UX Case Studies

Paul Daly

Batch Analytics

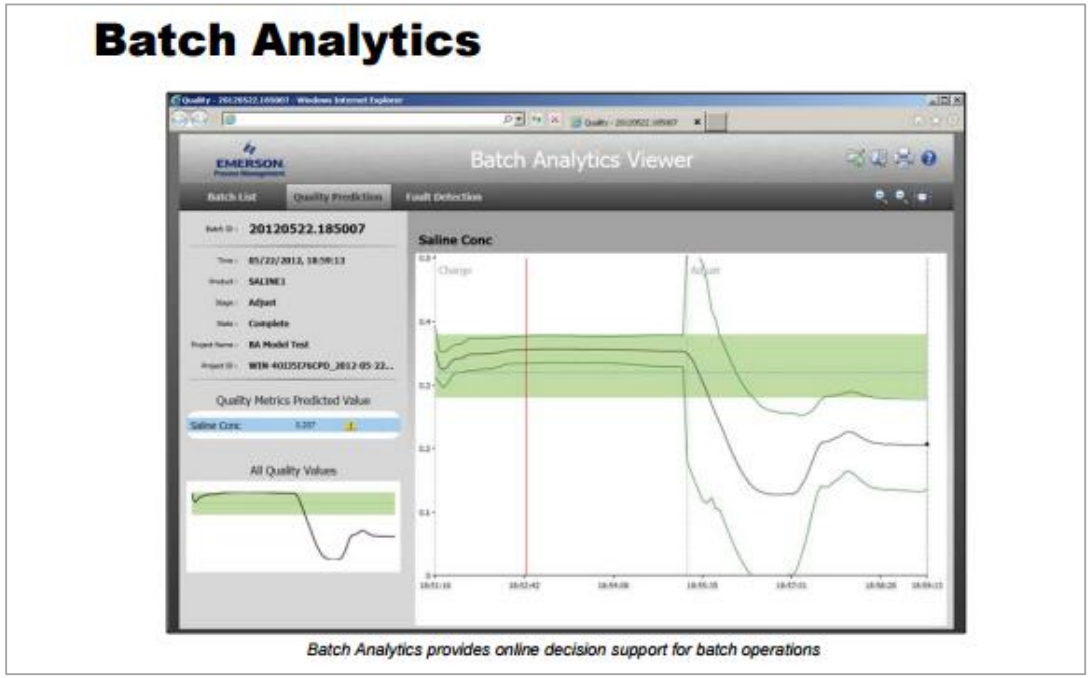
Emerson Process Management

Product Goal: Application which monitors a batch process, warns the operator when it predicts a low quality result, and provides information to fix it.

My UX Goal: doesn't require a statistician to configure model, integrates with what they know (chemical/process engineering)

My role: Lead (only) UX.
Working with Product Manager, Sr. Architect, 2 Dev Manager, Dev Leads, QA, R&D Scientists

Multiple Applications:
- Server configuration
- Administration
- Model Building
- Batch Monitoring



Batch Analytics provides online decision support for batch operations

Understanding the problem: personas

Ralph

Process Engineer

Work Experience:
- **Total:** 10 years
- **Same/Similar Job:** 5 years

Work Environment:
- **Workplace:** Works between an office/cubicle and the plant production area.
- **People:** Works closely with operators, control system engineers, maintenance organization, and the quality department . Also communicates with chemists lab technicians, and equipment vendors.

Skills & Education:
- **Academic:** Bachelors or Masters degree in Chemical Engineering.
- **Training/OJT:** Plant safety and production training.
- **Background:** May have worked as a Quality or Environmental Engineer.

WORK PROFILE

KEY RESPONSIBILITIES/GOALS
- Optimize production by identifying bottlenecks in the process.
- Analyze operations to identify production improvements.
- Monitor process equipment performance.

MAIN TASKS

Tasks
Review displays, charts, and key production
to resolve problems reported by operations
engineering.
Design production processes. Process mod
software used to evaluate current process
scenarios and create new designs.
Collaborate with control system engineer to
functional specifications for how the process
should be controlled and design or improve
strategies.
Prioritize, approve and request equipment
maintenance.
Gather information to investigate incidents
reported by operations and participate in ro
cause analysis investigations.
Size and specify process equipment (pump
tanks, heat exchangers, lines/pipes, etc.). R
plant engineering drawings (e.g. process flo
diagrams, equipment drawings) to communi
process equipment changes.
Assess feasibility and impact of production
Ensure that process is designed properly fo
safety and environment (e.g. chemical
reactions/handling, rupture discs, relief valv
etc.).
Collect and analyze data to monitor equipm
performance to predict and address mainte
and throughput problems.
Collaborates with instrument engineer to ev
new measuring and control devices.

CHARACTERISTICS

MOTIVATIONS & ATTITUDES
- Conservative
- Analytical
- Looks at the big picture

Bob

Batch Operator

Work Experience:
- **Total:** 20 years
- **Same/Similar Job:** 15 years

Work Environment:
- **Workplace:** Works between control room and production area, and remotely from office area. Protected, clean environment.
- **People:** Works with other batch operators, process and control system engineers, and maintenance technicians.

Skills & Education:
- **Academic:** Associates or Bachelors Degree in Chemistry or Biology.
- **Training/OJT:** Plant operations and safety. Manufacturing quality. Equipment and process qualification training per relevant standard operating procedure.
- **Background:** Progressive levels of hands on experience in plant.

WORK PROFILE

KEY RESPONSIBILITIES/GOALS
- Execute production orders to ensure integrity of batch is within specifications.
- Ensure safety of people and process equipment.
- Complete all batch processing paperwork.

