“I Wouldn’t Have Seen It If I Hadn’t Believed It: Confirmation Bias in Testing”

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Testing is About Making Sure That People Aren’t Being Fooled

…and we have to start with ourselves

The Big Theme of This Workshop

A tester is someone who knows that things can be different.

• Jerry Weinberg

Feedback Loop: Perception & Conception

Confirmation Bias

The tendency to see believe interpret
in ways that fit with your hypotheses expectations
rather than challenging them.

Confirmation Bias: Variations

availability bias Pollyanna principle belief perseverance
survivorship bias selection bias recency bias
endowment effect concurrency bias
choice-supportive bias
and, for today’s talk…
Positive Test Strategy

- "A tendency to test cases that are expected (or known) to have the property of interest rather than those expected (or know) to lack that property."
- “…can be a very good heuristic for determining the truth or falsehood of a hypothesis under realistic conditions.”
- It can, however, lead to systematic errors or inefficiencies.
  - Klayman and Ha, 1987

Positive Test Strategy

- "When concrete, task-specific information is lacking, or cognitive demands are high, people rely on the positive test strategy as a general default heuristic.” BUT…
- "emphasis on the sufficiency of one’s actions is enhanced when one is rewarded for each individual success rather than only for the final rule discovery.” - Klayman and Ha, 1987

The Great Traps of Test Cases

If you want to know how the system works, a focus on counting test cases is a really bad idea.

Escaping Confirmation Bias

- Practice the skill of factoring
- Change a factor in your description
  - Change one of the nouns to something else
  - Be more specific
  - Add adjectives to your description
  - Consider the opposite
- Manage the focus of your attention
  - Alternate between focusing and defocusing
  - Reverse figure and ground

Factoring: Dimensions of Interest

- Factoring is the process of analyzing an object, event, or model to determine the elements that comprise it.
- When we factor for the purposes of test design, we identify elements that we may need to observe or control during a test. We call those factors.
- Factors may be
  - intrinsic or relational
  - variable or static

Managing Attention

- To test for anticipated problems…
- To test a simple product, or part of a complex product very thoroughly…
- To pinpoint an observed problem…
- To confirm that a fix has been made…
- To maximize test integrity…
- To stay in grooves…
**Focusing Heuristics**

- Start the test from a known, clean state
  - reset the system; observe established pre-conditions
- Prefer simple, deterministic actions
  - focus on a relatively small number of tests
- Vary One Factor At a Time (OFAT)
- Develop and test to a specified model
  - trace test steps to that model
- Follow established and consistent lab procedures
- Make specific predictions, observations and records
  - test to observe that the system fits the patterns
- Make the test easy to reproduce
  - automated input may help

**Managing Attention**

- To find unexpected problems…
  - To find elusive problems in sustained field use…
  - To test whether a fix has broken something else…
  - To discover new dimensions of the product or the testing mission…
  - To get out of ruts…

**Defocusing Heuristics**

- Start from a variety of different states
  - not necessarily clean; don’t necessarily reset the system
- Prefer complex, challenging actions
  - considering perform a huge number of tests
- Vary Many Factors At a Time (MFAT)
- Generate tests from a variety of models
  - or without reference to a conscious model
- Question your lab procedures and tools
- Try to see things with open expectations
  - let the patterns come to you
- Make the test hard to pass, instead of easy to reproduce
  - automatic logging and screen recording may help

**Reverse Figure and Ground**

**Heuristic: A vs. THE**

- Example: “A problem…” instead of “THE problem…”
- Using “A” instead of “THE” helps us to avoid several kinds of critical thinking errors
  - single path of causation
  - confusing correlation and causation
  - single level of explanation

**Heuristic: Unless…**

- To test your description, try adding “unless…” to it, and performing a test based on that

**De-Focus!**
Heuristic: The Rule of Three

- Special case of the Rule Of At Least Three:

  If you can’t think of at least three explanations for something, you probably haven’t thought about it enough.

Readings

- Tools of Critical Thinking (Levy)
- Exploring Requirements (Weinberg)
- Perfect Software and Other Illusions About Testing (Weinberg)
- Lessons Learned in Software Testing (Kaner, Bach, and Pettichord)
- Quality Software Management, Vol. 1: Systems Thinking (Weinberg)

Readings

- How To Lie With Statistics (Huff)
- The Black Swan (Taleb)
- An Introduction To General Systems Thinking (Weinberg)
- Measuring and Managing Performance in Organizations (Austin)
- Software Testing as a Social Science (Kaner)
  - http://www.kaner.com/pdfs/KanerSocialScienceSTEP.pdf
- How To Solve It (Polya)
- Politics and the English Language (Orwell)