DEFECT SAMPLING – AN INNOVATION FOR FOCUSED TESTING

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THE BIG IDEA

- **As testers, our job is to find defects.**
  - However, we often look for only the symptoms of defects – failures.
- **All testing is sampling**
- **What if…**
  - We had ways to sample for defects?
  - Defects really *do* cluster?
  - We could predict where best to look for defects?
  - We looked for defects differently?

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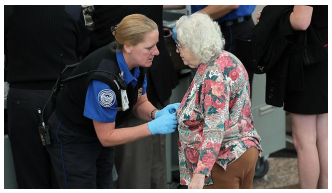
THE BAD NEWS

- **As testers, we suffer from the "needle in a haystack" problem.**
  - Looking for something very small in something very large.
  - However, a metal detector helps!



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"WE NEED PEOPLE TO TEST WHO DON'T THINK LIKE TESTERS"

CEO TO TEST MANAGER

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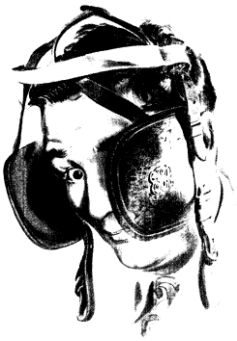
WHY?

- **When "professional" testers miss obvious things, business stakeholders rightly look for other solutions.**
- **It's common for:**
  - Our methods to get old and ineffective
  - Testers to grow complacent
  - People to fail to learn
  - Our perspectives to get too narrow
  - People to have misplaced priorities



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A GOLD MINING ANALOGY

- **Gold mining is an expensive task, even on a small scale.**
  - Testing can also be expensive.
- **There are often places that look promising for gold.**
  - But there is no way to tell from the surface if gold is really underground.
- **The only way to know for sure is to drill holes and sample the dirt.**
  - In testing, we can do something similar as a way to test our intuition and suspicions about where defects may be.
  - Test automation is a creative way to drill for defects.

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NO HELPFUL SIGNS!

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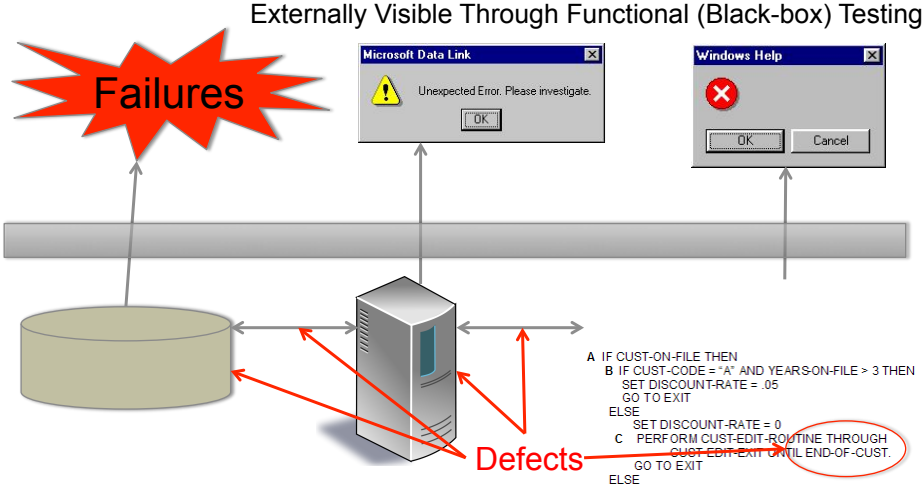
WHAT DO WE SEEK?

Externally Visible Through Functional (Black-box) Testing



Internally Visible Through Structural (White-box) Testing and Static Analysis

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THE PROBLEM

- **External**
  - Too much to cover, too little time
  - Unclear expected behavior
  - Test automation mainly used for confirmatory testing
- **Internal**
  - Lack of technical knowledge by testers
  - Lack of motivation from developers
  - Lots of code!
  - Many interactions
  - However, there are some very helpful static test tools

