No Test Cases Required:
Powerful, Credible, Accountable Testing that Finds Important Bugs Quickly

Michael Bolton, DevelopSense
mb@developsense.com
www.developsense.com
+1 (416) 992-8378

James Bach, Satisfice, Inc.
james@satisfice.com
www.satisfice.com
+1 (360) 376-4367

"We're making a product!"
"We need you to start testing it right now!"

What do you do?

Testing in two easy steps!

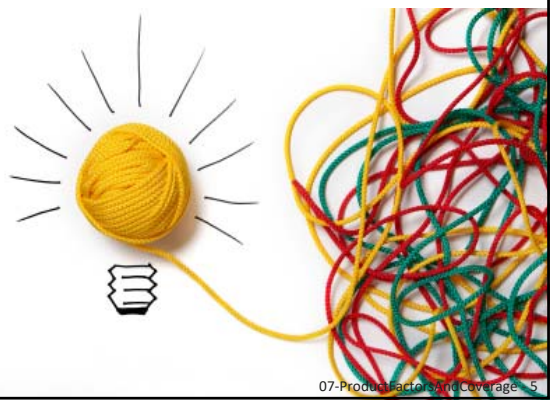
1. Prepare test cases.
2. Execute test cases.

Maybe it's more like this…

1. Read the specification.
2. Identify specific items to be checked.
3. Prepare test cases.
4. Execute test cases.

Or maybe it's more like this…

1. Read the spec.
2. OMG there is no spec!
3. Oh wait, there is a spec! I'll just read it.
4. OMG the spec is old and confusing and maybe WRONG…
5. Maybe I should ask someone…
6. OMG Nobody seems to know how this thing is supposed to work!
7. Wait… is there something…. *anything* I can test?



Yes! You CAN test…

- …the product
- …a mockup of the product
- …some document describing the product
- …a diagram that models the product
- …some feature of a work in progress
- …a product *like* this product
- …somebody's ideas about the product

Testing is the process of evaluating a product by learning about it through experiencing, exploring and experimenting.
To do that, you need models of the product.

Here's the good news…

Testing isn't really about test cases.

No Test Cases Required - 9

No Test Cases Required - 10

What is a test case?

There are many definitions:

- "a set of conditions under which a tester will determine whether an application, software system, or one of its features is working as it was originally established for it to do." (*Wikipedia*)

BUT... we will learn A LOT after we "originally establish" what a product should do.

Plus... we can't prove that a product works.

We can only SHOW that it CAN work.

What is a test case?

- "In order to fully test that all the requirements of an application are met, there must be at least two test cases for each requirement: one positive test and one negative test." (*Wikipedia*)

Notice the slip from "test case" into "test".
PLUS... for each requirement, apparently only one thing can go wrong!

What is a test case?

There are many definitions:

- "A set of input values, execution preconditions, expected results and execution postconditions, developed for a particular objective or test condition, such as to exercise a particular program path or to verify compliance with a specific requirement." (*ISTQB Glossary*)

If only they had said "or"!
If only they had included "activity!" Because...

What is a test?

"A set of one or more test cases."

(*ISTQB Glossary*)

DOH!

What is a test case?

In Rapid Software Testing, we say a test case is

"A set of some instructions or some data for testing some part of some product in some way"

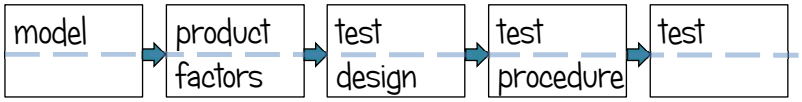
A TEST CASE says **something explicit** about **some conditions** of the test.

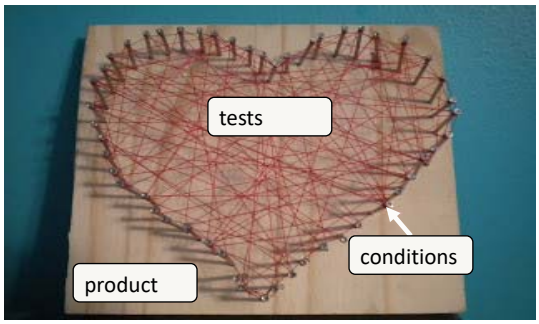
But a TEST is not just the explicit stuff. A test is full of **tacit knowledge** and **tacit activity** and **learning**.

We say all that to help clarify what is special and important about testing.

Product Factors

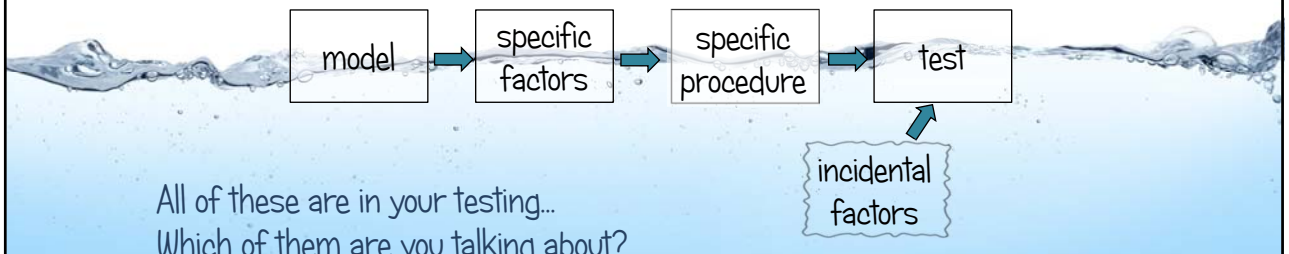
A product factor is anything about the product or its context that could be examined in a test.





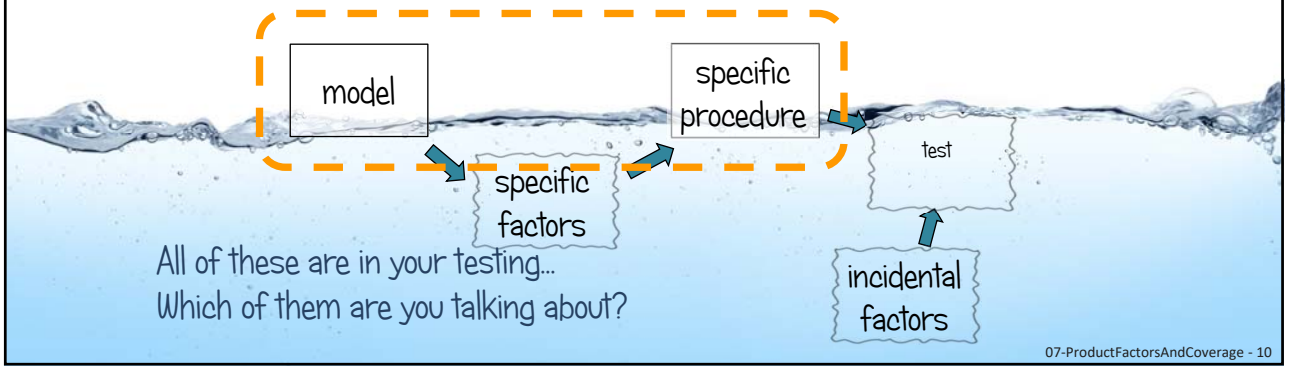
Product Factors

A product factor is anything about the product or its context that could be examined in a test.

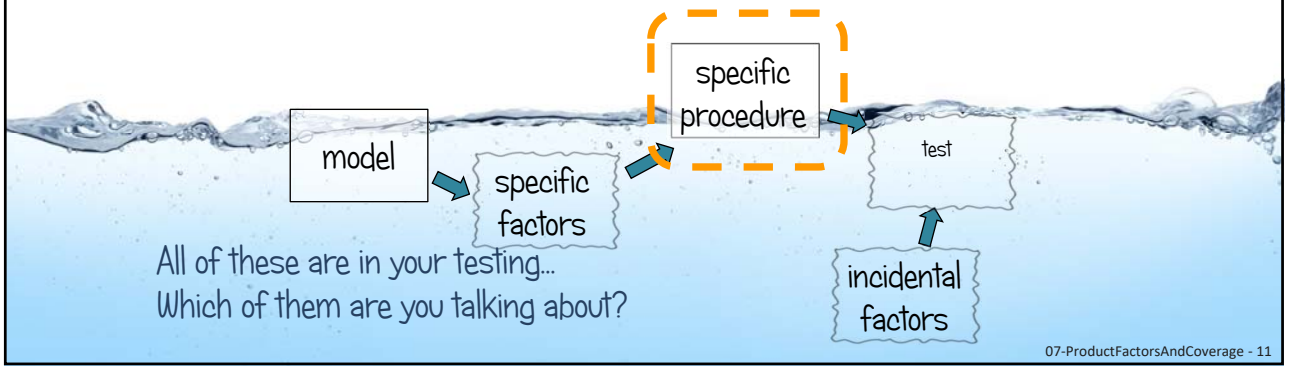


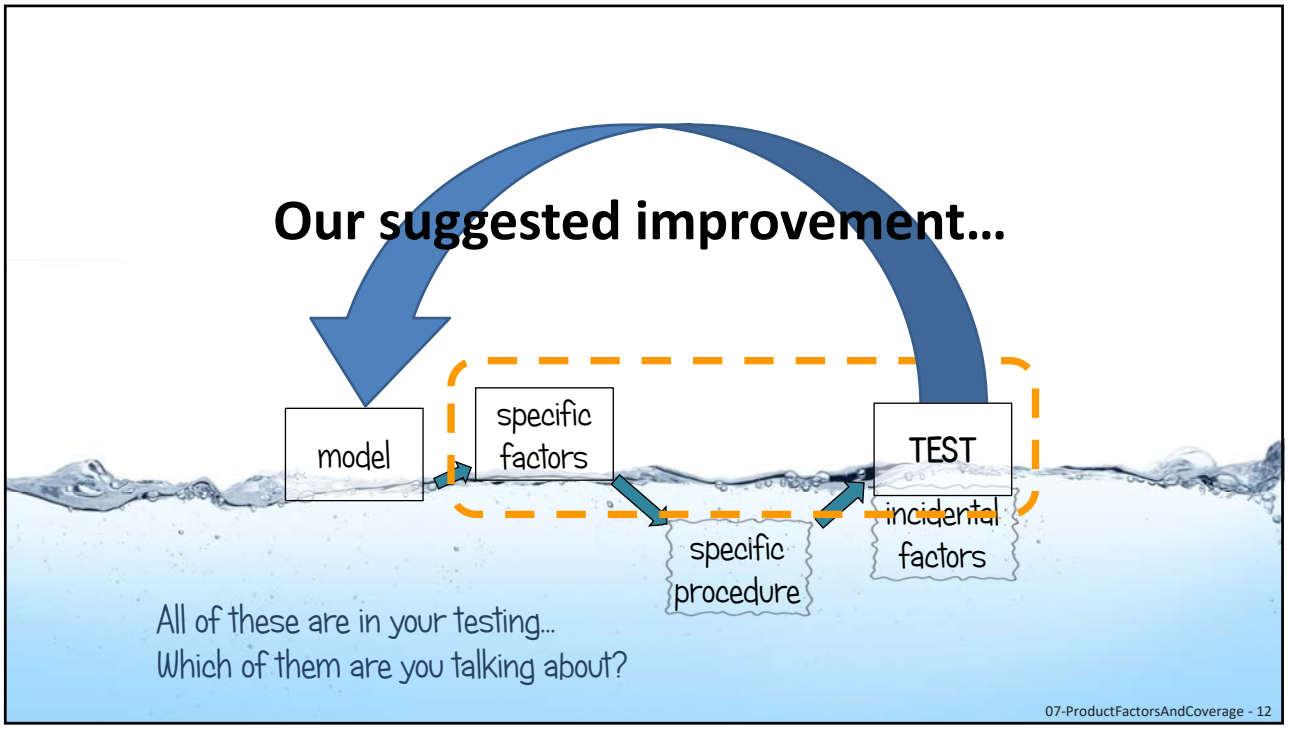
All of these are in your testing...
Which of them are you talking about?

Typical industry practice…



…or maybe even worse.