MAIN TASKS

Tasks	Frequency
Operate batches from start to finish (start, respond to prompts, restart, force hold, clear failures, verify/).	Continuously
Complete and document training for standard operating procedure changes prior to starting batch.	2 hours per week
Monitor batch informational messages, process, trends and take corrective action to prevent batch from going off specification (e.g. change active step in recipe, acknowledge alarms, update formula).	Continuously
Fill out necessary batch sheet paperwork (sometimes electronic) to document batch execution (verify and sign-off, sample analysis results, deviations from normal, manual readings).	Continuously
Ensure adequate supply of consumables (e.g. filters, gaskets, etc).	10 minutes per shift
Clean, prepare, check, and lock out equipment.	30 minutes 2-3 times per shift
Perform manual batch tasks (e.g. weigh, add ingredients, change transfer panel, open/close valve, scan bar code, move equipment, etc).	1-2 hours per shift
Update operator log book.	5 minutes 3-4 times per shift
Collect, label, and submit samples for lab analysis using laboratory information management system (LIMS). Take and enter certain sample readings.	10 minutes 4-5 times per shift
Provide shift supervisor with status on production during shift, anomalies, equipment, etc.	10 minutes 1-2 times per shift
Review batch sheet paperwork with previous/next operator at shift change meeting.	15-20 minutes per shift
Coordinate with up and downstream operators.	5 minutes 2-3 times per shift
Generate maintenance work requests.	5 minutes per week

CHARACTERISTICS

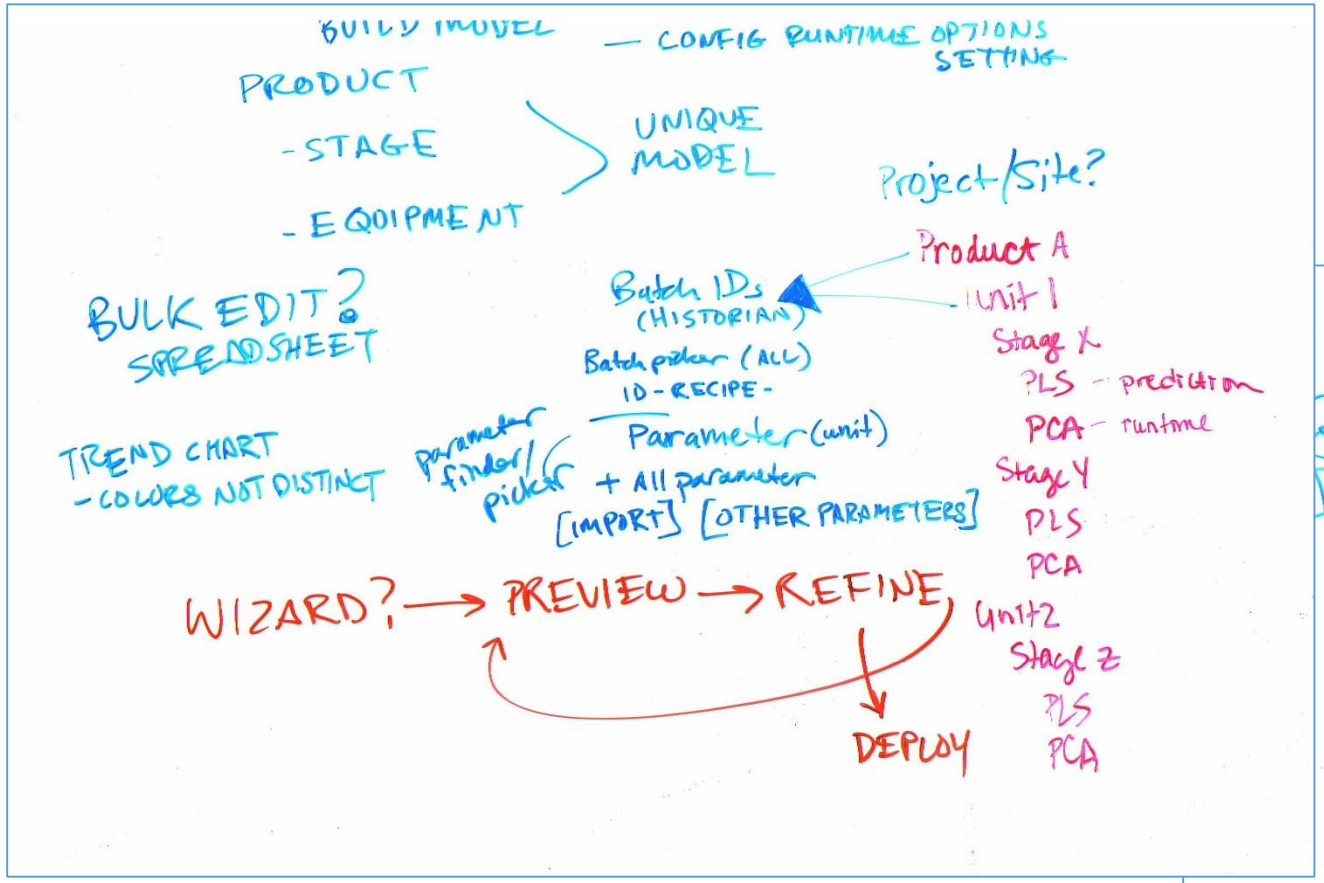
MOTIVATIONS & ATTITUDES
- Smart and efficient
- Calm, confident
- Procedurally oriented, meticulous, follows rules