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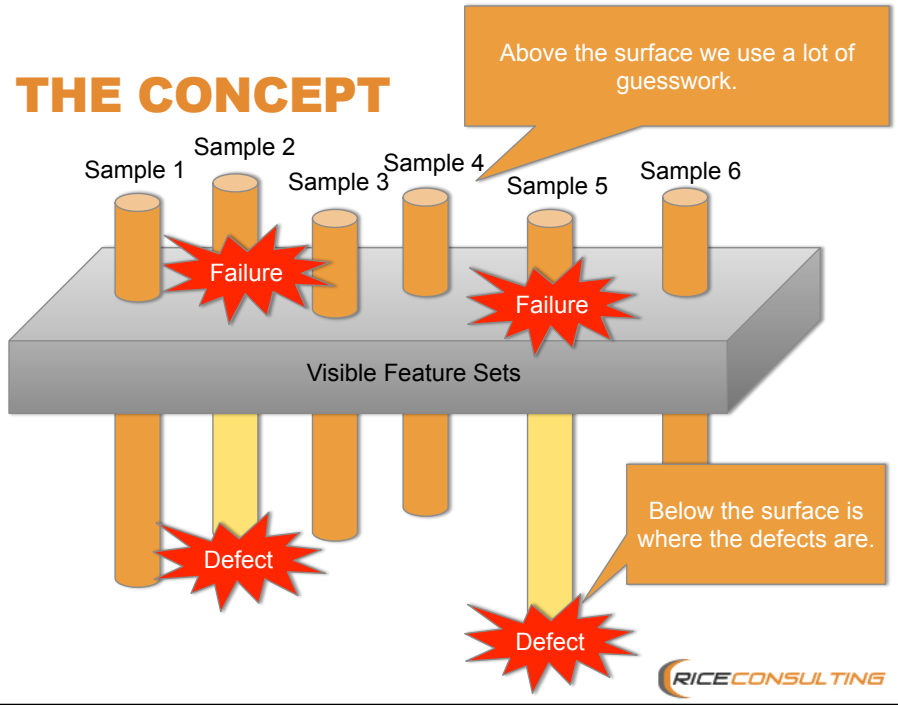
THE CONCEPT



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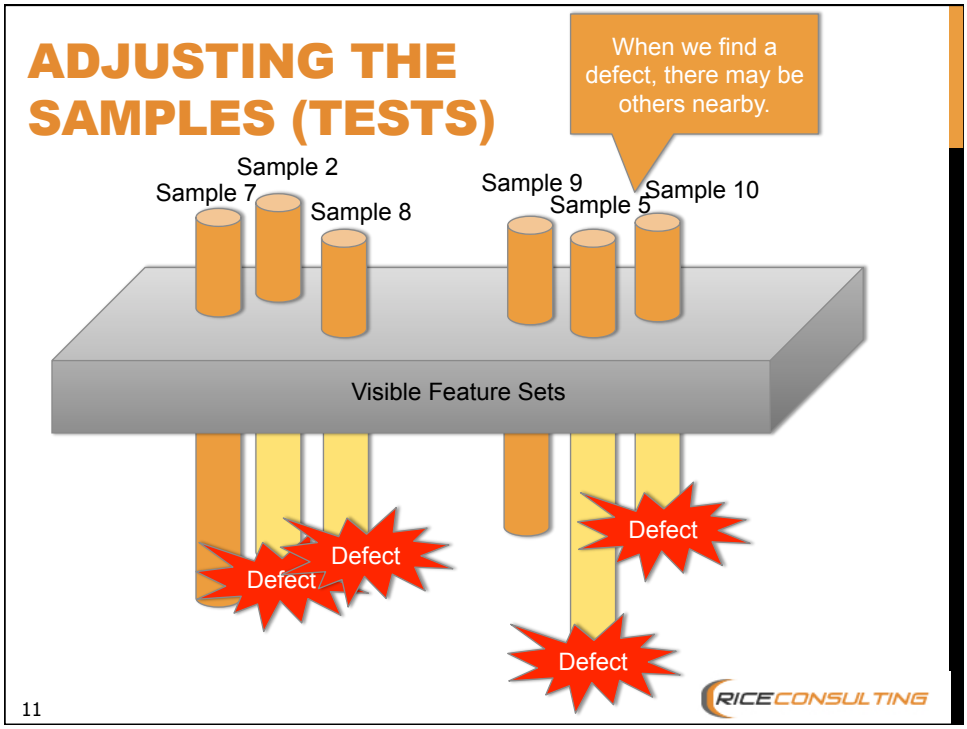