A test case is not a test

BesterTester 2.xls [Compatibility Mode] - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer Acrobat

I6 fx Expected Behavior

	A	B	C	E	H	I	
6	Sr. No.	Use Case ID	Test Case ID	Test Objectives	Test Steps	Expected Behavior	
9	1		ST1.1	To test for appearance of "Cart Credit Report" Link in MyAccount Logged In page for Users for whom privilege flag is enabled in BV_USER_PROFILE table	User logs in to MyCarts.com site and navigates to MyAccount Home page	"Cart Credit Report" Link should appear in MyAccount Logged In page only for Users for whom privilege flag is enabled in BV_USER_PROFILE table	
10	2		ST1.2	To test redirection from MyAccount page to Cart Credit Reports	Privileged user clicks on 'Cart Credit Reports' link	User should be redirected to 'Cart Credit Reports' page	
11							
12	**Accounts Tab in MyCarts Combined Activity Report**						
13	3		ST2.1	To test sorting of transactions by Account	User clicks on Account Header	Transactions should be sorted by Account in descending order	same as
14	4		ST2.2	To test sorting of transactions by Account	User clicks on Account Header	Transactions should be sorted by Account in ascending order	same as
15	11		ST2.3	To test appearance of total number of all carts and total sum of Account balances	User clicks on Accounts Tab	Total number of all carts and total sum of Account balances should appear	same as
16							
17	**Transaction History Tab in MyCarts Combined Activity Report**						
18	12		ST3.0	To test whether transactions are displayed	User clicks on Transaction History Link	Transactions should be displayed when successful response obtained. In case of error in response for any record in the resultset, none of the captured data is displayed. Instead appropriate error message is displayed	same as
19	13		ST3.1	To test whether friendly message is displayed while data is being retrieved for any report	User click on 'Cart Credit Report' link in MyAccount page and is redirected to MyCarts Combined Report page or User selects any input parameter and clicks Filter	For first load of MyCarts Combined Activity Report site and for every subsequent report selected, while data is being retrieved, a friendly message should be displayed	same as
	14		ST3.2	To test whether page has left navigation and whether standard MyCarts.com top navigation	User click on 'Cart Credit Report' link in MyAccount page and is redirected to MyCarts	Page with standard MYCARTS.COM top navigation and with no left navigation should be displayed for each and	same as

an_V 1.0.doc

	F	G	H	I	
	Expected Behavior	**Actual Behavior**	**Post-Condition**	**Status (Pass/Fail)**	
ite and page	"Cart Credit Report" Link should appear in MyAccount Logged In page only for Users for whom privilege flag is enabled in BV_USER_PROFILE table			Pass	
Credit	User should be redirected to 'Cart Credit Reports' page			Pass	
r	Transactions should be sorted by Account in descending order	same as expected behavior		Pass	
r	Transactions should be sorted by Account in ascending order	same as expected behavior		Pass	
	Total number of all carts and total sum of Account balances should appear	same as Expected Behavior		Pass	
tory Link	Transactions should be displayed when successful response obtained. In case of error in response for any record in the resultset, none of the captured data is displayed. Instead appropriate error message is	same as expected behavior		Pass	

What? No test cases?

Test cases themselves are not bad things (although they tend not to add value, and to make testing over-focused).

But *fixation* on test cases can be a real problem.

Instead of thinking “test cases” or “no test cases”, consider the degree to which testing needs to be *formalized*.

One Big Problem in Testing

Formality Bloat

- Much of the time, your testing doesn't need to be very formal*
- Even when your testing *does* need to be formal, you'll need to do substantial amounts of informal testing in order figure out how to do *excellent* formal testing.
  - Who says? The FDA. See http://www.satisfice.com/blog/archives/602
- Even in a highly regulated environment, you do *formal* testing primarily for the auditors. You do informal testing to make sure you don't lose money, blow things up, or kill people.

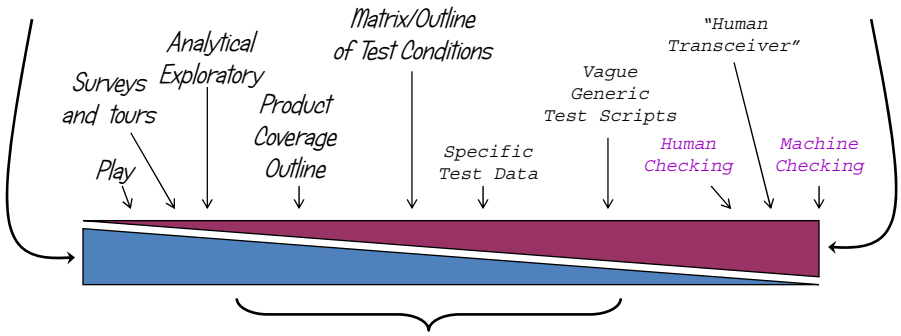
* *Formal testing means "testing that must be done to verify a specific fact, or that must be done in a specific way."*

The Testing Formality Continuum

Formal testing starts with informal testing

INFORMAL
Not done in any specific way.

FORMAL
Done in a specific way.



What do managers and developers really want from testers?

Test cases?

Counts of test cases?

Pass/fail rates?

Trust?

When will the testing be done?

What do managers and developers really want from testers?

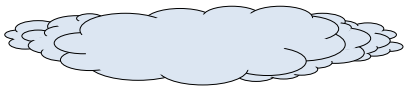
An answer to this question:

Are there problems
that threaten
the on-time successful
completion of the project?

A Key Problem for Managers

Engineering is an exploratory process that relies on skill, knowledge, and motivation. Lots of important and deep work happens without pre-existing instructions...

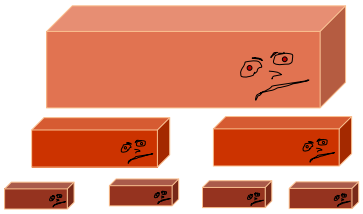
Like a...



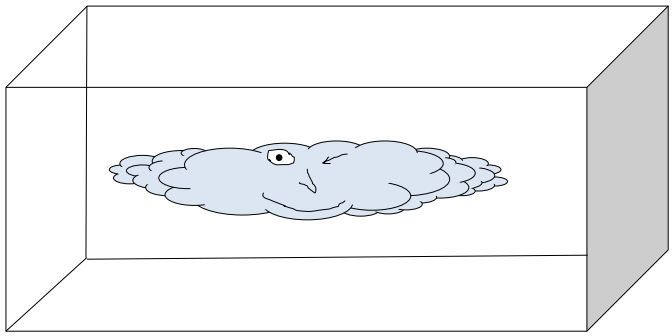
...mysterious cloud!

But managers often think in terms of discrete tasks and outcomes...

Like...



...bricks?



Solution: Put the cloud into a fake brick.

Three Forms of Test Management

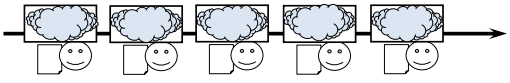
- **People-based:** Account for the people who test.
  "Jerry tests the back-end. Michael tests the front-end."
- **Artifact-based:** Account for tangible work products.
  "Here's the 217 test cases we created."
- **Activity-based:** Account for the things that testers do.
  "Here are the test activities that comprise our strategy. We did 17 test sessions this week, so far. Mostly, scenario testing."

Two kinds of activity-based management:
thread or **session**

Session-Based Test Management

- Time Box
  - Typically 90-minutes (+/- 45)
- Charter
  - A clear, concise mission for a test session
- Reviewable Results
  - a session sheet—a test report that can be scanned, parsed and compiled by a tool
- Debriefing
  - a conversation between tester and manager or test lead

vs.



See http://www.satisfice.com/sbtm.

Start with *Learning-Focused* Charters

- …for Intake Sessions (Goal: negotiate mission)

  "Interview the project manager. Ask about particular concerns or risks."

  "Read through all new use cases, and discuss with developers."

- …for Survey Sessions (Goal: learn product)

  "Familiarize yourself with the product by performing a UI tour. Create a Product Coverage Outline."

- …for Setup Sessions (Goal: create testing infrastructure)

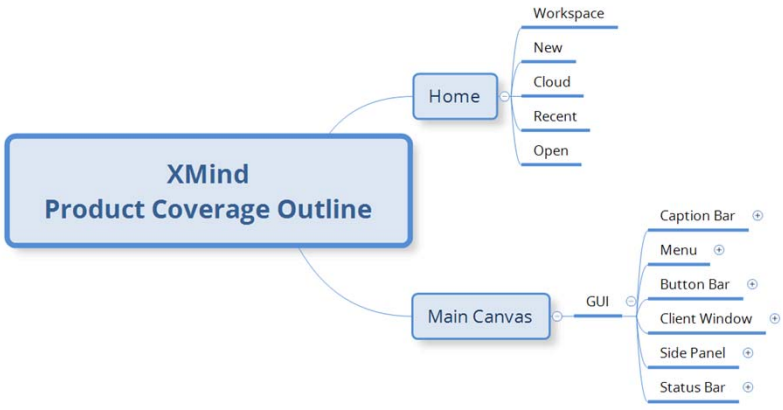
  "Develop a library of mindmaps for each major feature area. Use SFDIPOT as a checklist for coverage analysis."

  "Identify and list all the error messages in the product."

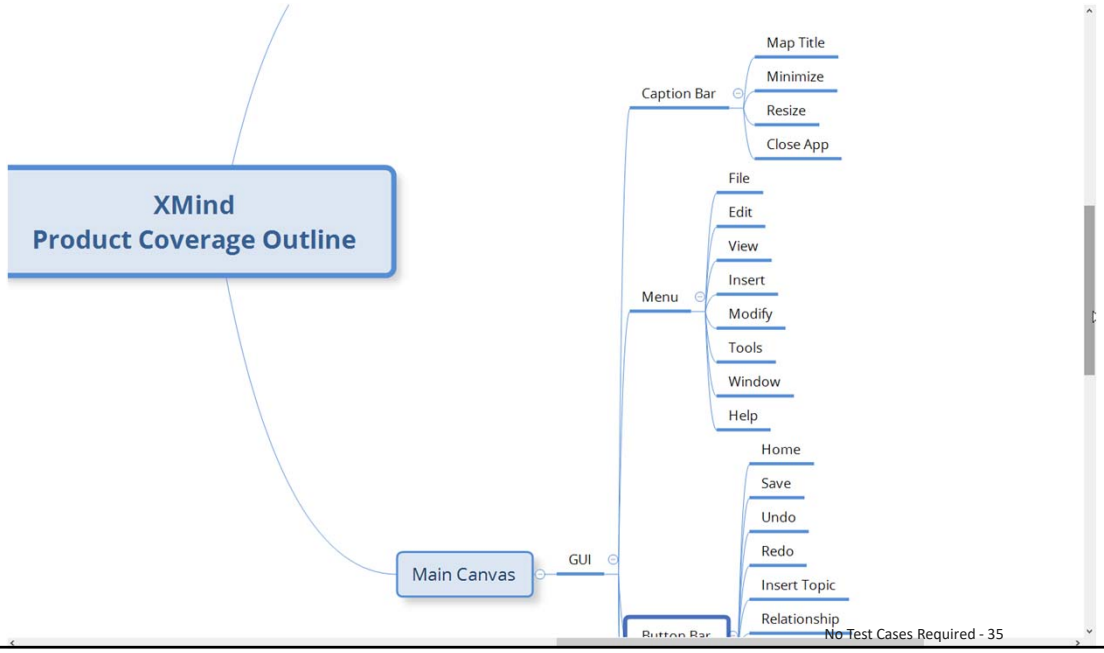
  "Develop a scenario playbook with SMEs and other testers."

  "Review use cases, and for each, add several ways in which the user could accidentally or maliciously misuse the feature."

