Dealing with Tough Questions and Testing Myths

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Updates

- This presentation is ALWAYS under construction
- Updated slides at http://www.developsense.com/past.html

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Themes

- It's a complex world
- There are lots of possible right answers
- There are lots of factors in any given right answer
- Many of the things that we think are *absolutes* are really *relationships*
- Many of the things that we treat as *objects* are *constructs*, not tangible, countable things
- Many of the things that we see as *objects* are *models* or *representations*
- Testing is a social science

The Big Theme of This Workshop

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

- Jerry Weinberg

A Martial Art

- Learning to answering the tough questions is like learning self-defense
- In order to defend ourselves from tough questions that can hurt, we have to learn
  - not everything is an *attack*, but many things are potential *traps*
  - the patterns of traps and attacks
  - premises (often false) that can be questioned
  - how to keep centered in our responses

Patterns of Difficult Questions

- Pressure to answer quickly
- Differences in models
- Invalid assumptions or biases in the question
- Insufficient data for an answer
- *Too much* data for an answer
- Fear from one or more parties

Some Tools for Dealing with Difficult Questions

- Critical thinking
- General systems thinking
- Psychology and personal interactions
- Factoring
- Heuristics
- Collaboration
- Treating testing as a soft science, not a hard one

Factoring: Identifying the Elements that Matter

- A factor is an element that you can identify, control, or vary about something.
- What factors form our models of something?
- To whom do they matter?
- How do we describe the factors?
- What factors are consistent with
  - the thing itself?
  - things like it?
- What are the elements that differ
  - from one thing to another?
  - in the same thing over time?

Critical Thinking Meta-thoughts

- Many of the tough questions are based on mistaken assumptions and critical thinking errors.
- Refine your answers by recognizing common errors and digging up buried assumptions

See Levy, "Tools of Critical Thinking"

Some Common Thinking Errors

- Reification Error
  - giving a name to a concept, and then believing it has an objective existence in the world
  - ascribing material attributes to mental constructs—"that product has quality"
  - mistaking relationships for things—"its purpose **is**…"
  - purpose and quality are *relationships*, not attributes; they depend on the person
  - how can we count ideas? how can we quantify relationships?

MY NOMINEE FOR TESTING'S BIGGEST PROBLEM!

Some Common Thinking Errors

- Fundamental Attribution Error
  - "it always works that way"; "he's a jerk"
  - failure to recognize that circumstance and context play a part in behaviour and effects
- The Similarity-Uniqueness Paradox
  - "all companies are like ours"; "*no* companies are like ours"
  - failure to consider that *everything* incorporates similarities *and* differences
- Missing multiple paths of causation
  - "A causes B" (even though C, D, and E are also required)

Some Common Thinking Errors

- Assuming that effects are linear with causes
  - "If we have 20% more traffic, throughput will slow by 20%"
  - this kind of error ignores non-linearity and feedback loops—c.f. general systems
- Reactivity Bias
  - the act of observing affects the observed
  - a.k.a. "Heisenbugs", the Hawthorne Effect
- The Probabilistic Fallacy
  - confusing unpredictability and randomness
  - after the third hurricane hits Florida, is it time to relax?

Some Common Thinking Errors

- Binary Thinking Error / False Dilemmas
  - "all manual tests are bad"; "that idea never works"
  - failure to consider gray areas; belief that something is either entirely something or entirely not
- Unidirectional Thinking
  - expresses itself in testing as a belief that "the application works"
  - failure to consider the opposite: what if the application *fails*?
  - to find problems, we need to be able to imagine that they *might* exist

Some Common Thinking Errors

- Availability Bias
  - the tendency to favor prominent or vivid instances in making a decision or evaluation
  - example: people are afraid to fly, yet automobiles are far more dangerous per passenger mile
  - to a tech support person (or to some testers), the product always seems completely broken
  - spectacular failures often get more attention than grinding little bugs
- Confusing concurrence with correlation
  - "A and B happen at the same time; they must be related"

Some Common Thinking Errors

- Nominal Fallacies
  - believing that we know something well because we can name it
    - "equivalence classes"
  - believing that we don't know something because we don't have a name for it at our fingertips
    - "the principle of concomitant variation"; "inattentional blindness"
- Evaluative Bias of Language
  - failure to recognize the spin of word choices
  - …or an attempt to game it
  - "our product is full-featured; theirs is bloated"

Some Common Thinking Errors

- Selectivity Bias
  - choosing data (beforehand) that fits your preconceptions or mission
  - ignoring data that doesn't fit
- Assimilation Bias
  - modifying the data or observation (afterwards) to fit the model
  - grouping distinct things under one conceptual umbrella
  - Jerry Weinberg refers to this as "lumping"
  - for testers, the risk is in identifying setup, pinpointing, investigating, reporting, and fixing as "testing"

Some Common Thinking Errors

- Narrative Bias
  - a.k.a "post hoc, ergo propter hoc"
  - explaining causation after the facts are in
- The Ludic Fallacy
  - confusing complex human activities with random, roll-of-the-dice games
  - "Our project has a two-in-three chance of success"
- Confusing correlation with causation
  - "When I change A, B changes; therefore A must be causing B"

Some Common Thinking Errors

- Automation bias
  - people have a tendency to believe in results from an automated process out of all proportion to validity
- Survivorship bias
  - we record and remember results from projects (or people) who survived
  - the survivors prayed to Neptune, but so did the sailors who died
  - What was the bug rate for projects that were cancelled?