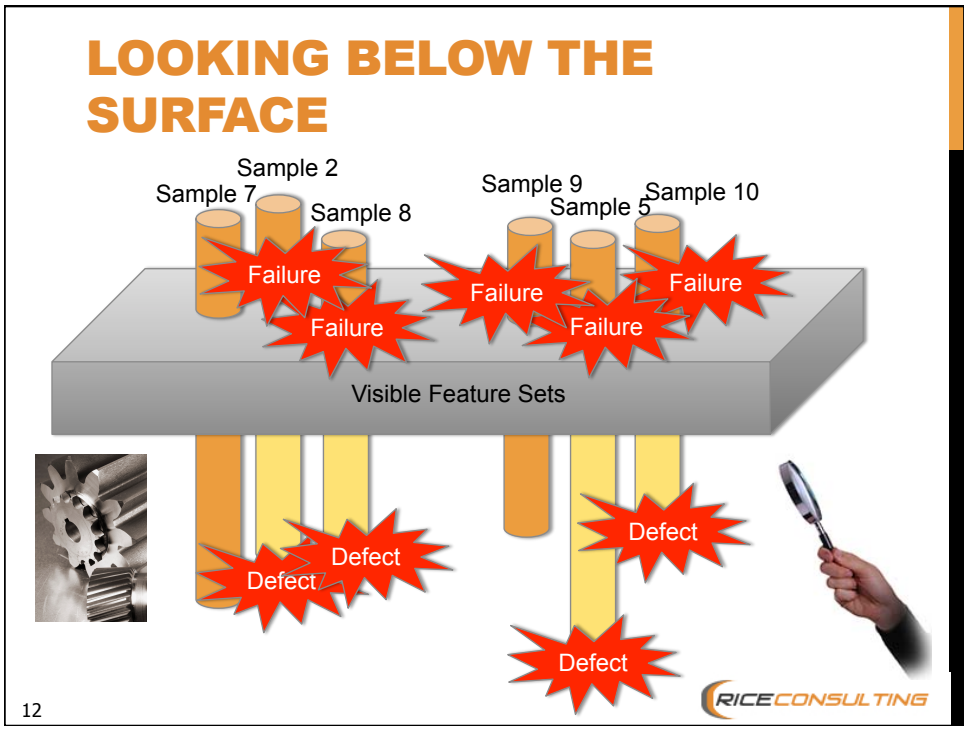

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PATTERNS TELL US SOMETHING

Sights are probably OK, but we need to work on accuracy

Other variables could have an impact: Wind, distance, etc.

Sights are off, but we are consistent in our aim.

Variation Consistency

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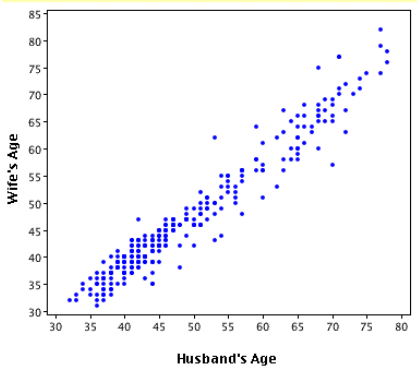
THE KEY – LOOK FOR PATTERNS

- **Patterns help us find interesting defects.**
  - Commonality
  - Concentration
  - Contrast
  - Types
  - Trends



Pearson's correlation

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2012 U.S. PRESIDENTAL ELECTION

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HOW CAN WE SAMPLE?

- Classes
- Risk
- Relationships
- Statistical Methods
- Randomly

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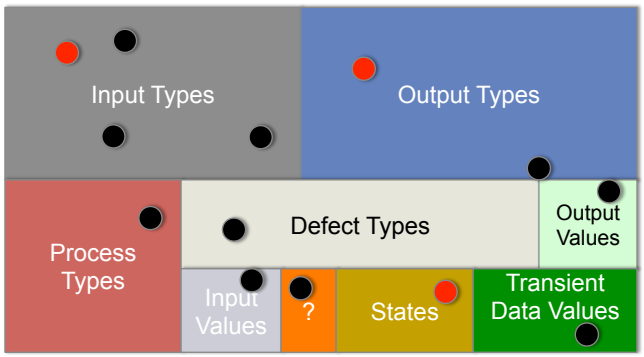
CLASSES – SAMPLE 1