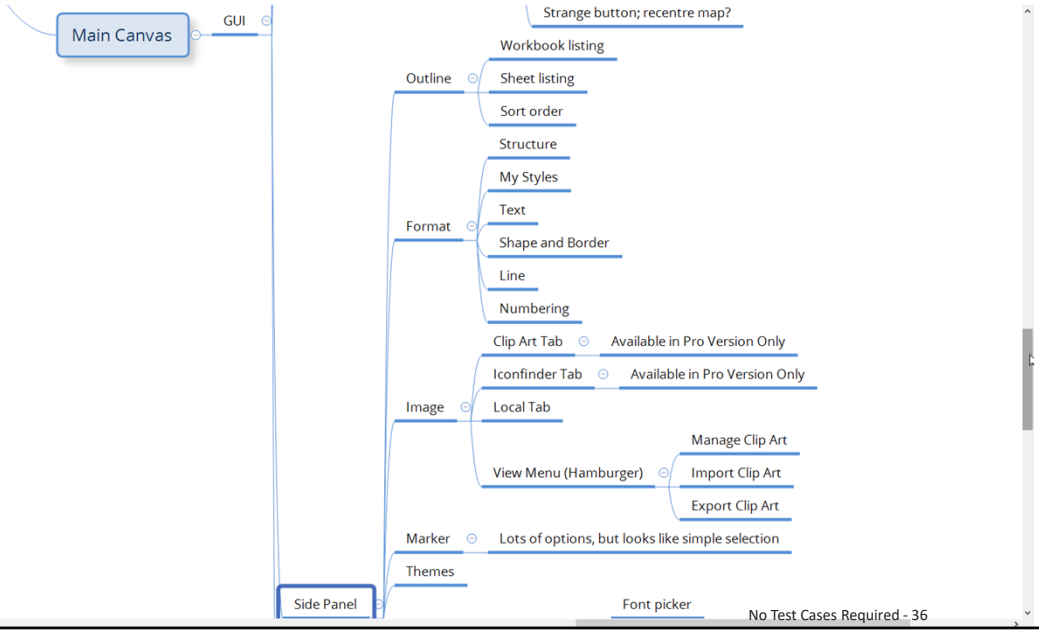
Learn the Product by Touring



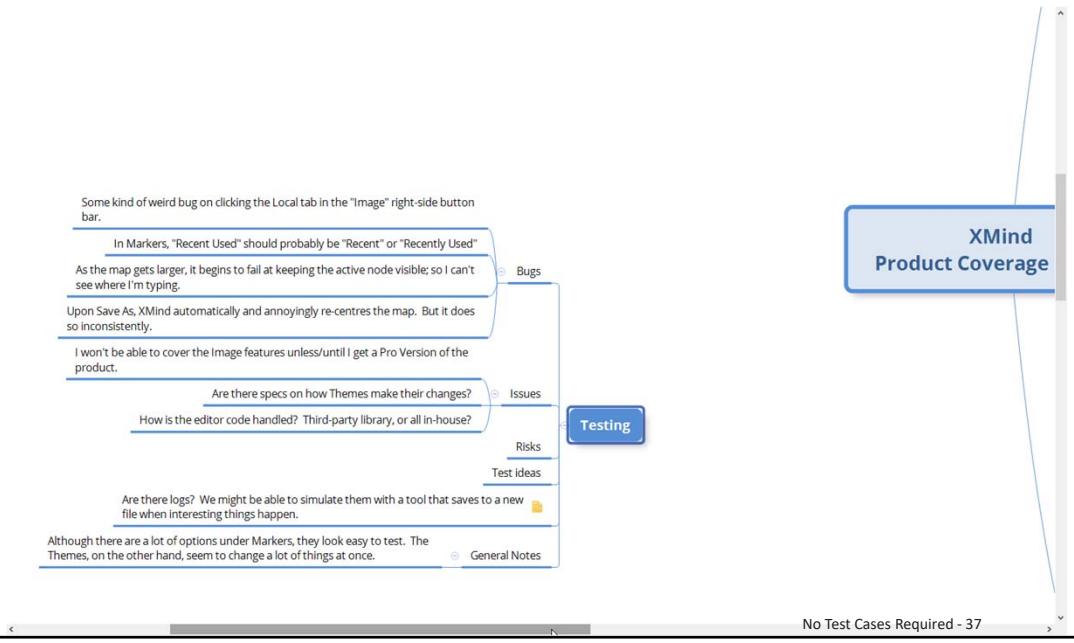
Iterate and Go Deeper



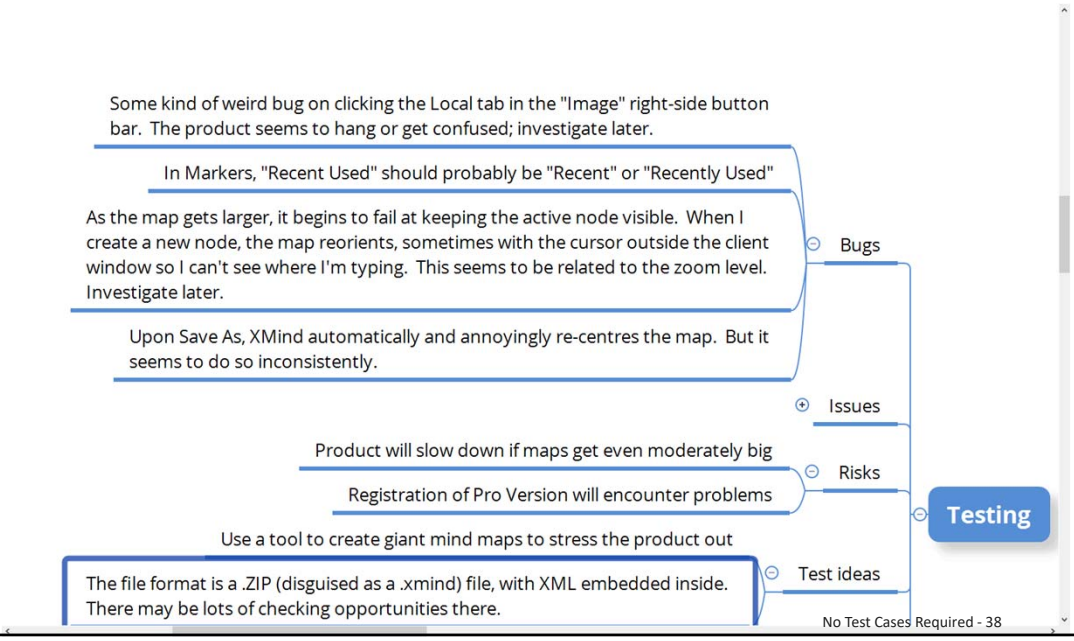
Keep Going Deeper Still



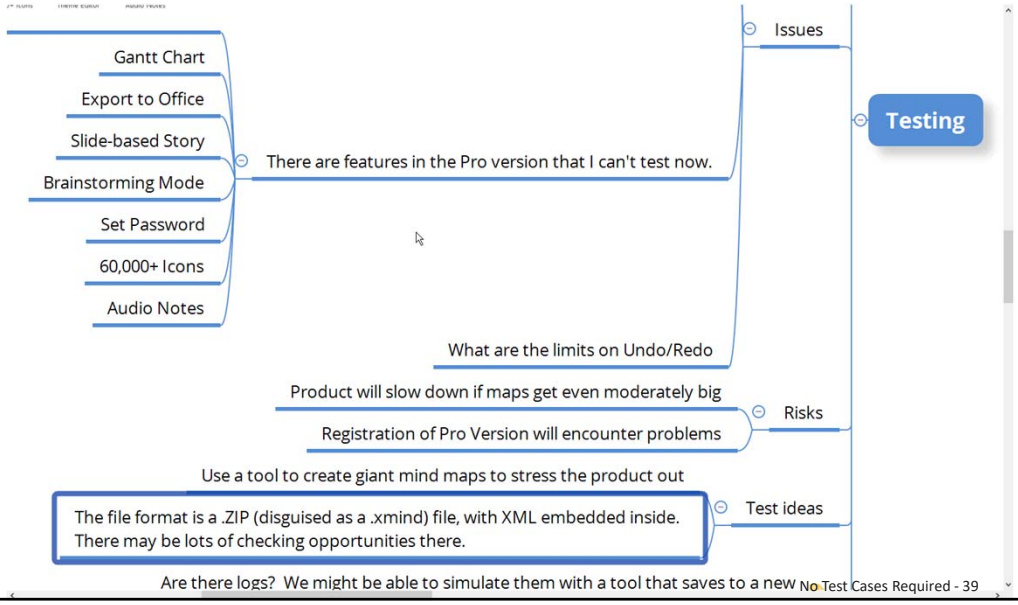
Keep Test Notes as You Go



Discover Bugs While Learning!



Note Issues While Learning!



Feed *Learning* into…

- Analysis Sessions (Goal: get deep coverage ideas)

  "Identify primary components and interactions with external applications."

  "Survey the OWASP Top 10 Security Risks page."

  "Perform comparative analysis on four major competitors."

  "Brainstorm a risk list for botched conversion of legacy data."

  "Prepare a preliminary finite-state model using StateMaker."

  "Review platform dependencies to identify performance bottlenecks and resource contention."

  "Create tools to generate data of arbitrary size and complexity."

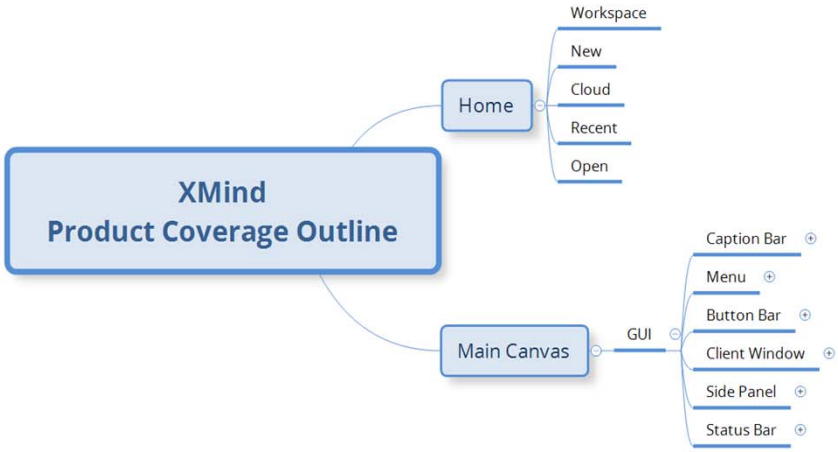
  "Review customer support logs for common problems and patterns of misuse."

This isn't about testing XMind!

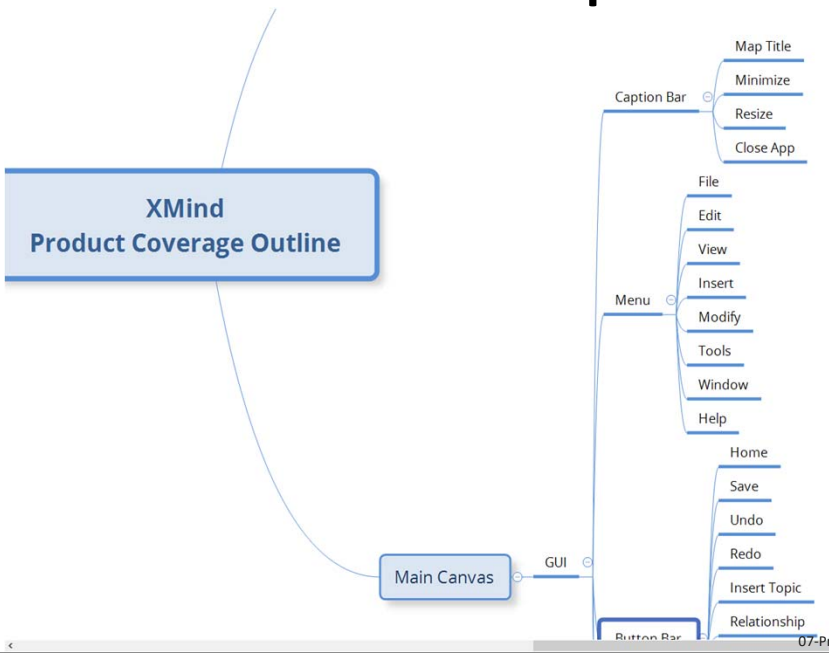
Want to start from a requirement, design, or specification document?

No problem!