Exercise

From experience (yours or others') or from fiction, give an example of each of the preceding types of errors.

Some Common Beliefs About Testing

- Every test must have an expected, predicted result.
- Effective testing requires complete, clear, consistent, and unambiguous specifications.
- Bugs found earlier cost less to fix than bugs found later.
- Testers are the quality gatekeepers for a product.
- Repeated tests are fundamentally more valuable.
- You can't manage what you can't measure.
- Testing at boundary values is the best way to find bugs.

Some Common Beliefs About Testing

- Test documentation is needed to deflect legal liability.
- The more bugs testers find before release, the better the testing effort.
- Rigorous planning is essential for good testing.
- Exploratory testing is unstructured testing, and is therefore unreliable.
- Adopting best practices will guarantee that we do a good job of testing.
- Step by step instructions are necessary to make testing a repeatable process.

Exercise

Associate each testing belief with at least one critical thinking error.

There are no right or wrong answers, but be prepared to defend yours.

General Systems Thinking

- General systems thinking is a way of observing and determining the way things (tend to (tend to)) work
- A means of analyzing, mastering, and learning to live with complexity
- A means of simplifying hard problems in useful ways
- Any view of a system is necessarily a model
  - "All models are wrong; some are useful."
    - George Box
  - "The map is not the territory."
  - "When the map and the territory disagree, believe the territory."
    - Jerry Weinberg, quoting the Swedish Army
- "Compared to what?" is a key modeling question

General Systems

- systems are made up of parts comprising a whole, with dynamic connections and relationships between them
- input, output, control, and feedback influence the behaviour of systems
- system behaviour may be linear or non-linear
- system behaviour may tend towards equilibrium or chaos
- no part of a system can change without some other part of the system changing
- systems can be decomposed into parts or subsystems, which are themselves systems
- notions of systems depend on our models

General Systems Thinking: The Science of Simplification

- …and the simplification of science.
- "*X* is the study of those systems for which the approximations of *X* work successfully."
- Concerned with general observations and patterns in identifying systems, their components, and their relationships
- Saying things concisely, while recognizing the potential for hidden or dangerous assumptions
- General systems laws must have at least two specific applications—and at least two specific exceptions

Models Link Observation and Inference

- **A model is an idea, activity, or object…**

  such as an *idea in your mind*, a *diagram*, a *list of words*, a *spreadsheet*, a *person*, a *toy*, an *equation*, a *demonstration*, or a *program*

- **…that represents (literally *re-presents*) another idea, activity, or object…**

  such as something complex that you need to work with or to study

- **…whereby understanding the model may help you to understand or manipulate what it represents.**

  - A *map* helps navigate across a terrain.
  - *2+2=4* is a model for adding two apples to a basket that already has two apples.
  - *Atmospheric models* help predict where hurricanes will go.
  - A *fashion model* helps understand how clothing would look on actual humans.
  - *Your beliefs about what you test are a model of what you test.*

General Systems in Testing

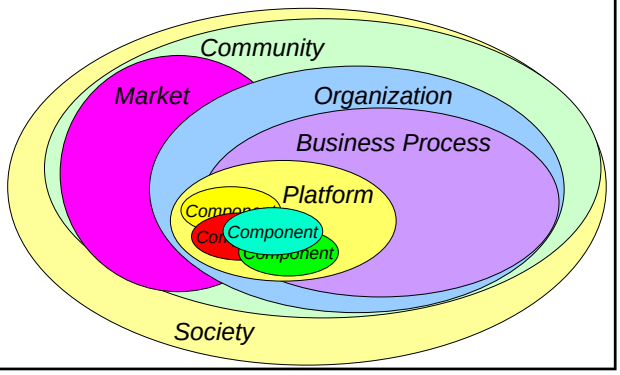
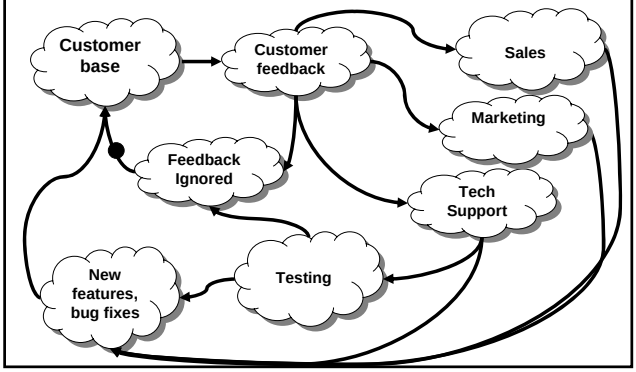


Diagram of Effects to Identify Risk: The Customer Feedback Loop



Heuristic

"guideline"

"rule of thumb"

noun:
A *fallible* method for *solving a problem* or *making a decision*

- Examples:
  - "Plant your corn early!"
  - Pull on the handle, push on the plate.
  - Problems are cheaper to fix the earlier they're found.