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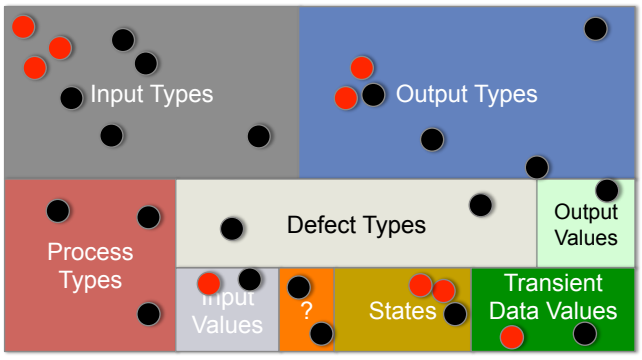
CLASSES – SAMPLE 2



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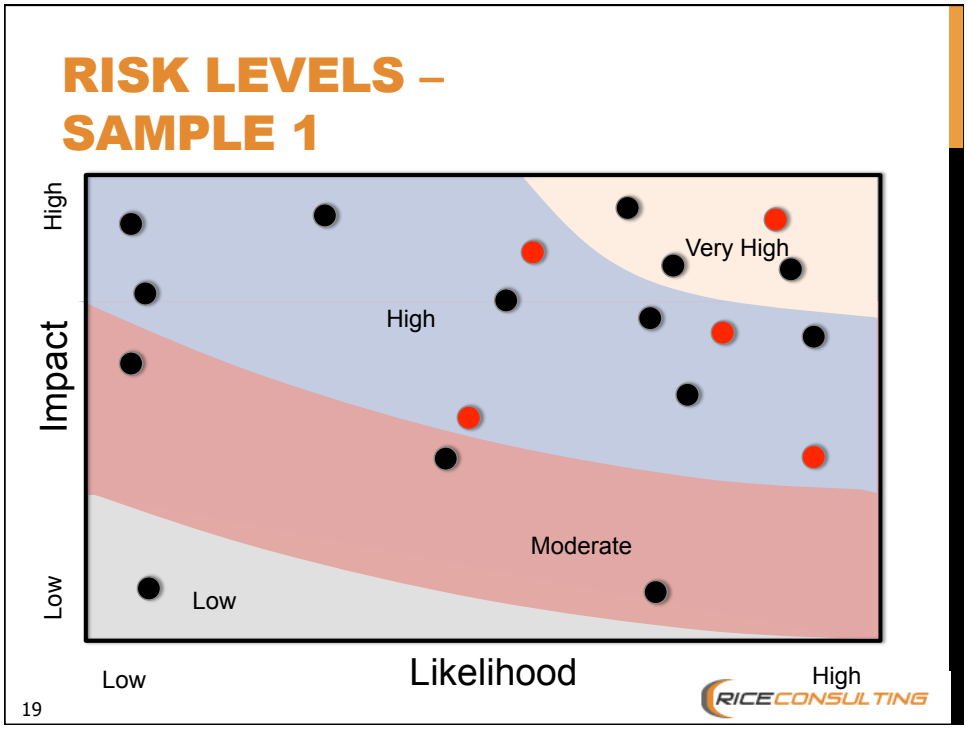