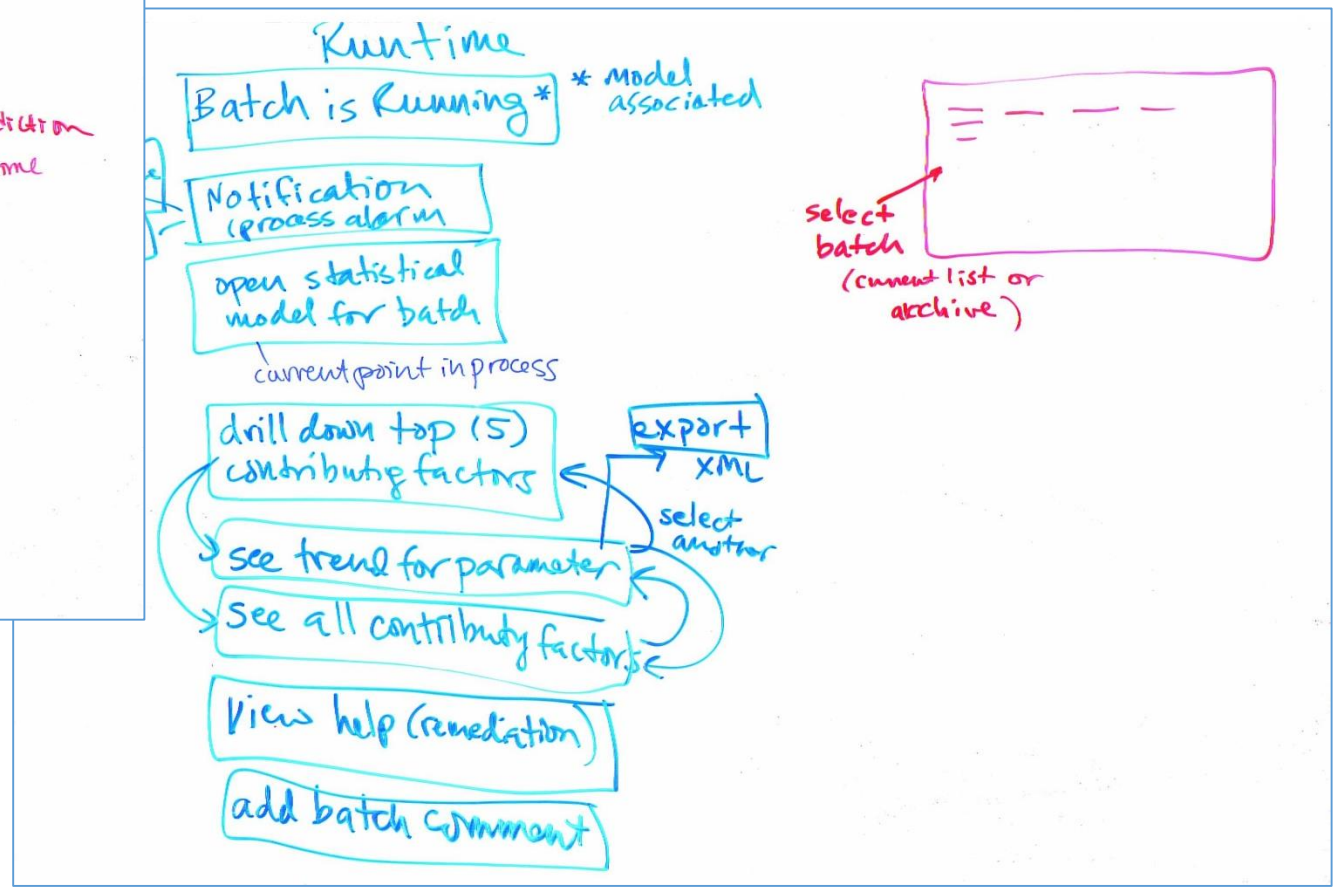
ATTRIBUTE MAP

ENVIRONMENT:					
Process Area	Control Room		Workshop		Office
40%	40%				20%
MOBILITY:					
Stationary			X		Roaming/route
ROLE:					
Technology focused		X			People focused
Designer/definer				X	Implementer
TECHNOLOGY:					
Asset hardware interaction		X			Asset software application interaction
Control hardware interaction				X	Control system software application interaction
Technology averse		X			Early technology adopter
Non-computer user		X			Advanced computer user
HARDWARE:					
Plant equipment, consumables, operator workstation, gowns, hair and shoe covers, masks, safety glasses, earplugs					
SOFTWARE:					
Operator interface, historian client, browser, email, MS-Excel, MS-Word					

