑	☑	◘	Practice
Improve visibility of testing/QA activities	☑	☑	☑	Practice
Lessen number of cycles	☑	●	◘	Process
Reduce automation test script maintenance	☑	●	☑	Practice
Reduce test case maintenance	☑	●	☑	Practice
Remove redundancies	☑	●	☑	Practice
Shorten the test cycle	☑	●	◘	Process
Test earlier	☑	◘	●	Process
Upgrade talent through training and/or churning	☑	☑	◘	People
Improve test selection	☑	◘	◘	Practice
Leverage outsourcing including global resources	◘	●	☑	Practice
Broaden test coverage	●	☑	●	Practice
Improve test design	●	☑	●	Practice

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The Objectives of the Initiative

- Recommend changes in three different areas—People, Practice (methods and tools) and Process.
- Coach the team through improvement implementation.
- Monitor and measure progress over time.

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Typical Assessment Activities

- **Identify an executive sponsor—Often, this is the CTO, VP of Engineering or a GM of a division.**
- Conduct half a dozen pre-assessment information gathering meetings.
- Conduct a dozen 2 - 3 hour interview sessions with staff across the organization, including executive and middle management staff across functions, project management and programming staff and ultimately, software testing and QA staff.
- Conduct software testing survey consisting of about a hundred questions designed to gather intelligence about testing practices, and groups' as well as individuals' capability.
- Review about a thousand pages of documents.

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The Results—Company A's Top Issues

- Ineffective test design methods and techniques.
- Testing requirement-focused.
- An ineffective test automation strategy and framework diminishes the overall effectiveness (and causes resource depletion in some cases).
- Poor resource allocation.
- Testing staff has low morale.
- Lack of visibility into QA and test activities.
- Testing staff has strong domain expertise but its industry QA and skill-based testing expertise is light.
- Metrics program does not lead to actionable improvement activities
- Poor process definitions and executions (e.g., no approvals, no checkpoints, no traceability).
- Poor integration and management of offshore resources.

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The Results—Company B's Top Issues

- The only focus of testing is requirement-based.
- Test process is documentation heavy, more than necessary which slows everything down.
- Testing lacks depth—More checklist rather bug-finding oriented.
- Poor configuration and scenario coverage.
- Lack of visibility to help evaluate testing effectiveness and efficiency.
- Test automation is ad-hoc. Much of the automation is done by translating manual test scripts.
- Lack of visibility to help understand test automation effectiveness and efficiency.
- The practice of system testing is redundant to other testing.
- The objectives of external testing are not aligned with business objectives.
- Poor external beta test practice and management.

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Conclusions in Both Cases

- Key issues to be addressed before focusing on tactics:
  - Lack of a corporate-wide software testing strategy that aligns testing/QA objectives with business objectives.
  - Unclear testing/QA objectives and direction from management at the organizational level (across-functions).
  - Lack of a test automation strategy, framework and tool that deliver long-term cost-effective, manageable and scalable results.

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Common Findings

Based on several dozens of assessments:

- The key issue is not a lack of testing tools, processes or competent staff.
- It is the lack of a corporate-wide test strategy that leads to other problems.

"What's the use of running if you are not on the right road."

German Proverb

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How Web Testing Has Evolved at These Companies

- You get a ship date.
- You get some sort of requirements.
- You follow some sort of processes. These processes are often
  - developed ***top-down***
  - progressing with the ***timeline*** (from start to end)
  - missing the understanding of the testing/quality objectives, and the selection of the best practices and processes to help meeting those objectives.
- You do what you have always done—So you do things right, ***but not necessarily the right things.***

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What's Your Job?

- When I ask the staff what the test teams do, I often get
  - validate requirements, find bugs, assure quality, QC the product, make sure the customer is happy with the product and so on
- If I said "But those are different objectives," I get "We do all of the above."

That's a bad sign because you can't do all without proper resource allocation (which often is the case).

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A Historical Perspective

How we have evolved

- Early days: Developers wrote code and did some testing.
- Mid-80: Dedicated resources for testing. We were learning how to test well.
- Mid-90: Due to high demand, everyone who can speak English can test.
- Early 2000:
  - A good crop of testing folks remained in the industry.
  - Quality pressures and limited resources force us to be more methodical about how we test.
  - New tools and techniques are available but produce limited results if not applied thoughtfully.
  - We have to do more with less.
  - Offshore is a common part of the resource model

We need to rethink how testing is done to be more cost effective. We need a strategy!

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Another Historical Perspective

Source: Gartner Group's 'four states of development' concept referred in Achieving Quality by Design Part II: Using UML by Ed Adams and Sam Guckenheimer.

Formulating a Test Strategy

- It's teamwork.
- It requires all stakeholders to participate.
- It requires executive support.
- It requires thinking out-of-the-box—Start with a blank piece of paper.
- It requires a lot of asking "why?"
- Think bottom-up, and start from the end.

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A Formulated Strategy Should Include

1. Identifying different product development styles from inception through maintenance, so that we can eventually map the appropriate test strategy to each.
2. Mapping out phases, milestones and relevant activities on a typical timeline.
3. Identifying the equivalent type of test strategies for each development method.
4. Prescribing what's involved in each test strategy.