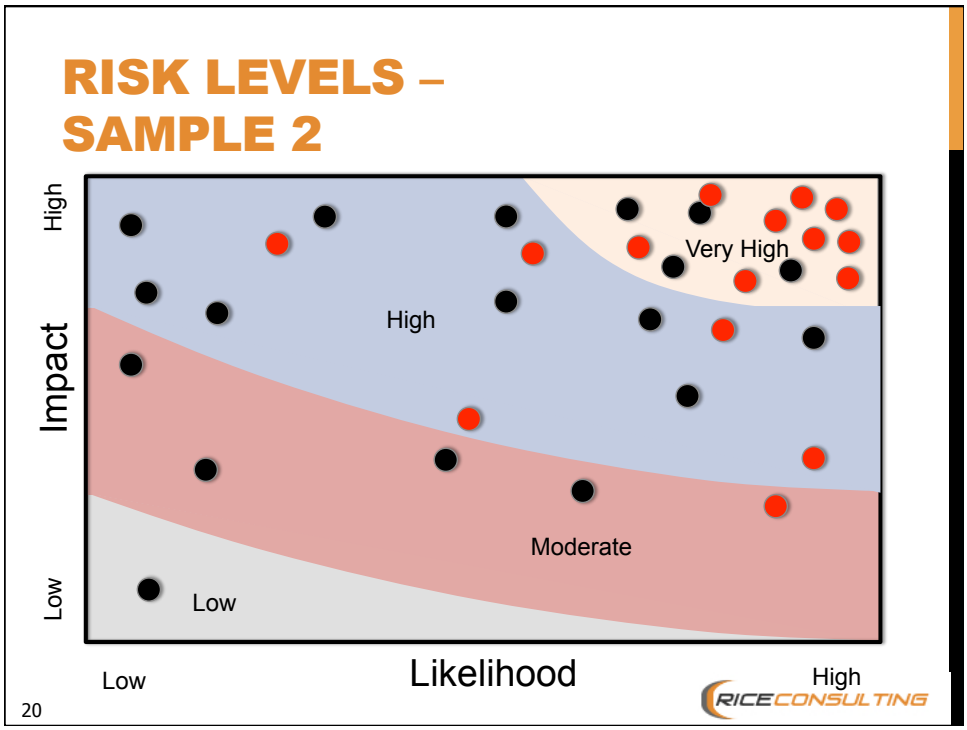

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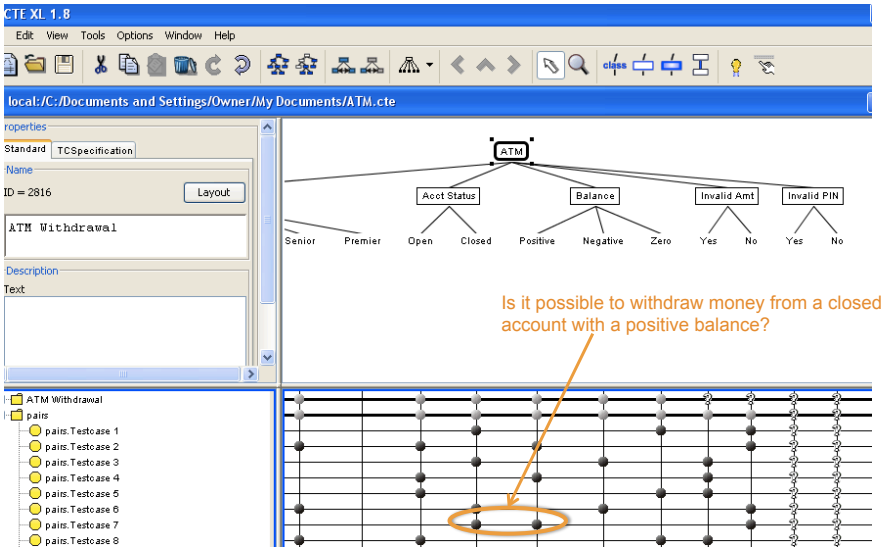
RELATIONSHIPS



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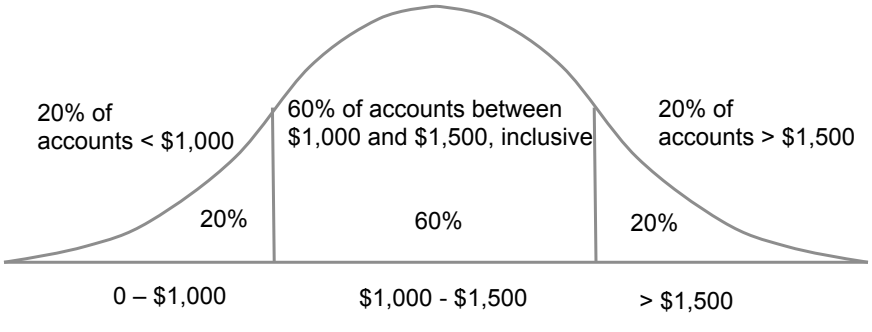
STATISTICAL SAMPLING

- **Population analysis**
  - Used to model test data based on production data.



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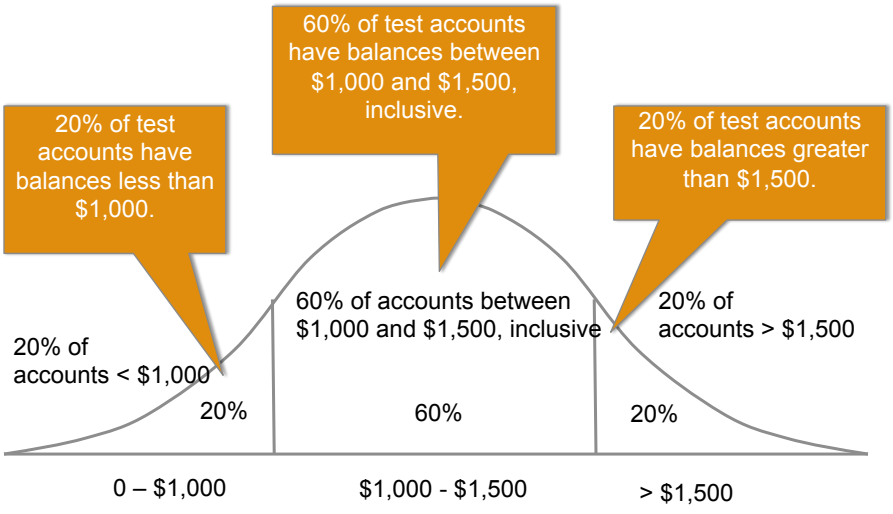
TEST DATA MODELING