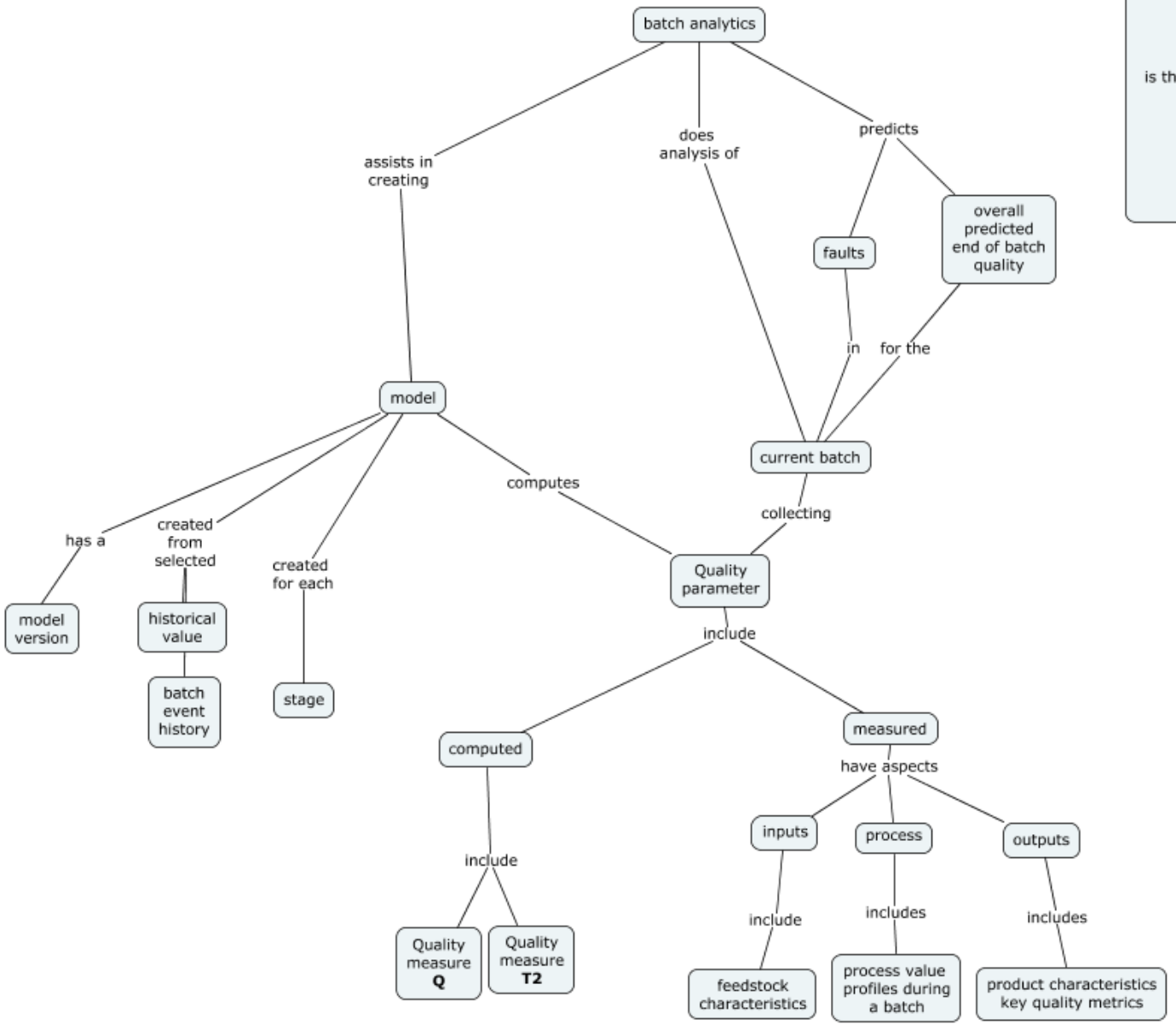
EMERSON
Process Management

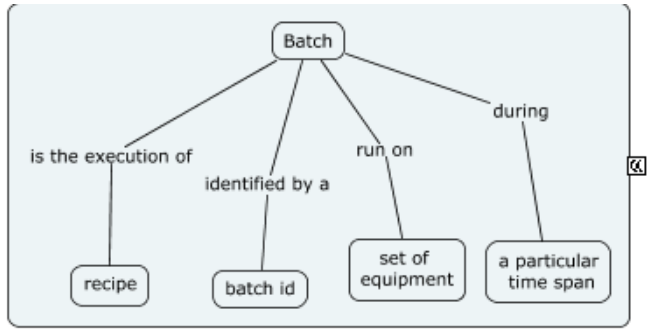
Understanding the problem: read research papers - whiteboarding with the team

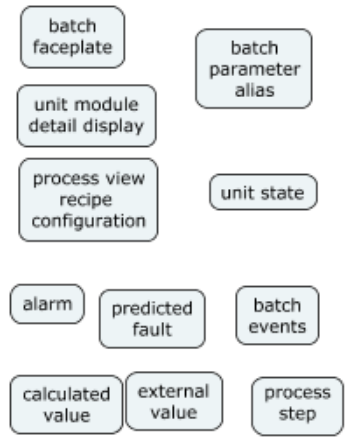




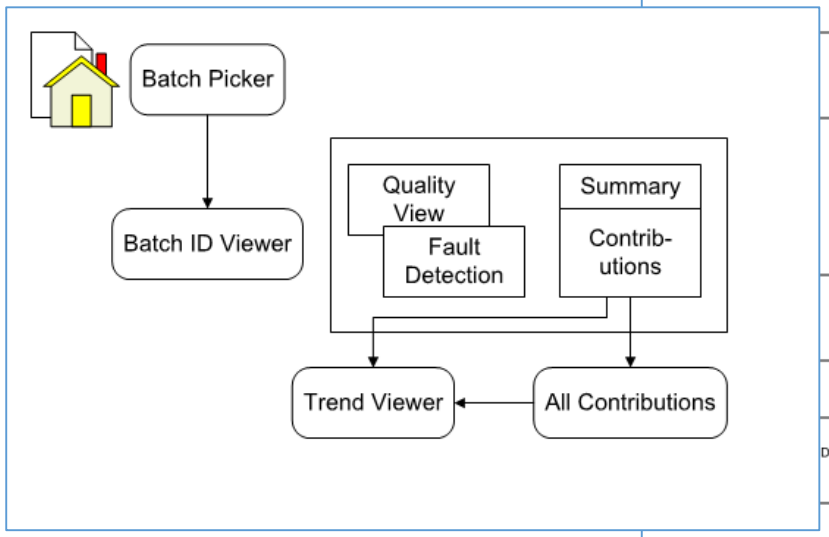
Understanding the problem: Concept Mapping