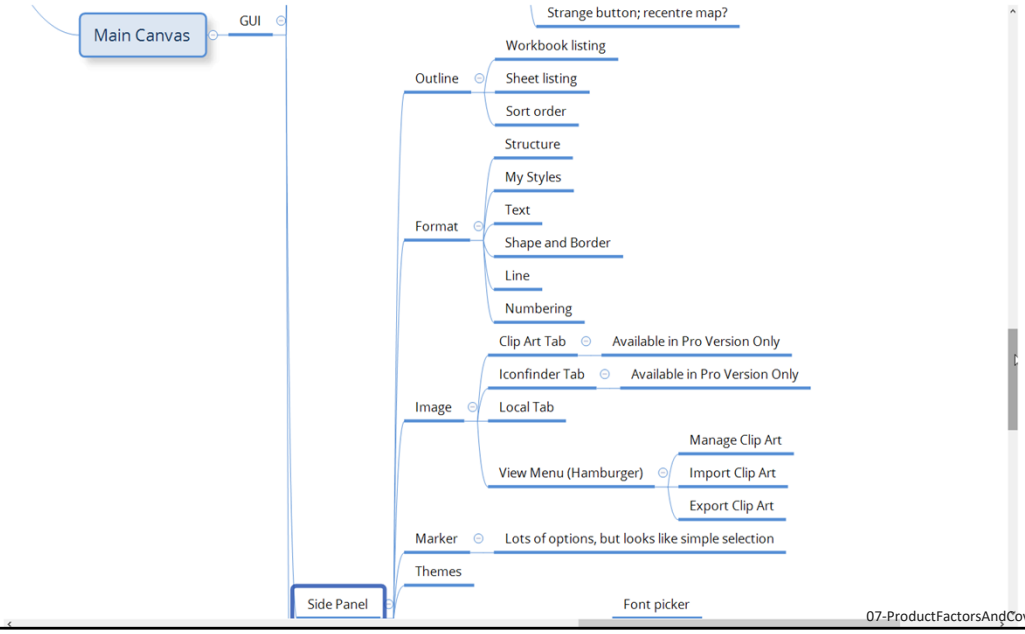
Learn the Product by Touring



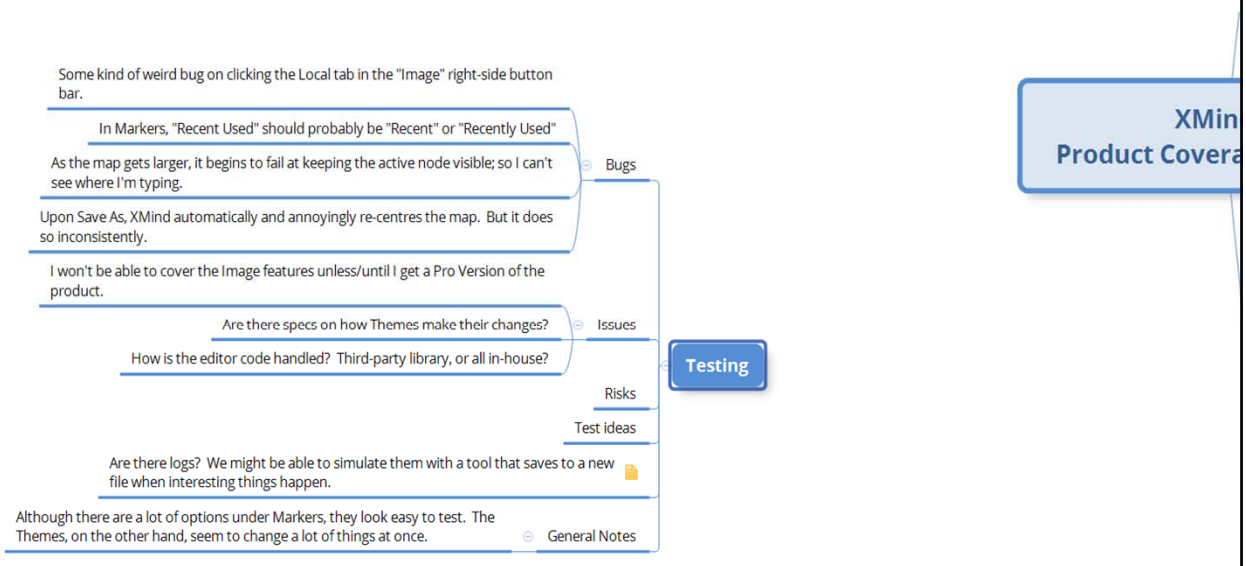
Iterate and Go Deeper

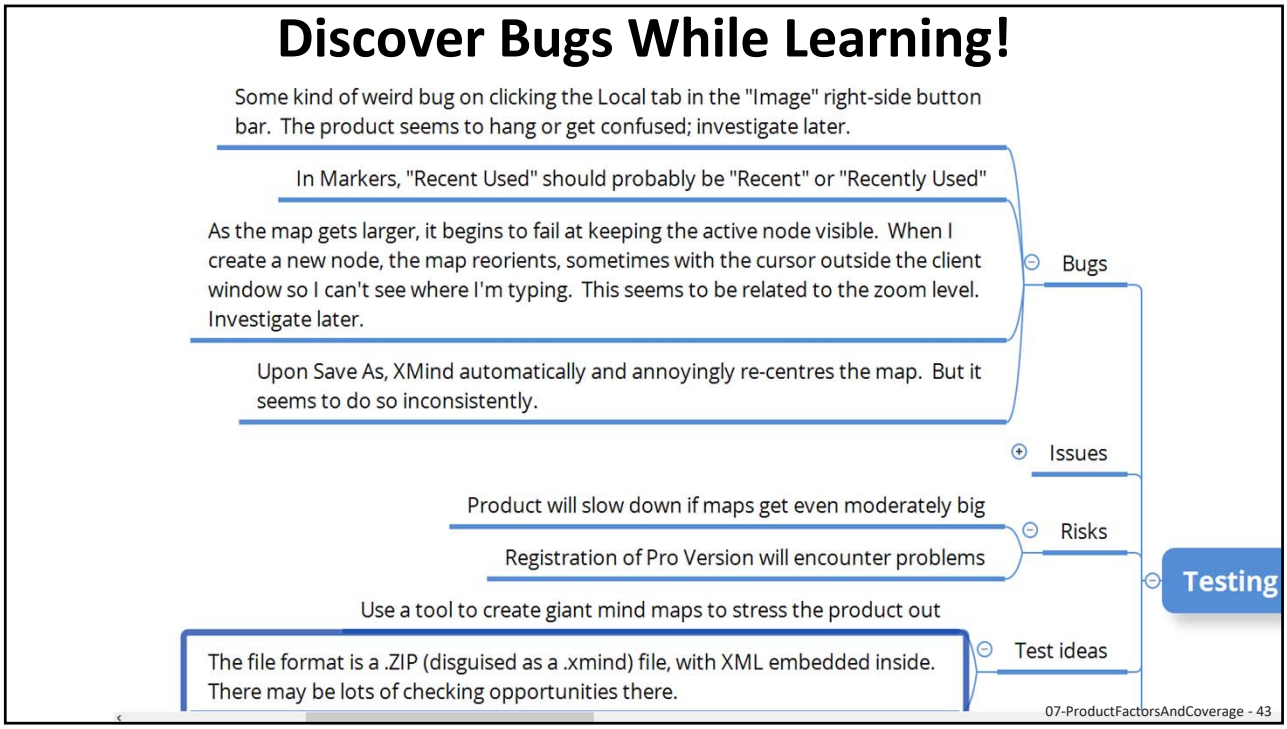


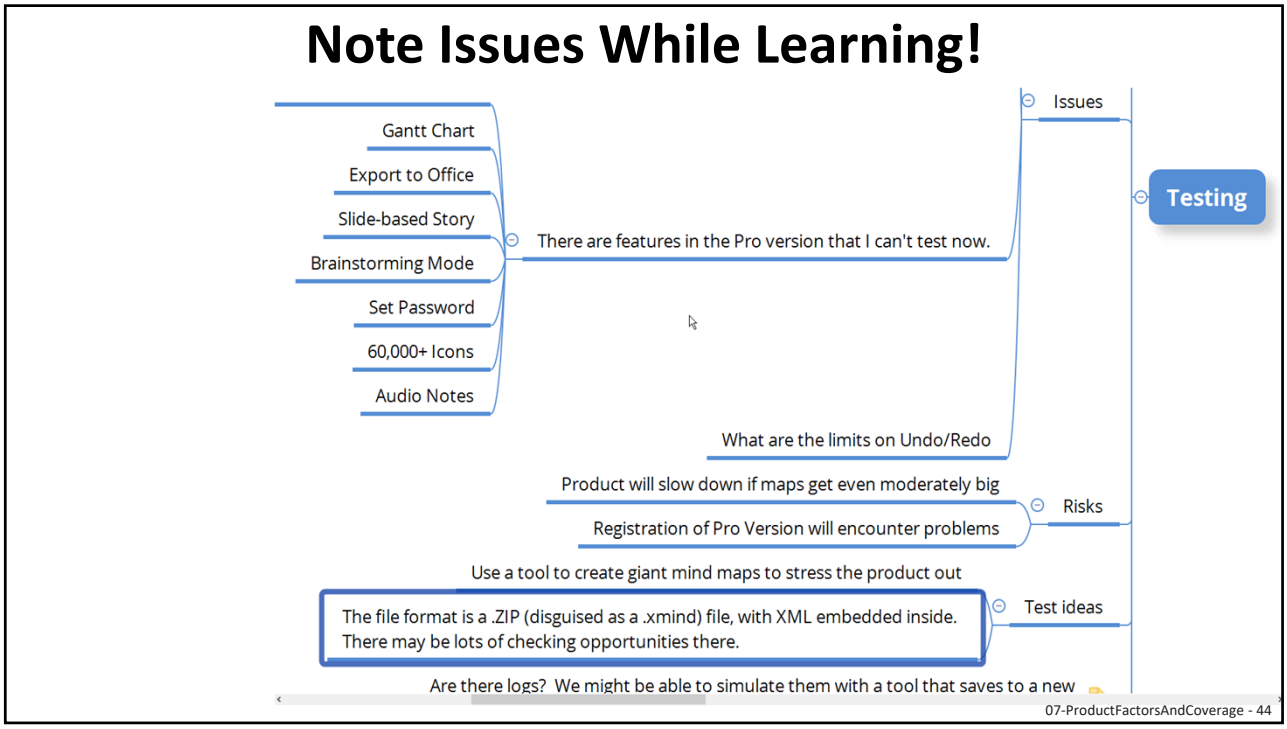
Keep Going Deeper Still



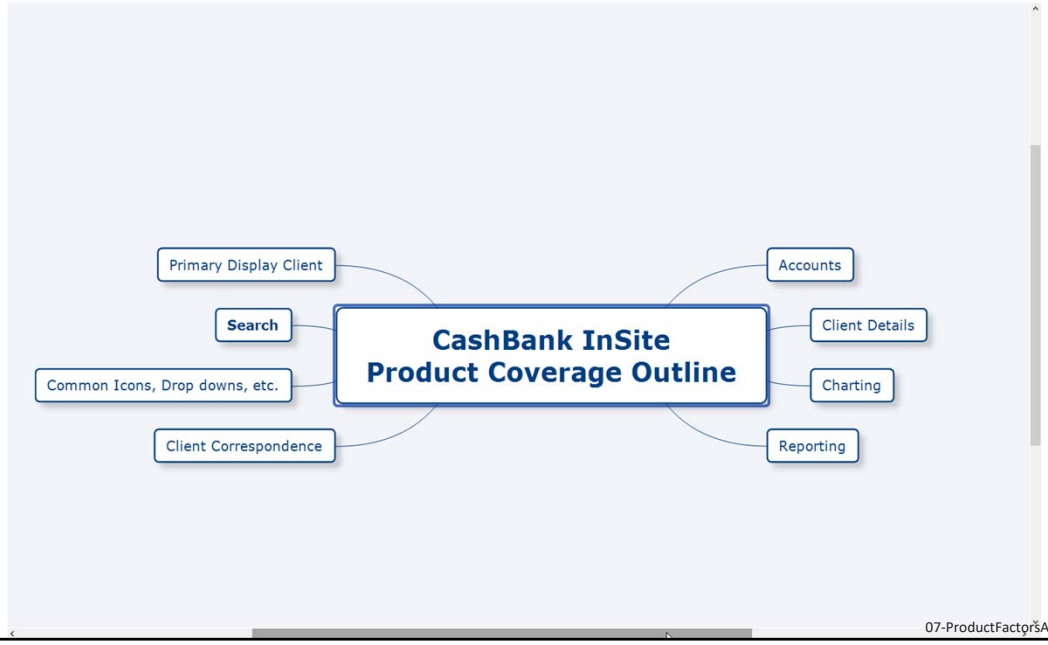
Keep Test Notes as You Go



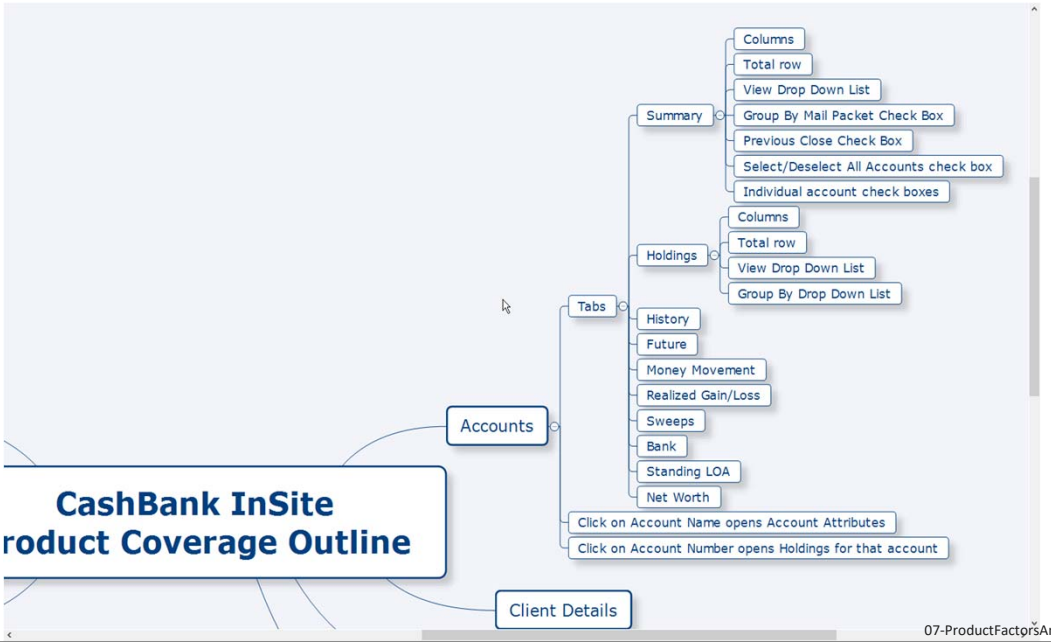

Discover Bugs While Learning!
Some kind of weird bug on clicking the Local tab in the "Image" right-side button bar. The product seems to hang or get confused; investigate later.
In Markers, "Recent Used" should probably be "Recent" or "Recently Used"
As the map gets larger, it begins to fail at keeping the active node visible. When I create a new node, the map reorients, sometimes with the cursor outside the client window so I can't see where I'm typing. This seems to be related to the zoom level. Investigate later.
Upon Save As, XMind automatically and annoyingly re-centres the map. But it seems to do so inconsistently.
Bugs
Issues
Product will slow down if maps get even moderately big
Registration of Pro Version will encounter problems
Risks
Testing
Use a tool to create giant mind maps to stress the product out
The file format is a .ZIP (disguised as a .xmind) file, with XML embedded inside. There may be lots of checking opportunities there.
Test ideas
07-ProductFactorsAndCoverage - 43


Note Issues While Learning!
Gantt Chart
Export to Office
Slide-based Story
Brainstorming Mode
Set Password
60,000+ Icons
Audio Notes
There are features in the Pro version that I can't test now.
Issues
Testing
What are the limits on Undo/Redo
Product will slow down if maps get even moderately big
Registration of Pro Version will encounter problems
Risks
Use a tool to create giant mind maps to stress the product out
The file format is a .ZIP (disguised as a .xmind) file, with XML embedded inside. There may be lots of checking opportunities there.
Test ideas
Are there logs? We might be able to simulate them with a tool that saves to a new
07-ProductFactorsAndCoverage - 44