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Strategy Formulation Process

1. What are your quality objectives or characteristics? (see p.24)
2. What are the requirements for each characteristic? (see p.25)
3. What are the types of bugs that affect each quality characteristic? (see p.26)
4. What are the test types or activities needed to support finding problems described in #3? (see p.27)
5. What are the most effective approaches to finding specific types of bugs as early as possible? (see p.28)
6. What is the required application maturity to support #4? (see p.29)
7. How would #5 and #6 be mapped to the various phases in the SDLC? (see p.30)
8. How would you qualify the maturity of the software to determine that it has reached its milestone?
9. How do you quantify and measure your work?
10. What tools can help you improve your work and which framework is needed to implement the tool successfully?

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Quality Objective Examples

- Functionality
- Usability
- Performance
- Security
- Compatibility
- Scalability
- Recovery

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Requirements for Quality Objective Examples

SEIU R-I

Description: Technical System Design Supplemental Integration Requirements are included in this report. The Integration Requirements will detail the outline for performing exploratory testing using Test Director. The Integration Requirements, themselves, are the Test Specifications.

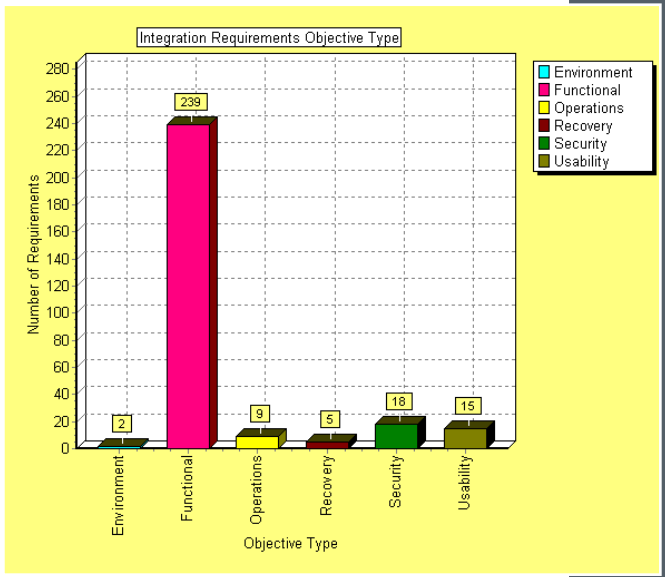
Document Version: 0.1

Document Date: 19-Aug-2003 04:18 PM

Related Documents: SEIU Technical Design Specification

Chapter 1 Requirements

Requirement Phase	Req ID	Reference	Requirement	Objective Type
Integration-Risk Based Exploratory Assessment	2974	Software	SEIU Database Roles give basic privileges to the system	Security
Integration-Risk Based Exploratory Assessment	3136	Software	The SEIU Move Study Groups are functional	Functional
Integration-Risk Based Exploratory Assessment	3137	Software	The SEIU Move Study Group Sets are functional	Functional
Integration-Risk Based Exploratory Assessment	3138	Software	The SEIU Move Extract is functional	Functional



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Bug Type Examples

1. Design errors
2. Coding standard, other coding-related error
3. Design and coding-related errors
4. Design and logic errors
5. Function/Class specific errors
6. Exported function specific errors
7. Functional errors at run-time
8. UI design errors
9. Errors caused by environments
    1. Configuration: Composed of certain mixes of software and/or hardware configurations
    2. Compatibility: Composed of certain mixes of software and/or hardware types and versions
10. Errors that prevent the system from meeting satisfactory response-time
11. Functional errors caused by heavy traffic or usage of the system
12. Exception-handling errors at the system level
13. Errors caused by resource depletion due to memory leaks or clean-up routines
14. Errors in functional and data recovery after a system failure
15. Installation errors
16. Vulnerabilities that expose security risks to the operator as well as the user of the system
17. Source data errors
18. Errors in meeting certain standards or regulations

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Test Type Examples

1. Design Review
2. Code Inspection/Review
3. Code Walkthrough
4. Design Walkthrough
5. Unit
6. API
7. External Functional
8. Usability
9. Accessibility
10. Configuration
11. Compatibility
12. Regression
13. Performance
14. Load
15. Stress
16. Failover/Recovery
17. Installation
18. Security
19. Compliance

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Test Approach Examples

- Requirement-based
- Scenario-based
- Soap Opera
- Model-based
- Attack-based
- Risk-based
- Fault Injection
- DAST
- Exploratory

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Application Stability Examples

- Pre-coding
- Coding stage
- Code and unit test complete
- Pre-integration
- Run-time testable
- Functionality complete (assuming that much of the developer centric work has been done earlier)
- Functionality complete and tested
- Functionally stable for multiple users
- Install-ready