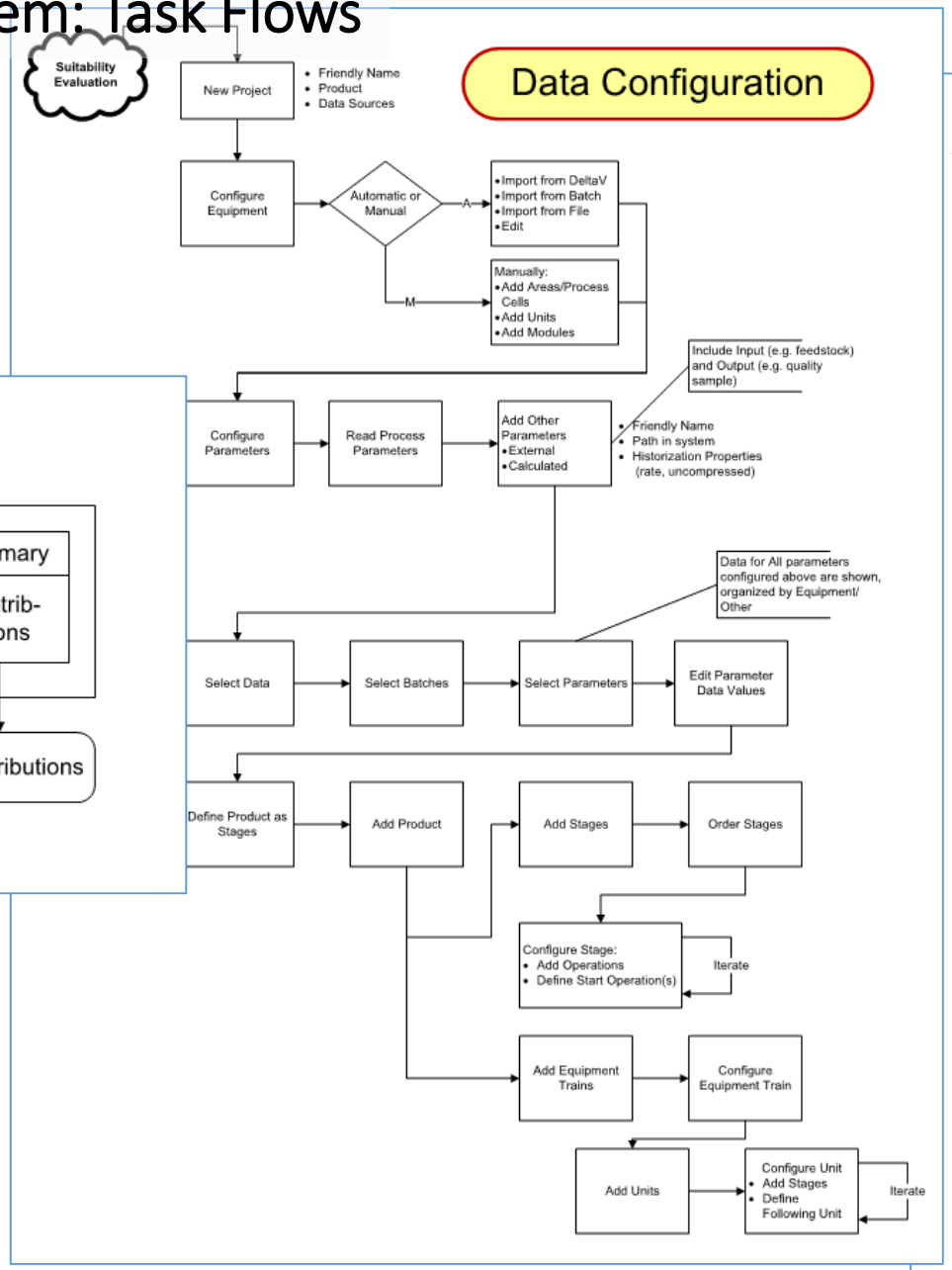


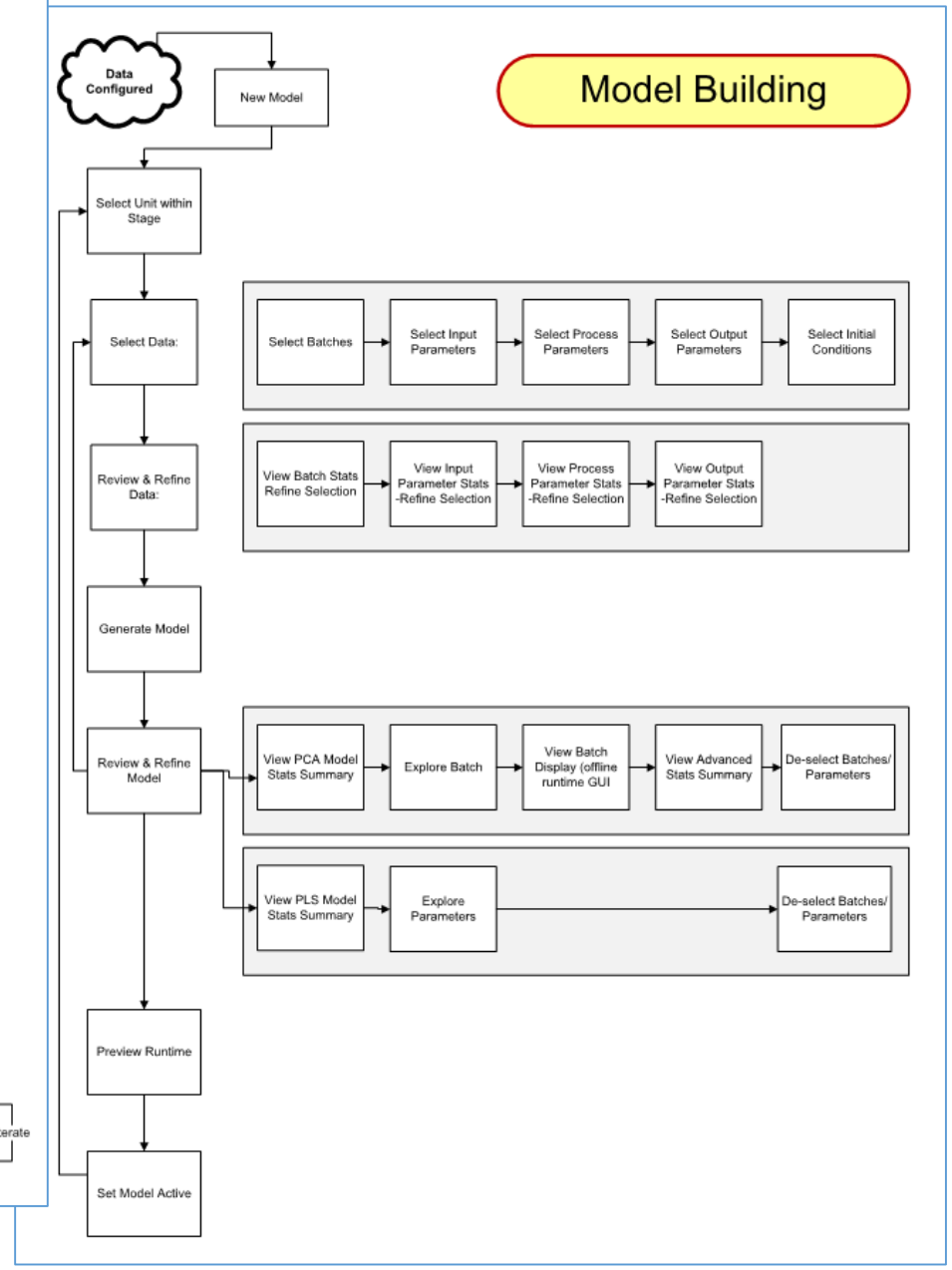




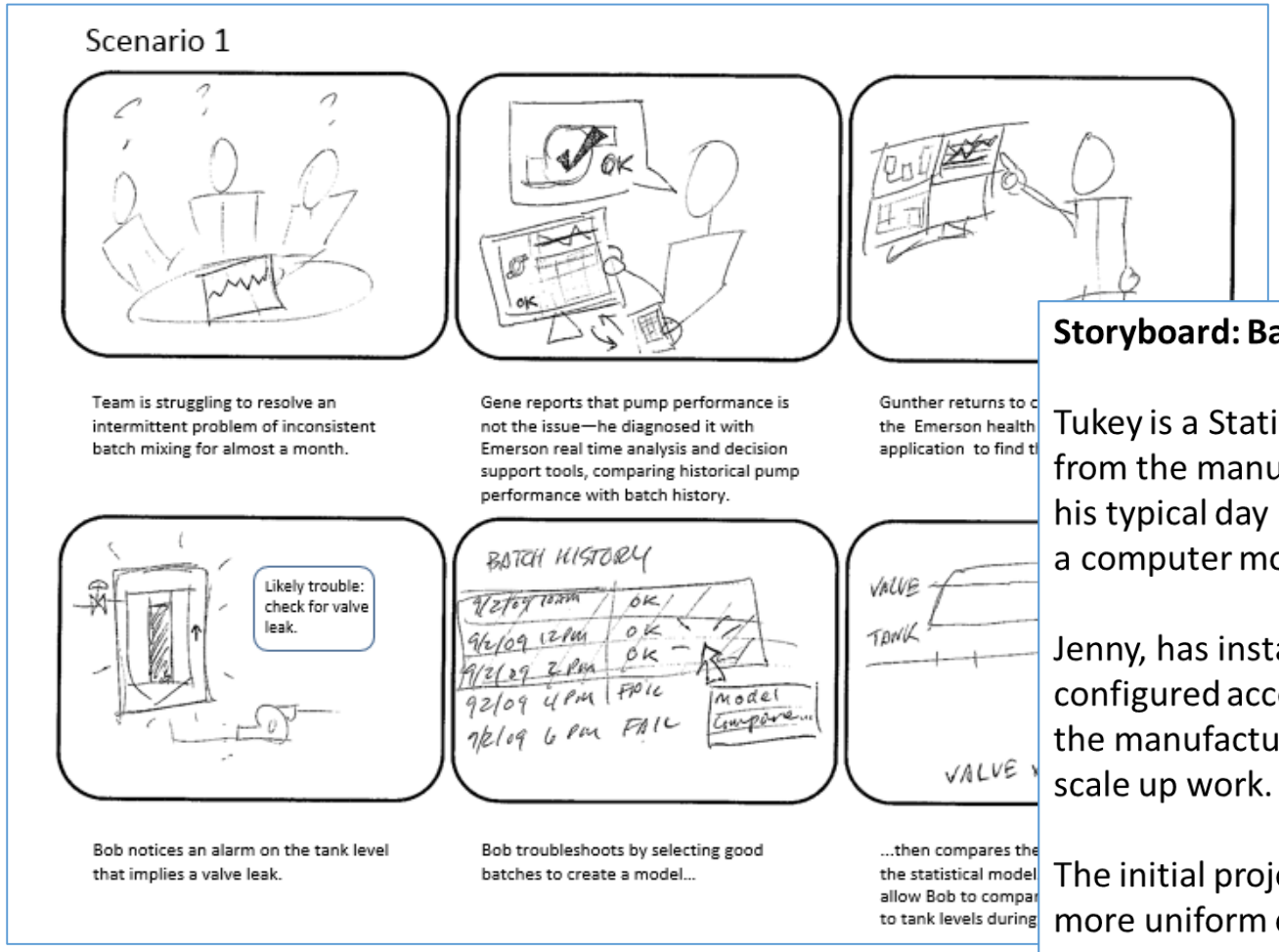
Understanding the problem: Task Flows







Designing the Solution: Scenarios and Storyboarding



Storyboard: Batch Analytics Model Building

Tukey is a Statistician at MajorPharma. He works in the headquarters building, away from the manufacturing plant. Occasionally he will visit the lab to check samples, but his typical day is spent with spreadsheets, reports, STATISTICA stats packages in front of a computer monitor.

Jenny, has installed Batch Analytics application for DeltaV and Susan in IT has configured access for Tukey to run the application at his office. Tukey is familiar with the manufacturing process, having worked with QA and Ralph, the process engineer, in scale up work. He has formed a team to implement Process Analytics.

The initial project will be a test with the coating (i.e. 'paint') for tablets. The goal is a more uniform coloration and consistency.

Tukey, Ralph and Jenny have looked at the data collection in the historian to ensure they are collecting the process variables they want to measure, at the recommended sample rate and uncompressed. They have also followed Emerson's guidelines for implementation and tuned the process. Enough batches have been run to start modeling.