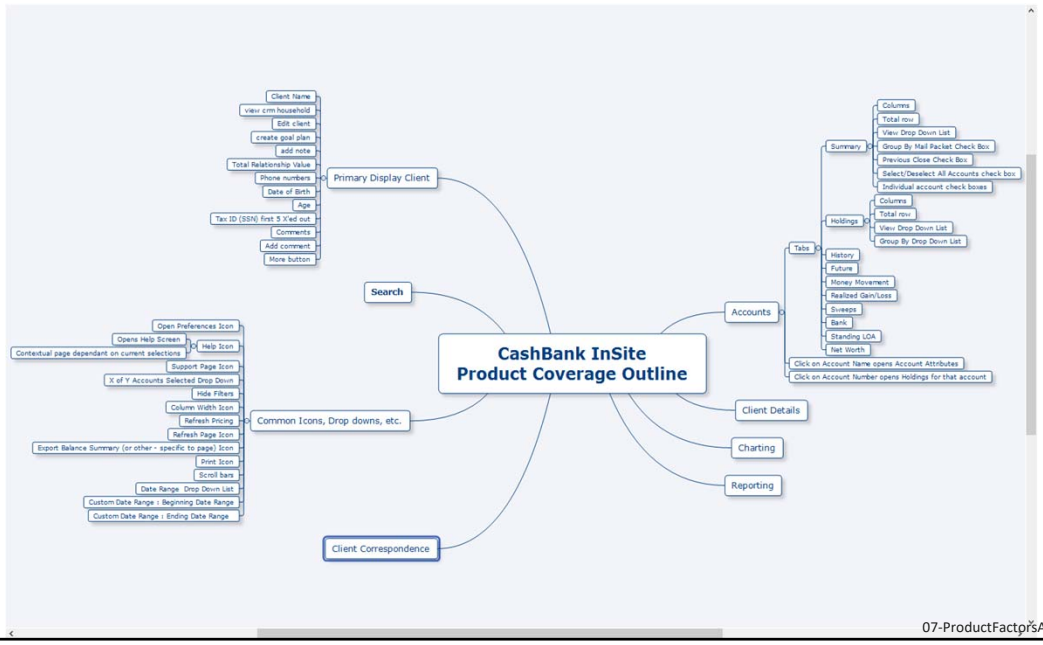
Attend that Feature Meeting



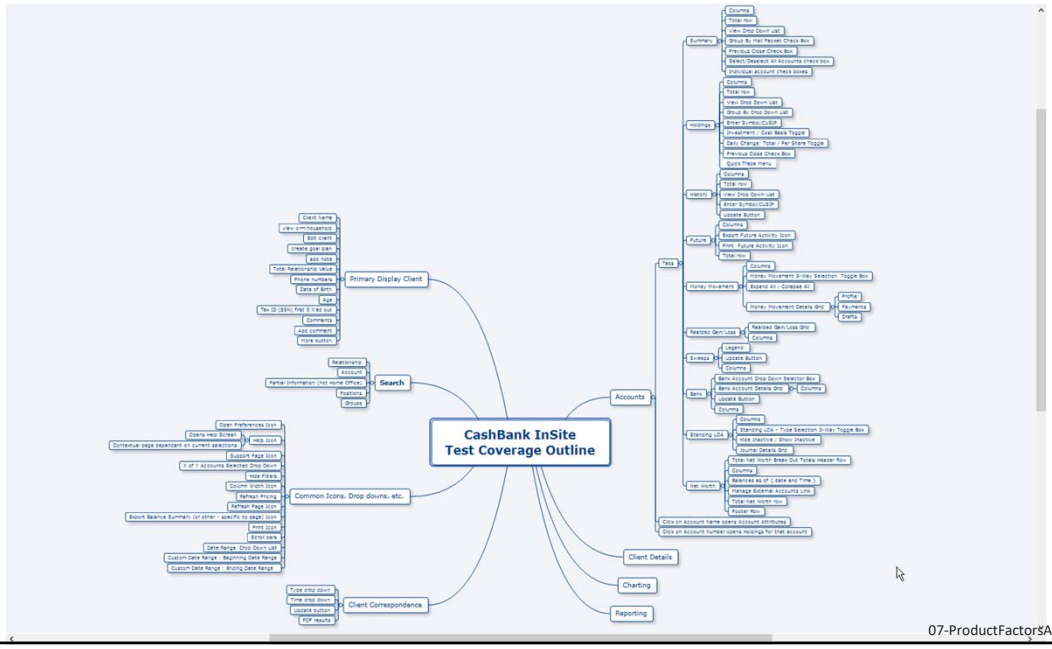
Study the Specs



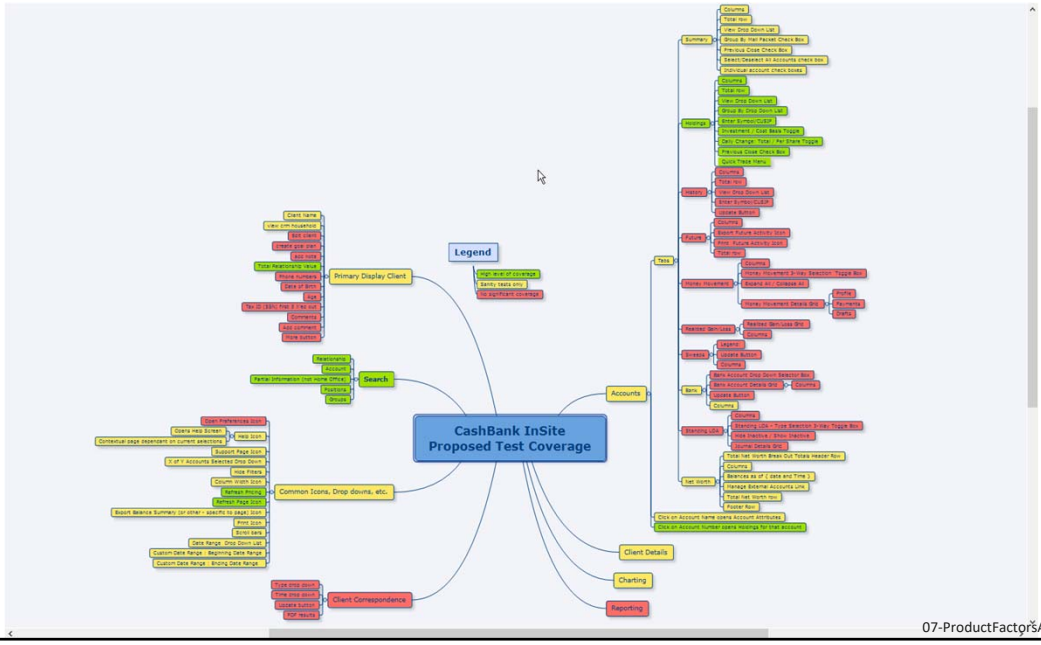
Model the Test Space



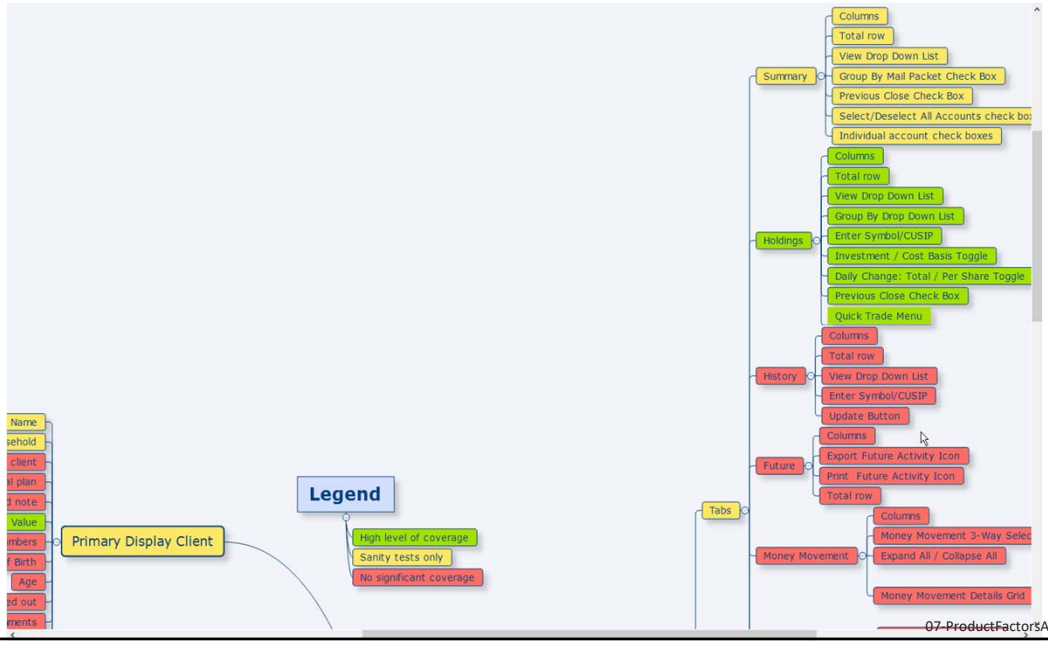
Now Bring in the Client!



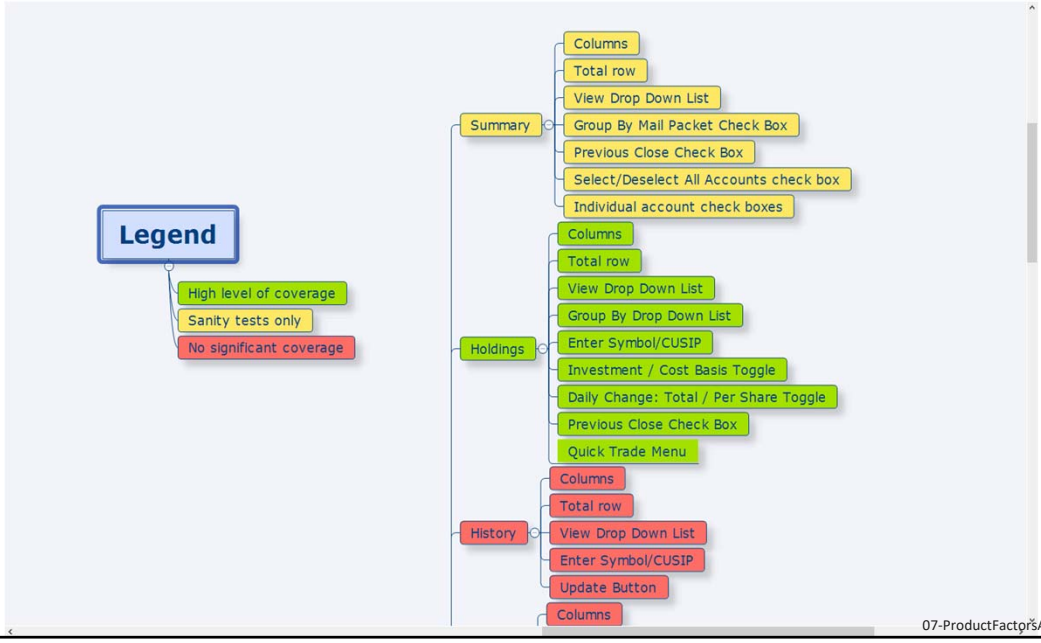
Negotiate Coverage



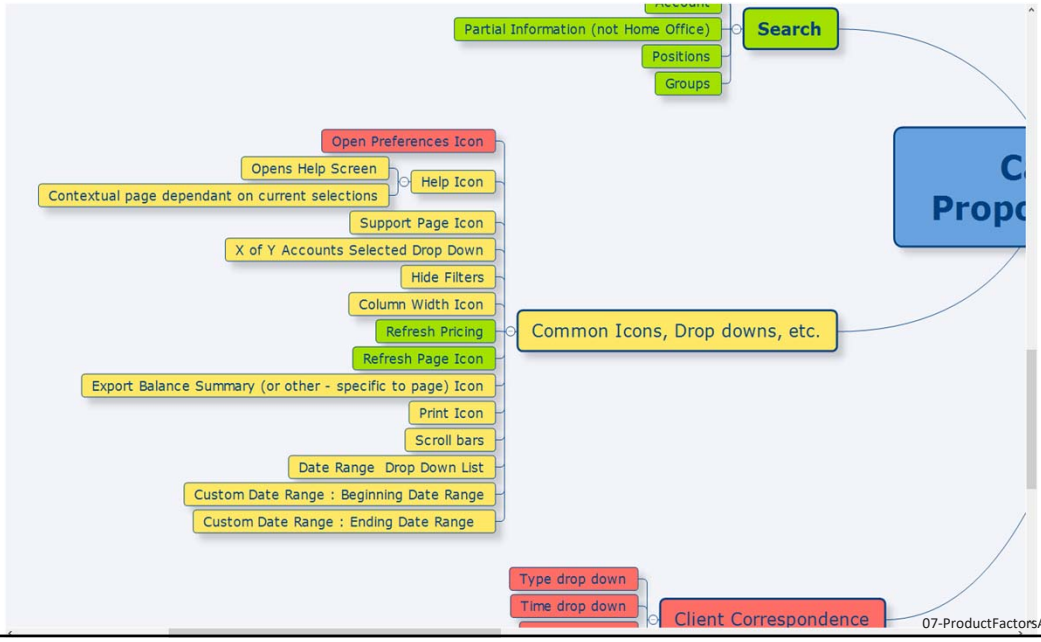
Focus on the Risky Stuff



Feature Area Coverage



Interface Coverage



Degrees of Coverage (without quantification)

Level 0	**We don't know much about this area.** We're aware that this area exists, but it's mostly a black box to us, so far. Whatever testing that's been done, we don't really trust.
Level 1	**We're just getting to know this area.** We've done basic reconnaissance; surveyed it; we've done smoke and sanity testing. We may have some artifacts that represent our models, which will help us to talk about them and go deeper. If the product were completely broken, we'd know.
Level 2	**We've learned a good deal about this area.** We've looked at the core and the critical aspects of it. We're collecting and diversifying our ideas on how to cover it deeply. We've done some substantial testing focused on common usage patterns, the highest suspected risks, and the most important quality criteria.
Level 3	**We have a comprehensive understanding of this area.** We've looked deeply into it from a number of perspectives, and applied a lot of different test techniques. We've done harsh, complex, and challenging tests on a wide variety of quality criteria. If there were a problem or unrecognized feature in this area that we didn't know about, it would be a big surprise. Any problem that escapes can teach us something important (as opposed to being evidence of not trying very hard).