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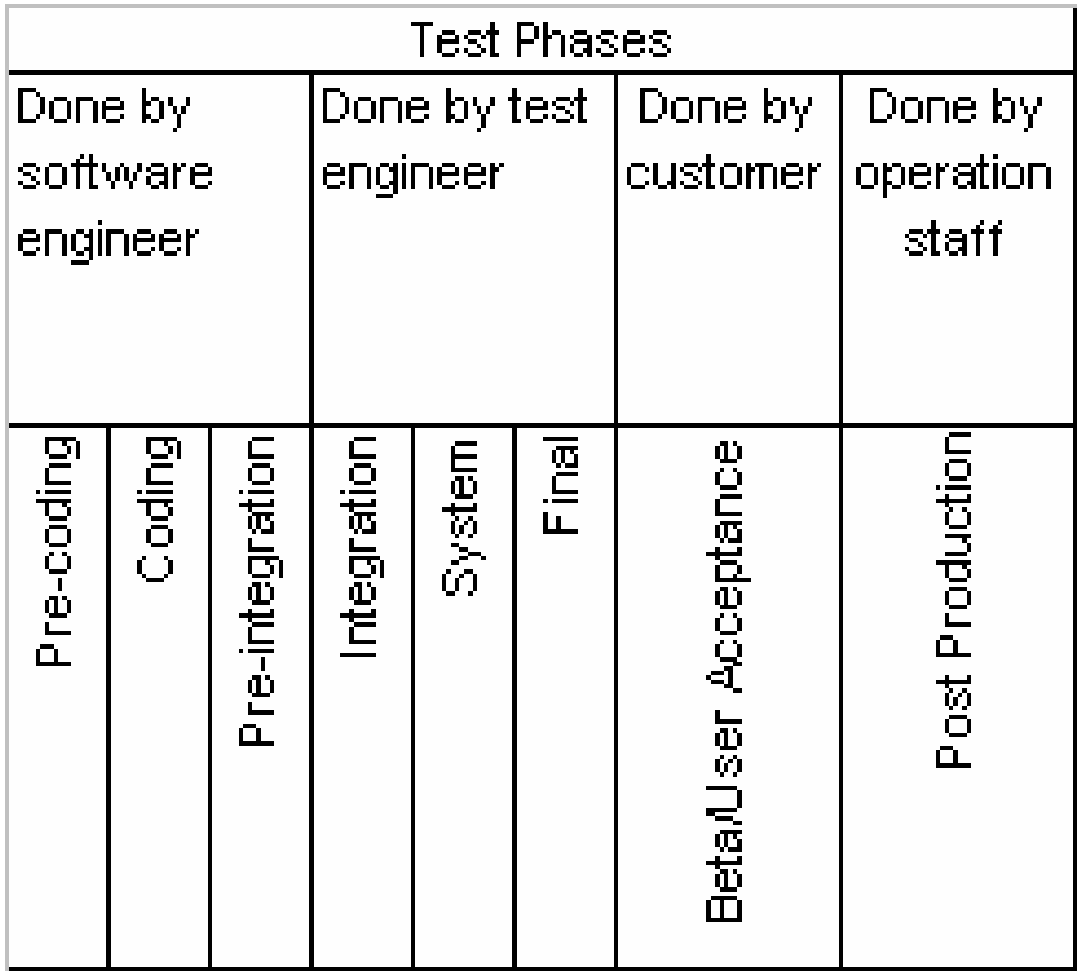
Test Phase Examples



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Results After Implementation

- In both cases, the missed bug rates have been reduced to less than 10% at the same cost structure.
- More importantly, none of the bugs missed are considered critical bugs that require immediate patches.
- “Faster” is a trickier attribute to measure because it depends on many variables, many of which are not testing-specific. However, both organizations have moved to a release-train model.
- Test automation frameworks are deployed for better visibility, maintainability and productivity.
- While much progress has been made, obtaining metrics remains the largest problem. This is due to the fact that it requires some infrastructure to ensure data integrity.

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Parting Thoughts

There is still much work to do

- We should do more study on metrics with real-world data.
- We should do better research to understand the various types of bugs so we can develop better methods and tools to find them earlier.
- We need to improve our understanding of various types of tests, and their power and limitations, so we can have a wider selection.
- We should do better at deploying a framework that connect methods and tools and manual testing to provide the most return on investment.
- We should be better at training the testing workforce with better skills and testing practices; and most importantly, we should be better at formulating test strategy.
- We should do more study on, and be better at, test case generation
- We need to do better at delivering tools that connect the symptom of a problem to source error.

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About LogiGear Corporation

LogiGear provides global solutions for software testing including the world-leading test automation solution with Action Based Testing. For over a decade, we've worked with hundreds of companies, from Fortune 500 to startups, delivering unique testing solutions that meet their unique needs. We double their test coverage, cut test time in half, improve quality and reduce cost.

LogiGear has built a reputation for offering the widest range of services in the software testing industry. Be it turn-key test automation, consulting, training, outsourced testing, or products, we partner with software organizations to create approaches that precisely meet their demands.

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Enjoy STP Conference 2006!

"Strategy without tactics is the slowest route to victory. Tactics without strategy is the noise before defeat."

Sun Tzu

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