Step 1 – Import Configuration

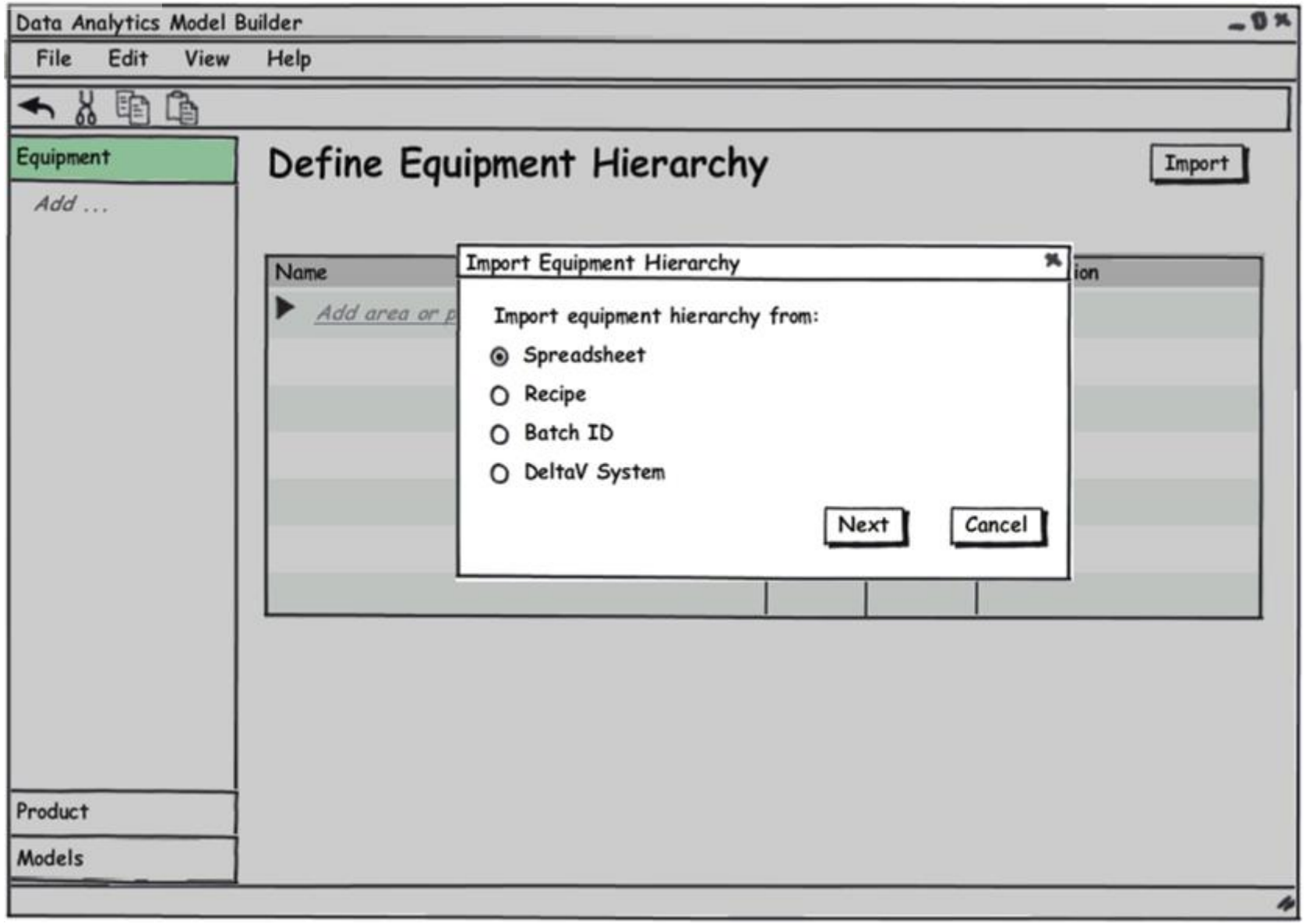
Since MajorPharma uses DeltaV, Tukey is saved the step of manually entering the configuration of the equipment and the product stages.

MajorPharma runs multiple manufacturing lines and has more than one DeltaV system. Jenny helps him connect to the system running the coating process. By selecting this, he automatically imports the Plant hierarchy as a checkbox tree, and can ‘uncheck’ the equipment that won’t be used in the model.

Tukey tries another method: he selects ‘Import by Batch ID’, which brings up the current batch list. After selecting a batch ID for the product he wants to model, he clicks ‘Import’ and is presented with the associated equipment hierarchy (and later product stages).

Tukey is ready to start picking the parameters of interest.

Balsamiq wireframing



Defining Candidate Parameters:

Usage	Description	Friendly Name	Parameter Path	Source	Engineering Units	Data Type	Comment	Stage A?	Stage B?	Stage C?
Input				DeltaV						
Process				Batch Historian						
Output				LIMS, MMS, etc				x		