Notice that test coverage is not the same as product quality. Product quality is about how good or bad the product is relative to people's needs or desires. Coverage is about how well we know the product.

More Comprehensive Ideas

…for Deep Coverage Sessions (Goal: find the elusive bugs)

- "Perform scenario testing based on the scenario playbook."
- "Run state-machine-based tours to achieve double-transition state coverage. Find possibilities for programmed checks."
- "Perform steeplechase boundary testing on major data items."
- "Help developers to set up automated checks for the continuous integration pipeline."
- "Generate each identified error message in the product. Look for mismanaged state and error recovery problems, confusing or unhelpful user messages, and missing error codes."
- "Develop scripts (working below the GUI) to run transactions continuously and graph results and timings. Make sure many transactions (15%? like production logs?) include invalid data that should be handled and rejected."

(Optional) Formalize Some Charters

PROCHAIN ENTERPRISE **SCENARIO TESTING**

Scenario Testing Protocol and Setup

Mission	Find important bugs quickly by exploring the product in ways that reflect complex, realistic, compelling usage.
Testers	- As a rule, the testers should understand the product fairly well, though an interesting variation of a scenario can be to direct a novice user to learn the product by attempting to perform the scenario test. - The testers should understand likely users, and likely contexts of use, including the problems users are trying to solve by using the product. When testers understand this, scenario testing will be a better counterpoint to ordinary function testing. - The testers should have the training, tools, and/or supervision sufficient to assure that they can recognize and report bugs that occur.
Setup	- Select a user database & project database *that you can afford to mess up* with your tests. - Assure that the project database has at least two substantial projects and program in it, preferably more. The projects should include *many* tasks, statuses of green/yellow/red, and multiple buffers per project. - Tasks should have *variety*, e.g. short ones, long ones, key tasks, non-key tasks, started, not-started, with and without attachments and checklists. - Set the simulation date to intersect with the project data that you are using.

(Optional) Formalize Some Charters

PROCHAIN ENTERPRISE **SCENARIO TEST CHARTER**

UP1: "Check tasks and update"

Theme	You are an individual contributor on a project. You have tasks assigned to you. Check your tasks and update them. Check the status of tasks that gate the ones you are responsible for.
Setup	- Assure that your user account(s) are set up with rights to access a project that has *many* tasks assigned to it.
Activities	❑ Go to Tasks panel and filter tasks for ones assigned to you. (Alternatively, filter in other ways such as by project or by incomplete tasks; and choose a way to sort) ❑ Select one of the task list views and visit each task. Set the task filter to show, at least: actual start, total duration, and remaining duration. ❑ For some tasks, view details, checklists, and attachments. ❑ Update each task in some way, including: - No update - "Mark as Updated" - Shorten duration remaining - Set remaining duration to zero; or "Mark as Completed"

(Optional) Formalize Some Charters

PROCHAIN ENTERPRISE **SCENARIO TEST CHARTER**

UP2: "Check status and perform buffer update"

Theme	You are a project manager. You need to update your project to prepare your weekly report on project status.
Setup	- Log in with a user account set up with project manager rights. - Buffer consumption for one of the projects should ideally be in the yellow or red. - At least some of the projects should have multiple project buffers.
Activities	❑ View the Standard Projects Status Chart (or custom chart), filter on a set of projects (and turn on name labels). Start a second session in a window next to the first one (log in as the same user), and filter for the same project set. Now you have two project status charts that you can compare. ❑ Pick one project as "yours". Now, compare status history of your project to others. Explore the other project details in any way necessary to account for the *differences* in status. ❑ View all impact chains for your project, and for some of those tasks: - view task details - view task links

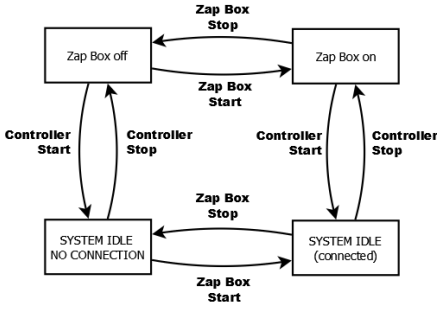
Is This Good Formal Testing?

9.8.1 To verify Power Accuracy

9.8.1.1 Connect the components according to the General Setup document.
9.8.1.2 Power on and connect test jig (instead of electrodes)
9.8.1.3 Power on the Zapper Box.
9.8.1.4 Power on the Control Box.
9.8.1.5 Set default settings of temperature and power for the Zapper Box.
9.8.1.6 Set test jig load to nominal value
9.8.1.7 Select nominal duration and nominal power setting
9.8.1.8 Press the Start button
9.8.1.9 Verify Zapper reports the power setting value ±10% on display.

Assumed State Model for Powering on the System

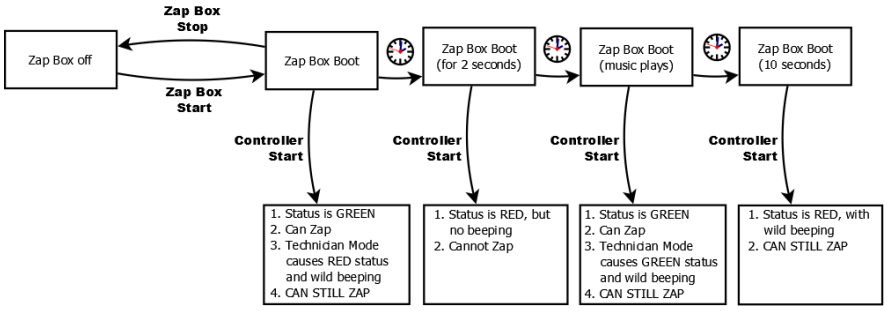
Zapper State Model



- There was nothing in the spec about which box to turn on first. We assumed it didn't matter.
- In the FIRST MINUTE of an exploratory sanity check. We discovered that it mattered a LOT.

Actual…

Zapper State Model



Prefer Steering to Scripting

3.2.2 Fields and Screens

3.2.2.1 Start the Zapper Box and the Control Box. (Vary the order and timing, retain the log files, and note any inconsistent or unexpected behaviour.)

3.2.2.2 Visually inspect the displays on each box and **VERIFY** conformance to the requirements specifications. Remain alert for the presence of any behaviour or attribute that could mislead or confuse the operator, or impair the performance or safety of the product in any material way.

3.2.2.3 With the system settings at *default* values, change the contents of every user-editable field through the range of all possible values for that field. (e.g. Use the knob to change the session duration from 1 to 300 seconds.) Visually **VERIFY** that appropriate values appear and that everything that happens on the screen appears normal and acceptable.

3.2.2.4 Repeat 3.2.2.3 with system settings changed to their *most extreme* possible values.

3.2.2.5 Select at least one field and use the on-screen keyboard, knob, and external keyboard respectively to edit that field.

Sometimes Extremely Specific Test Design Matters

3.5.2.3 From the Power Monitor log file, extract the data for the measured electrode. This sample should comprise the entire power session, including cooldown, as well as the stable power period with at least 50 measurements (10 seconds of stable period data).

3.5.2.4 From the Control Box log file, extract the corresponding data for the stable power period of the measured electrode.

3.5.2.5 Calculate the deviation by subtracting the Control Box's reported power for the measured electrode from the corresponding power meter reading (use interpolation to synchronize the time stamp of the power meter and Control Box logs).

3.5.2.6 Calculate the mean of the power sample X (bar) and its standard deviation (s).

3.5.2.7 Find the 99% confidence and 99% two-sided tolerance interval k for the sample. (Use Table 5 of NIST* SOP-QAD-10, or use the equation below for large samples.)

3.5.2.8 The equation for calculating

$$k = \sqrt{\frac{(N-1)\left(1+\frac{1}{N}\right)Z^2_{(1-p)/2}}{\chi^2_{\gamma,N-1}}}$$

where $\chi^2_{\gamma,N-1}$ is the critical value of the chi-square distribution with degrees of freedom, $N-1$, that is exceeded with probability γ and $Z_{(1-p)/2}$ is the critical value of the normal distribution which is exceeded with probability $(1-p)/2$. (*See NIST Engineering Statistics Handbook.)

Skilled, Observant Tester + Oracles = No Need for Silly Test Documentation!

These two paragraphs replaced 50 pages of overly formal and unhelpful procedural instructions for testing a Class 3 medical device.

3 Test Procedures

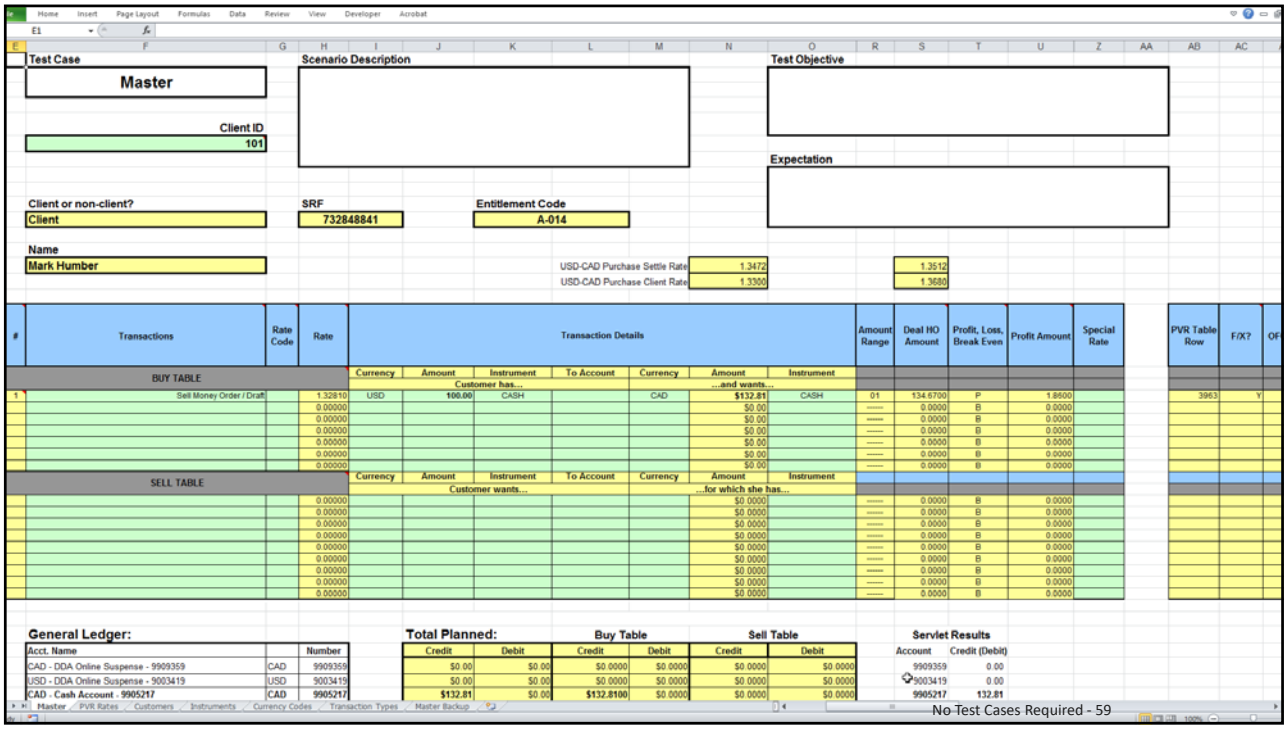
3.1 General testing protocol.

In the test descriptions that follow, the word “verify" is used to highlight *specific items that must be checked*. In addition to those items a tester shall, at all times, be alert for *any* unexplained or erroneous behavior of the product. The tester shall bear in mind that, regardless of any specific requirements for any specific test, there is the overarching general requirement that the product shall not pose an unacceptable risk of harm to the patient, including an unacceptable risk using reasonably foreseeable misuse.