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RANDOM SAMPLING

- **Not a substitute for other approaches**
- **However, it can be helpful at times to help get off the beaten path.**
  - Examples:
    - The first n rows of data
    - Every nth occurrence
    - Random number generators

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HOW CAN WE LEVERAGE THIS?

- **Test Automation**
  - Frameworks to vary inputs and actions:
    - Randomly
    - Based on defect patterns and clustering

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EXAMPLE

- **There are 10,000,000 possible values for a field variable to be tested.**

  1. Extract or build test data based on the values to test and the randomizing formula chosen.
  2. Create automated tests using the data as input.
  3. If a failure is seen, capture the test values and test a lower to higher range.

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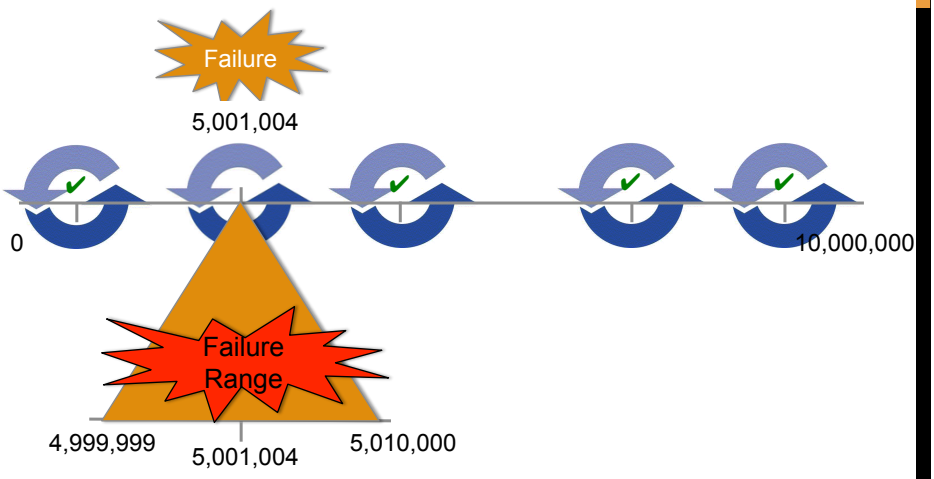
EXAMPLE (2)



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THE MISSING LINK – FEEDBACK FROM MISSED DEFECTS

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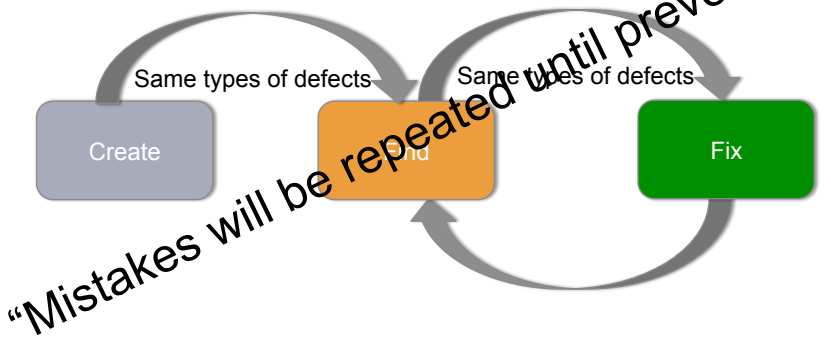
ENDING THE CYCLE OF DEFECTS