Heuristic

adjective:
"serving to discover"

- Examples:
  - a heuristic *approach*
  - heuristic *guidewords*
  - heuristic *models*
  - heuristic *tools*

Heuristics

- Fallible, "fast and frugal" methods of solving problems, making decisions, accomplishing a task…

All is heuristic!

"The engineering method is ***the use of heuristics*** *to cause the* ***best change*** *in a* ***poorly understood situation*** *within the* ***available resources****."*

Billy Vaughan Koen
Discussion of the Method

Heuristics Are Fallible

- Heuristics use guidance and control of skilled practitioners.
- They're heavily context-dependent.
- They may be useful even when they contradict each other—especially when they do!
- They can substitute for complete and rigorous analysis.
- Because they are *reasonable, low-cost* shortcuts, heuristics can present *more valuable* solutions for the present circumstances *because* they're less complete.

"Heuristic reasoning is not regarded as final and strict but as provisional and plausible only, whose purpose is to discover the solution to the present problem."
- George Polya, *How to Solve It*

Heuristic: A vs. THE

When trying to explain something, prefer "a" to "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…

Try adding "unless..."

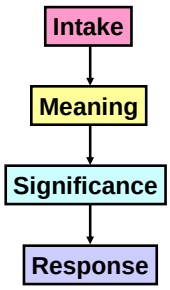
- When someone asks a question based on a false or incomplete premise, try adding "unless…" to the premise
- When someone offers a Grand Truth about testing, append "unless…"

Heuristic: The Helpful Rule

No matter how much it looks otherwise, everyone is trying to help.

- Take responsibility for the communication
- Make it clear that you too are trying to help
- The helpful rule comes from Jerry Weinberg

The Satir Interaction Model



- Developed by Virginia Satir and explained by Jerry Weinberg
- Useful to identify the phases in conversation and communication

Intake

- distinct from in*put*
- you have considerable control over what you choose to sense
- listen carefully to the words, but…
- listen to the music and watch the players, too
- beware of selective listening, both in yourself and in the other

Meaning

- Words are inherently slippery and fundamentally ambiguous
- A given sentence or question may have a large number of possible interpretations
- Words don't have meaning until some person *assigns* a meaning
- People may differ in their meanings
- Keep your sense of possibilities open
- Feed back into Intake
- Hint: try applying the Rule of Three

Significance

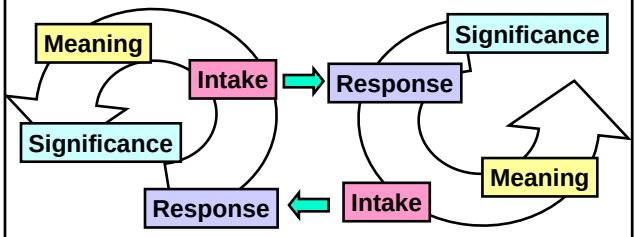
- Gives priority *for some person* to meaning *for some person*
- Feeds back into Intake and Meaning
- Strongly conditioned by emotion
- Hint: apply the Rule of Three here, too

Response

- Don't feel obliged to respond
  - right away, or
  - under pressure
- Do watch, listen, and assign priorities to observations
- Do anticipate to go with the response, "seek more data"

…and remember…

- …the process is continuous and interactive.



Heuristic: The Data Question

What did you see or hear (smell, taste, touch) that made you believe...?

This heuristic comes from Jerry Weinberg and Don Gause, *Exploring Requirements*

Heuristic: The Subtitle

- Reframe an idea so you can see alternatives and bring out assumptions in a conversation.

No user would ever do that.

really means...

"No user *that I've thought of*, and *that I like*, would ever do that *on purpose*."

What users haven't you thought of?

What users don't you like?

What might a user that you *do* like do by accident?

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.

- This idea comes from Jerry Weinberg

Heuristic: The Turnaround

- This idea comes from the work of Byron Katie.
- Identify the factors in the sentence.
  - Note that pronouns are especially ripe for alternative interpretations.
- Vary or invert one or more of the factors.
- Repeat at least three times.

The Turnaround: Exercise

Your manager asks…

Are You On Top Of It?

The Turnaround: Example

- My boss doesn't understand me!
- I don't understand my client.
- My client does understand me.
- I don't understand me.
- My client doesn't understand himself.
- My client doesn't understand my work.
- My client doesn't understand his work.

Testing as a Social Science

- This is a very compelling notion from Kaner
- Social sciences investigate effects on *people*
- Include qualitative *and* quantitative research methods.
- Diversity of values and interpretations is normal.
- Observer bias is an accepted fact of life and is managed explicitly in well-designed research.

Partial answers that might be useful!

Readings

- Exploring Requirements (Weinberg)
- Tools of Critical Thinking (Levy)
- 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)
- Quality Software Management, Vol. : First-Order Measurement (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)