3.2 Test personnel requirements

The tester shall be thoroughly familiar with the generator and workstation FRS, as well as with the working principles of the devices themselves. The tester shall also know the working principles of the power test jig and associated software, including how to configure and calibrate it and how to recognize if it is not working correctly. The tester shall have sufficient skill in data analysis and measurement theory to make sense of statistical test results. The tester shall be sufficiently familiar with test design to complement this protocol with exploratory testing, in the event that anomalies appear that require investigation. The tester shall know how to keep test records to credible, professional standard.

**After we’ve learned and tested,
we can decide on formal test cases
and automated checks
IF and HOW and WHEN
they suit our purposes.**



Test Case: Master

Scenario Description

Test Objective

Client ID: 101

Expectation

Client or non-client? Client | SRF: 732848841 | Entitlement Code: A-014

Name: Mark Humber

USD-CAD Purchase Settle Rate: 1.3472 | 1.3512
USD-CAD Purchase Client Rate: 1.3300 | 1.3680

#	Transactions	Rate Code	Rate	Transaction Details							Amount Range	Deal HO Amount	Profit, Loss, Break Even	Profit Amount	Special Rate	PVR Table Row	F/X?	OF
BUY TABLE				Currency	Amount	Instrument	To Account	Currency	Amount	Instrument								
				Customer has...					...and wants...									
1	Sell Money Order / Draft		1.32810	USD	100.00	CASH		CAD	$132.81	CASH	01	134.6700	P	1.8600		3963	Y	
			0.00000						$0.00		-----	0.0000	B	0.0000				
			0.00000						$0.00		-----	0.0000	B	0.0000				
			0.00000						$0.00		-----	0.0000	B	0.0000				
			0.00000						$0.00		-----	0.0000	B	0.0000				
			0.00000						$0.00		-----	0.0000	B	0.0000				
			0.00000						$0.00		-----	0.0000	B	0.0000				
SELL TABLE				Currency	Amount	Instrument	To Account	Currency	Amount	Instrument								
				Customer wants...					...for which she has...									
			0.00000						$0.0000		-----	0.0000	B	0.0000				
			0.00000						$0.0000		-----	0.0000	B	0.0000				
			0.00000						$0.0000		-----	0.0000	B	0.0000				
			0.00000						$0.0000		-----	0.0000	B	0.0000				
			0.00000						$0.0000		-----	0.0000	B	0.0000				
			0.00000						$0.0000		-----	0.0000	B	0.0000				
			0.00000						$0.0000		-----	0.0000	B	0.0000				
			0.00000						$0.0000		-----	0.0000	B	0.0000				

General Ledger:

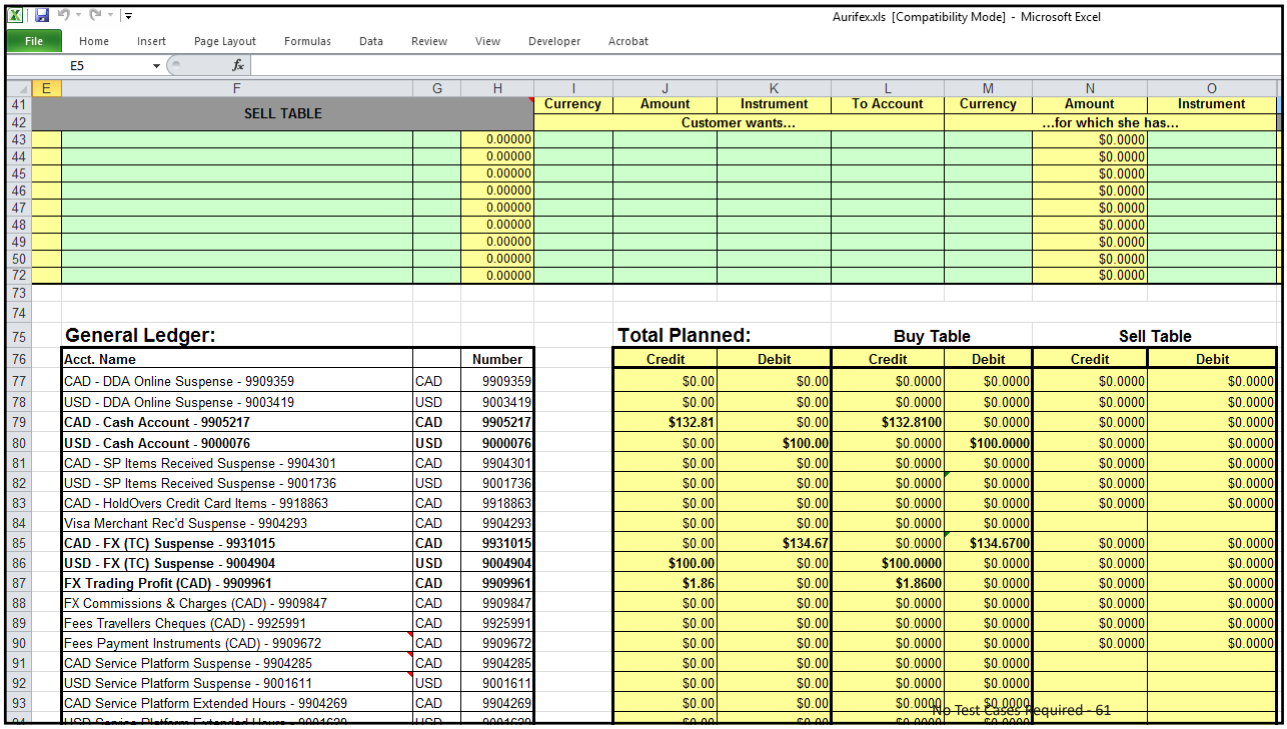
Acct. Name		Number	Total Planned: Credit	Total Planned: Debit	Buy Table: Credit	Buy Table: Debit	Sell Table: Credit	Sell Table: Debit
CAD - DDA Online Suspense - 9909359	CAD	9909359	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
USD - DDA Online Suspense - 9003419	USD	9003415	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
CAD - Cash Account - 9905217	CAD	9905217	$132.81	$0.00	$132.8100	$0.0000	$0.0000	$0.0000

Servlet Results

Account	Credit (Debit)
9909359	0.00
9003419	0.00
9905217	132.81

USD-CAD Purchase Settle Rate: 1.3472
USD-CAD Purchase Client Rate: 1.3300

Transactions	Rate Code	Rate	Transaction Details					
BUY TABLE			Currency	Amount	Instrument	To Account	Currency	Amount
			Customer has...					...and wants...
Sell Money Order / Draft		1.32810	USD	100.00	CASH		CAD	$132.81
		0.00000						$0.00
		0.00000						$0.00
		0.00000						$0.00
		0.00000						$0.00
		0.00000						$0.00
		0.00000						$0.00
SELL TABLE			Currency	Amount	Instrument	To Account	Currency	Amount
			Customer wants...					...for which she h
		0.00000						$0.0000
		0.00000						$0.0000
		0.00000						$0.0000
		0.00000						$0.0000
		0.00000						$0.0000
		0.00000						$0.0000
		0.00000						$0.0000
		0.00000						$0.0000
		0.00000						$0.0000



Aurifex.xls [Compatibility Mode] - Microsoft Excel

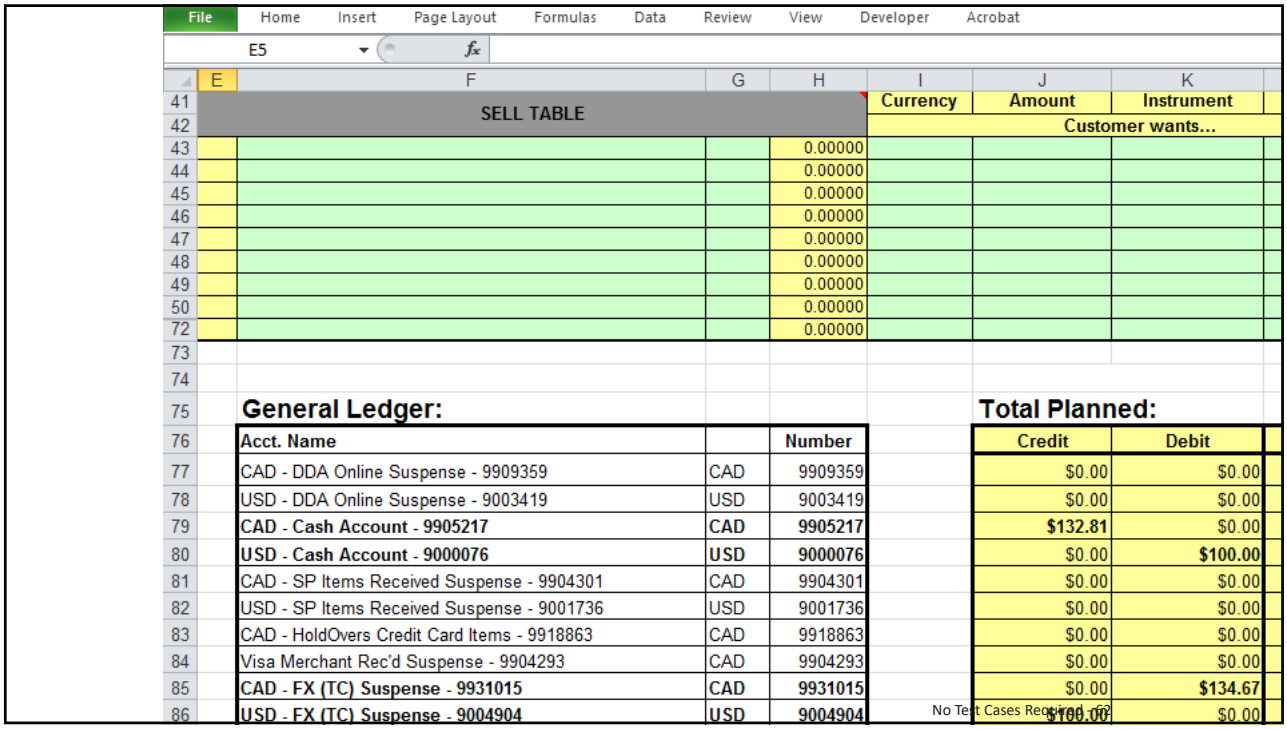
File Home Insert Page Layout Formulas Data Review View Developer Acrobat

E5

	SELL TABLE			Currency	Amount	Instrument	To Account	Currency	Amount	Instrument
				Customer wants...				...for which she has...		
			0.00000						$0.0000	
			0.00000						$0.0000	
			0.00000						$0.0000	
			0.00000						$0.0000	
			0.00000						$0.0000	
			0.00000						$0.0000	
			0.00000						$0.0000	
			0.00000						$0.0000	
			0.00000						$0.0000	

General Ledger:

Acct. Name		Number	Total Planned: Credit	Total Planned: Debit	Buy Table: Credit	Buy Table: Debit	Sell Table: Credit	Sell Table: Debit
CAD - DDA Online Suspense - 9909359	CAD	9909359	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
USD - DDA Online Suspense - 9003419	USD	9003419	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
CAD - Cash Account - 9905217	**CAD**	**9905217**	**$132.81**	$0.00	**$132.8100**	$0.0000	$0.0000	$0.0000
USD - Cash Account - 9000076	**USD**	**9000076**	$0.00	**$100.00**	$0.0000	**$100.0000**	$0.0000	$0.0000
CAD - SP Items Received Suspense - 9904301	CAD	9904301	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
USD - SP Items Received Suspense - 9001736	USD	9001736	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
CAD - HoldOvers Credit Card Items - 9918863	CAD	9918863	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
Visa Merchant Rec'd Suspense - 9904293	CAD	9904293	$0.00	$0.00	$0.0000	$0.0000		
CAD - FX (TC) Suspense - 9931015	**CAD**	**9931015**	$0.00	**$134.67**	$0.0000	**$134.6700**	$0.0000	$0.0000
USD - FX (TC) Suspense - 9004904	**USD**	**9004904**	**$100.00**	$0.00	**$100.0000**	$0.0000	$0.0000	$0.0000
FX Trading Profit (CAD) - 9909961	**CAD**	**9909961**	**$1.86**	$0.00	**$1.8600**	$0.0000	$0.0000	$0.0000
FX Commissions & Charges (CAD) - 9909847	CAD	9909847	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
Fees Travellers Cheques (CAD) - 9925991	CAD	9925991	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
Fees Payment Instruments (CAD) - 9909672	CAD	9909672	$0.00	$0.00	$0.0000	$0.0000	$0.0000	$0.0000
CAD Service Platform Suspense - 9904285	CAD	9904285	$0.00	$0.00	$0.0000	$0.0000		
USD Service Platform Suspense - 9001611	USD	9001611	$0.00	$0.00	$0.0000	$0.0000		
CAD Service Platform Extended Hours - 9904269	CAD	9904269	$0.00	$0.00	$0.0000	$0.0000		