- **Defects = Rework = Lost $$**
- **The cycle continues until broken**



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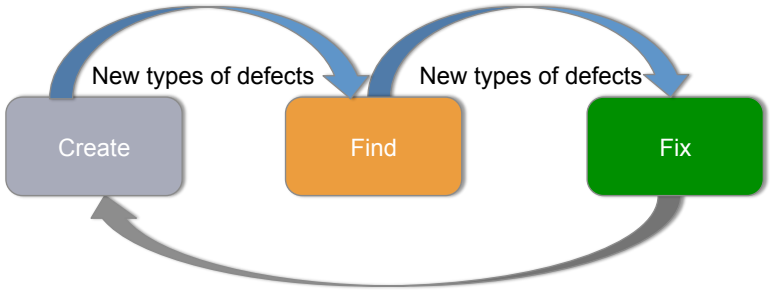
THE FEEDBACK LOOP



Identify root causes and fix the process

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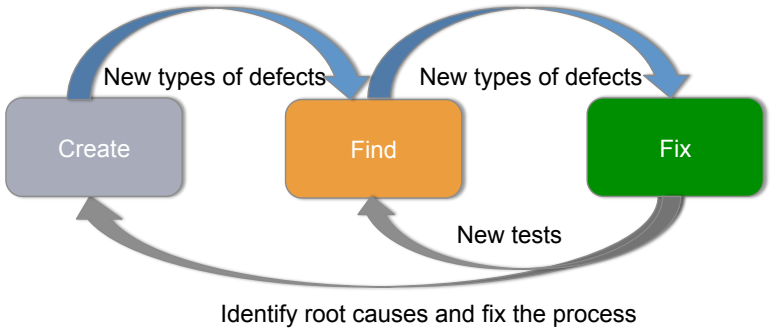
USING DEFECT FEEDBACK FOR TEST DESIGN



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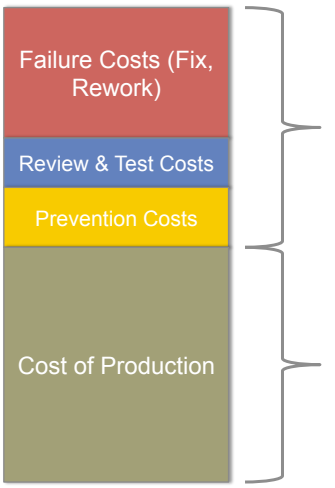

Cost of Quality

Cost to Build
(Development, Delivery)

When you consider the cost of a post-release defect, the value gained in preventing defects is like finding gold!

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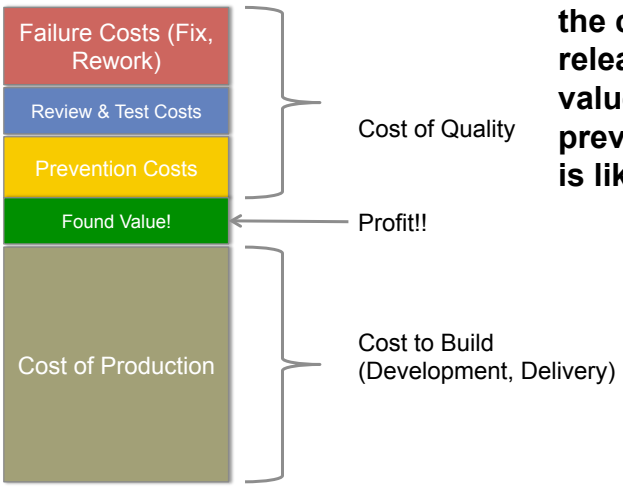

When you consider the cost of a post-release defect, the value gained in preventing defects is like finding gold!

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SUMMARY

- **Failures are only symptoms of defects.**
- **Not every defect manifests a failure.**
- **Not all failures are defects.**
- **Before spending valuable time designing and performing non-productive tests, intelligent test sampling is a good way to focus your efforts.**
- **No drill, no dig!**

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BIO - RANDALL W. RICE

- Over 35 years experience in building and testing information systems in a variety of industries and technical environments
- ASTQB Certified Tester – Foundation level, Advanced level (Full)
- Director, American Software Testing Qualification Board (ASTQB)
- Chairperson, 1995 - 2000 QAI's annual software testing conference
- Co-author with William E. Perry, *Surviving the Top Ten Challenges of Software Testing* and *Testing Dirty Systems*
- Principal Consultant and Trainer, Rice Consulting Services, Inc.

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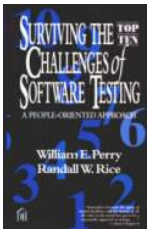

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