# *Bugs in Your Shopping Cart: A Taxonomy*

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# *Challenges of E-Commerce Testing*

- ***Global market:*** Many languages, currencies and cultural norms, global shipping, different legal systems (conflicting advertising / sales laws), etc.
- ***Multiple platforms:*** End-to-end, a single transaction might involve several systems on several continents, running on different processor and O/S families.
- ***Multiple clients:*** Client operating systems, browsers, peripherals, and ever-so-many different utilities.
- ***Multiple customer profiles:*** The user profile varies greatly by gender, age, language, wealth, etc.
- ***Multiple partner apps.*** The application under test relies on services provided by third parties, which are totally outside the application developer's control. For example, most of the credit card processing steps are done by the credit card company's system.

# *Challenges of E-Commerce Testing*

- ***Components from strangers. T***hird party components allow programmers to snap together large programs (or make big changes) quickly. Just because the components were written by someone else doesn't mean they're reliable.
- ***Multiple clocks, no standard time.*** There is no shared reference clock and so events can occur, or appear to occur, out of sequence.
- ***Random delays complicate timing.*** Different services will be provided at different speeds (and end user client(s) will receive and respond at varying speeds). Race conditions and other time-related problems more likely.
- ***Rapid change.*** Rapid, iterative development. Constantly changing UI.

# *Challenges of E-Commerce Testing*

***Most people coming to e-commerce testing will face a steep, multi-dimensional learning curve.***

# *The Bug Taxonomy*

- An outline that categorizes and lists a large number of potential bugs.
- The tester who uses the taxonomy can sample from the list, selecting a potential problem for analysis.
  - The tester's question is whether the software under test could have a bug analogous to the one from the list.
  - If so, the next question is what type of test would expose this type of bug.
- A good taxonomy
  - Has enough detail for a motivated, intelligent newcomer to the area to be able to understand it.
  - Is broad enough to raise at least a few issues new to someone with moderate experience in the area.
- A good taxonomy is a useful tool for informing a tester who is new to the area about the types of problems to be tested for.

# *Using A Bug Taxonomy*

- Kaner published an extensive taxonomy (over 400 bugs) in 1988 (updated by Kaner, Falk & Nguyen, 1993) and was frequently contacted by readers who used the list. Based on that feedback, we expect the following uses of the Shopping Cart list:
  - Tester unfamiliar with an aspect of the program looks for potential failure modes in the risk list, then explores the program looking for those types of failures.
  - Tester who has run out of good test ideas looks for plausible failure modes in the risk list, then creates tests looking for those types of failures.

# *Using A Bug Taxonomy*

- Test manager, training new testers, walks with the group through selected examples from the risk list in order to convey to the trainees the breadth of their work.
- Tester, auditing a test plan, samples from the taxonomy, selects plausible failures, then checks the test plan to determine what tests (if any) could have detected the failure. If none, the test plan has a hole.

# *Relation to FMEA*

- Failure Mode and Effects Analysis involves a multi-disciplinary evaluation of a product.
- The analysts identify the functions of the product, the ways they could fail (the failure modes), the potential impacts and severity of those failures, likelihood of the failures and potential causes of them.
- http://www.fmeca.com/ffmethod/fmeaproc.htm
- Given this information, the analysts (or management) prioritize their research.
- This is strongly analogous to *risk-based testing*, in which tests are designed to check whether certain potential bugs are actually in the product, and are then prioritized if there isn't enough time to run them all.

# *Categorizing the Risks*

We put together a list of about 60 categories of potential bugs, such as performance, understandability, accessability. Within a given category, we list

- Potential failures;
- Information about causes of the failures, if we have that information;
- References; and
- Examples of actual failures within the category's theme, that were reported in the trade press.

# *Categorizing the Risks--Example*

**Cache Server failure**

***Cache servers are used as intermediaries for web requests and retains previously requested copies of resources. The use of a cache server is to handle common requests locally and improve site performance by better speed up and reduced overhead on the web servers.***

The common issues discussed here are can be found in more detail in "Known HTTP Proxy/Caching Problems [1]"

- Cache may return an outdated shopping cart document if the header is misrepresented or last modified date is omitted
- If shopping cart content is dynamic in nature, then cache server will not be able to serve new content
- If caching proxy server fails during shopping session, sometimes the browser fails to bypass server and may need to be reconfigured and shopping cart state may be lost

# *Categorizing the Risks--Example*

**Cache Server failure (continued)**

- If shopping cart uses any form of encoded response, the proxy might cache it and send it to a non-encoding capable client
- Sensitive shopping cart content may get cached by Interception proxies that break client cache directives like "No cache" or "Must revalidate"
- The cache server may end up blocking some methods used by the shopping cart software, because the method contained in the request is unknown to the proxy so instead it generates the default HTTP 501 Error as a response.
- Shopping carts that use IP address to track state of the cart, may fail because Interception proxies at ISP level may alter client's IP to that of the proxy itself
- A caching proxy mesh might break HTTP content serialization resulting in the user getting older content when the shopping cart page loads

# *Categorizing the Risks--Example*

**Cache Server failure (continued)**

**Examples of related bugs and other known issues**

- Is Web caching bad for the Internet?
  http://www.cnn.com/2000/TECH/computing/04/18/web.cache.idg/
- Known HTTP Proxy/Caching Problems
  http://www.wrec.org/Drafts/draft-ietf-wrec-known-prob-03.txt

# *How We Developed the List*

- Brainstormed a first draft top-level list (we thank James Bach for his assistance)
- Searched electronic bug databases (such as bugnet.com and cnet.com) for examples
- Searched open source software for bug databases for specific products. These gave us examples and indications of the types of bugs possible
- Brainstormed additional types of problems
- Circulated the list and the outline for peer review

# *What's Coming Soon*

- Current taxonomy is a subset of the full set for Shopping Cart
  - We have rougher but extensive draft material for about 20 more categories. This is available on request to people who have a legitimate, *immediate* need.
  - A more polished version of these, and a few others, will be in Giri Vijayaraghavan's M.Sc. thesis, which will probably be completed in December 2002. Check for it at www.testingeducation.org in January 2003.

# *References*


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