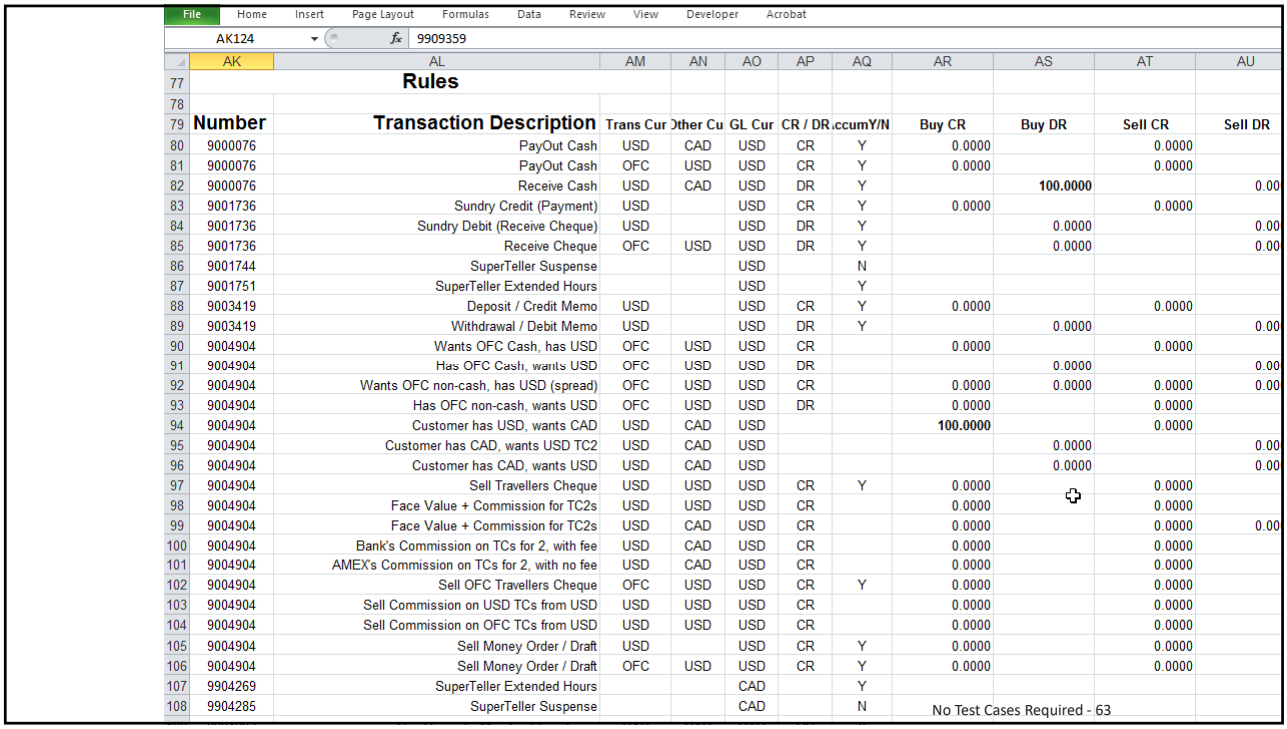
File Home Insert Page Layout Formulas Data Review View Developer Acrobat

E5

	SELL TABLE			Currency	Amount	Instrument
					Customer wants...	
			0.00000			
			0.00000			
			0.00000			
			0.00000			
			0.00000			
			0.00000			
			0.00000			
			0.00000			
			0.00000			

General Ledger:

Acct. Name		Number	Total Planned: Credit	Total Planned: Debit
CAD - DDA Online Suspense - 9909359	CAD	9909359	$0.00	$0.00
USD - DDA Online Suspense - 9003419	USD	9003419	$0.00	$0.00
CAD - Cash Account - 9905217	**CAD**	**9905217**	**$132.81**	$0.00
USD - Cash Account - 9000076	**USD**	**9000076**	$0.00	**$100.00**
CAD - SP Items Received Suspense - 9904301	CAD	9904301	$0.00	$0.00
USD - SP Items Received Suspense - 9001736	USD	9001736	$0.00	$0.00
CAD - HoldOvers Credit Card Items - 9918863	CAD	9918863	$0.00	$0.00
Visa Merchant Rec'd Suspense - 9904293	CAD	9904293	$0.00	$0.00
CAD - FX (TC) Suspense - 9931015	**CAD**	**9931015**	$0.00	**$134.67**
USD - FX (TC) Suspense - 9004904	**USD**	**9004904**	**$100.00**	$0.00



File Home Insert Page Layout Formulas Data Review View Developer Acrobat

AK124 | 9909359

	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU
77		**Rules**									
78											
79	**Number**	**Transaction Description**	**Trans Cur**	**Other Cu**	**GL Cur**	**CR / DR**	**AccumY/N**	**Buy CR**	**Buy DR**	**Sell CR**	**Sell DR**
80	9000076	PayOut Cash	USD	CAD	USD	CR	Y	0.0000		0.0000	
81	9000076	PayOut Cash	OFC	USD	USD	CR	Y	0.0000		0.0000	
82	9000076	Receive Cash	USD	CAD	USD	DR	Y		**100.0000**		0.00
83	9001736	Sundry Credit (Payment)	USD		USD	CR	Y	0.0000		0.0000	
84	9001736	Sundry Debit (Receive Cheque)	USD		USD	DR	Y		0.0000		0.00
85	9001736	Receive Cheque	OFC	USD	USD	DR	Y		0.0000		0.00
86	9001744	SuperTeller Suspense			USD		N				
87	9001751	SuperTeller Extended Hours			USD		Y				
88	9003419	Deposit / Credit Memo	USD		USD	CR	Y	0.0000		0.0000	
89	9003419	Withdrawal / Debit Memo	USD		USD	DR	Y		0.0000		0.00
90	9004904	Wants OFC Cash, has USD	OFC	USD	USD	CR		0.0000		0.0000	
91	9004904	Has OFC Cash, wants USD	OFC	USD	USD	DR			0.0000		0.00
92	9004904	Wants OFC non-cash, has USD (spread)	OFC	USD	USD	CR		0.0000	0.0000	0.0000	0.00
93	9004904	Has OFC non-cash, wants USD	OFC	USD	USD	DR		0.0000		0.0000	
94	9004904	Customer has USD, wants CAD	USD	CAD	USD			**100.0000**		0.0000	
95	9004904	Customer has CAD, wants USD TC2	USD	CAD	USD				0.0000		0.00
96	9004904	Customer has CAD, wants USD	USD	CAD	USD				0.0000		0.00
97	9004904	Sell Travellers Cheque	USD	USD	USD	CR	Y	0.0000		0.0000	
98	9004904	Face Value + Commission for TC2s	USD	USD	USD	CR		0.0000		0.0000	
99	9004904	Face Value + Commission for TC2s	USD	CAD	USD	CR		0.0000		0.0000	0.00
100	9004904	Bank's Commission on TCs for 2, with fee	USD	CAD	USD	CR		0.0000		0.0000	
101	9004904	AMEX's Commission on TCs for 2, with no fee	USD	CAD	USD	CR		0.0000		0.0000	
102	9004904	Sell OFC Travellers Cheque	OFC	USD	USD	CR	Y	0.0000		0.0000	
103	9004904	Sell Commission on USD TCs from USD	USD	USD	USD	CR		0.0000		0.0000	
104	9004904	Sell Commission on OFC TCs from USD	USD	USD	USD	CR		0.0000		0.0000	
105	9004904	Sell Money Order / Draft	USD		USD	CR	Y	0.0000		0.0000	
106	9004904	Sell Money Order / Draft	OFC	USD	USD	CR	Y	0.0000		0.0000	
107	9904269	SuperTeller Extended Hours			CAD		Y				
108	9904285	SuperTeller Suspense			CAD		N				

No Test Cases Required - 63

Sometimes Extremely Specific Test Design Matters

3.5.2.3 From the power meter log file, extract the data for the measured electrode. This sample should comprise the entire power session, including cooldown, as well as the stable power period with at least 50 measurements (10 seconds of stable period data).

3.5.2.4 From the session log file, extract the corresponding data for the stable power period of the measured electrode.

3.5.2.5 Calculate the deviation by subtracting the reported power for the measured electrode from the corresponding power meter reading (use interpolation to synchronize the time stamp of the power meter and generation logs).

3.5.2.6 Calculate the mean of the power sample X (bar) and its standard deviation (s).

3.5.2.7 Find the 99% confidence and 99% two-sided tolerance interval k for the sample. (Use Table 5 of SOP-QAD-10, or use the equation below for large samples.)

3.5.2.8 The equation for calculating the tolerance interval k is:

$$k = \sqrt{\frac{(N-1)\left(1+\frac{1}{N}\right)Z^2_{(1-p)/2}}{\chi^2_{\gamma,N-1}}}$$

where $\chi^2_{\gamma,N-1}$ is the critical value of the chi-square distribution with degrees of freedom, N-1, that is exceeded with probability γ and $Z_{(1-p)/2}$ is the critical value of the normal distribution which is exceeded with probability $(1-p)/2$. (See NIST Engineering Statistics Handbook.)

Yes, testing like this requires skill.

To TEST is to tell three braided stories:

A story about the status of the PRODUCT…

…about what it does, how it failed, and how it might fail...
…in ways **that matter to your clients and their customers**.

Bugs

A story about HOW YOU TESTED…

…how you operated and observed the product…
…how you recognized problems and their significance…
…what you have tested so far *and have not tested yet*…
…what you won't test at all (unless things change).

Oracles

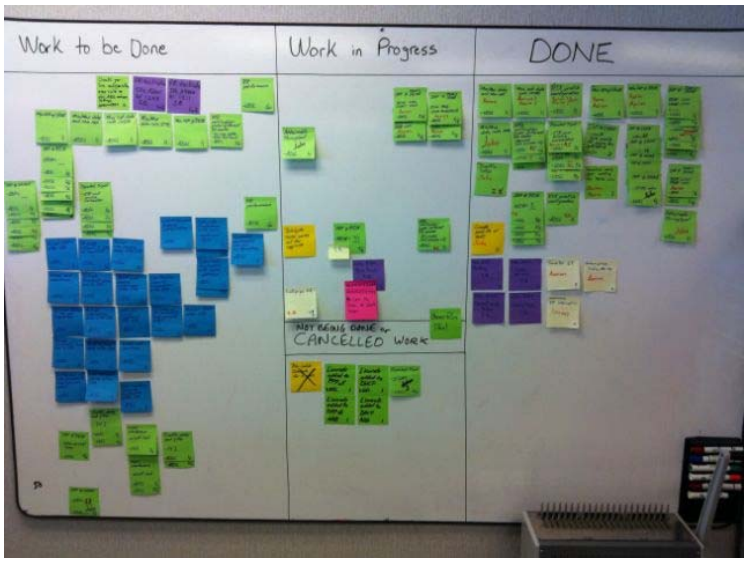
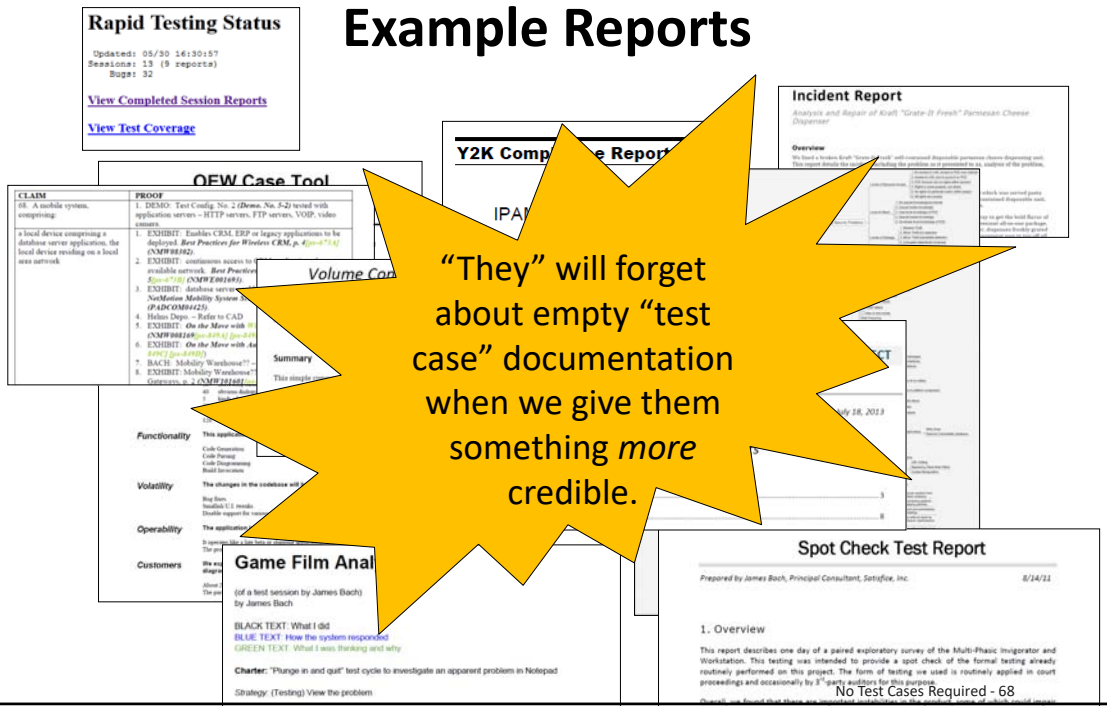
Coverage

A story about how GOOD that testing was, or could be…

…the risks and costs of testing or not testing…
…how testable (or not) the product is…
…what made testing harder or slower…
…what you need and recommend for faster, higher-value testing.

Issues

One Way to Visualize Progress: Summarize the Charters



Example Reports