Defining Product Stages

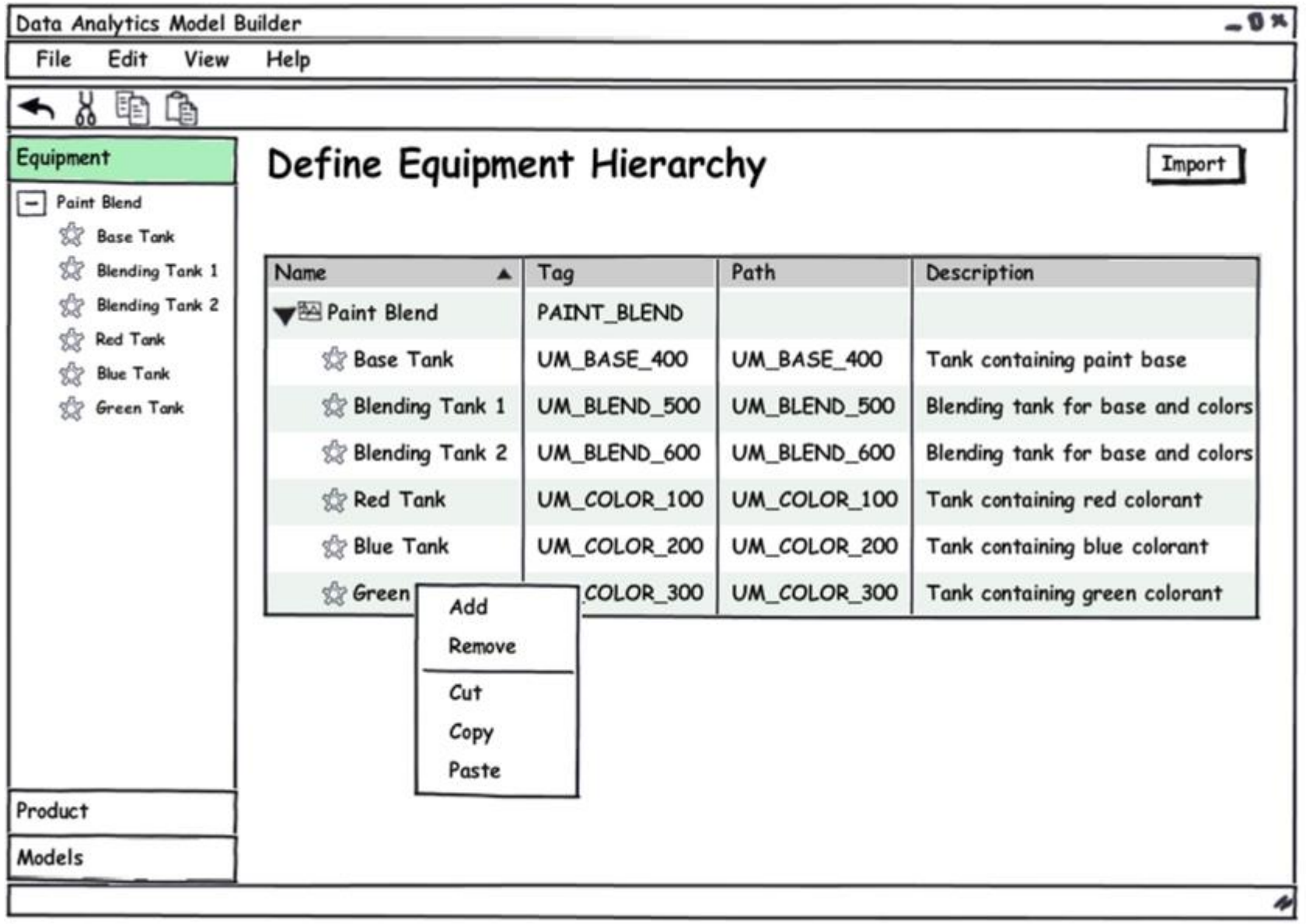
Stage Name	Parameter Path	Operation	Value (equals, OR)	Order
A				
B				
C				

CW's data matrix for model definition – basically fills in two tables, then all the data is available in the prototype for selection.

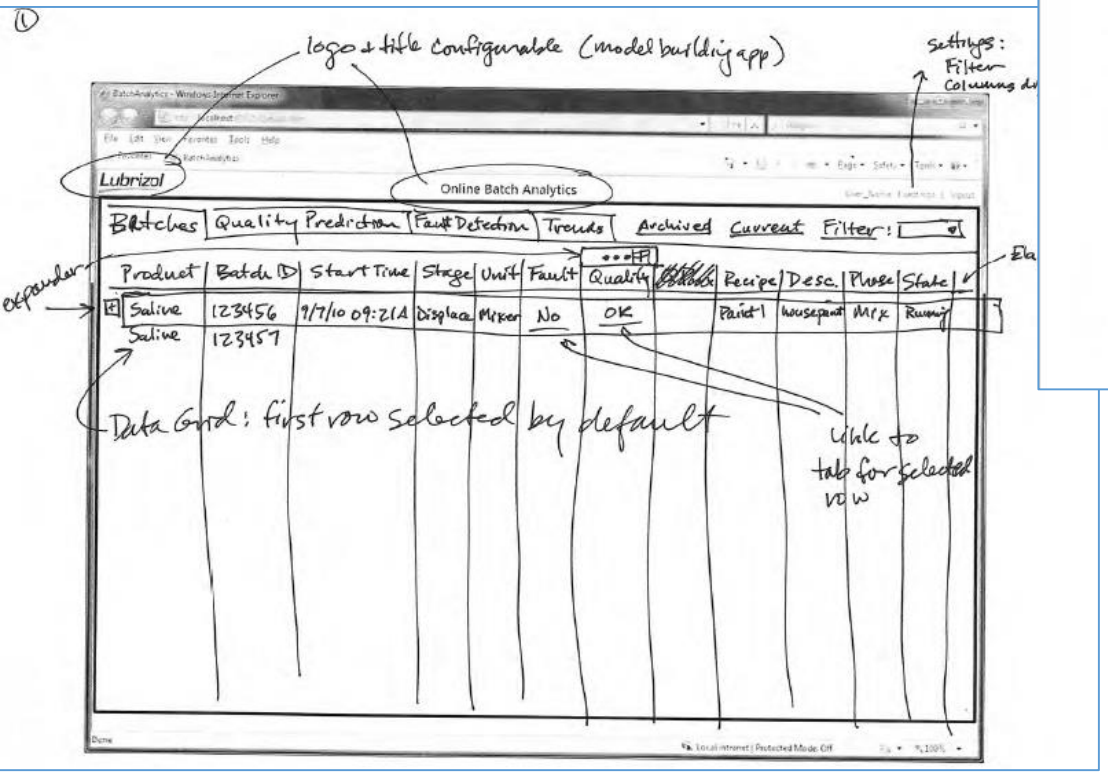
-If we define the product stages first, they are available for the second table (in what stage is the parameter recommended for model building)

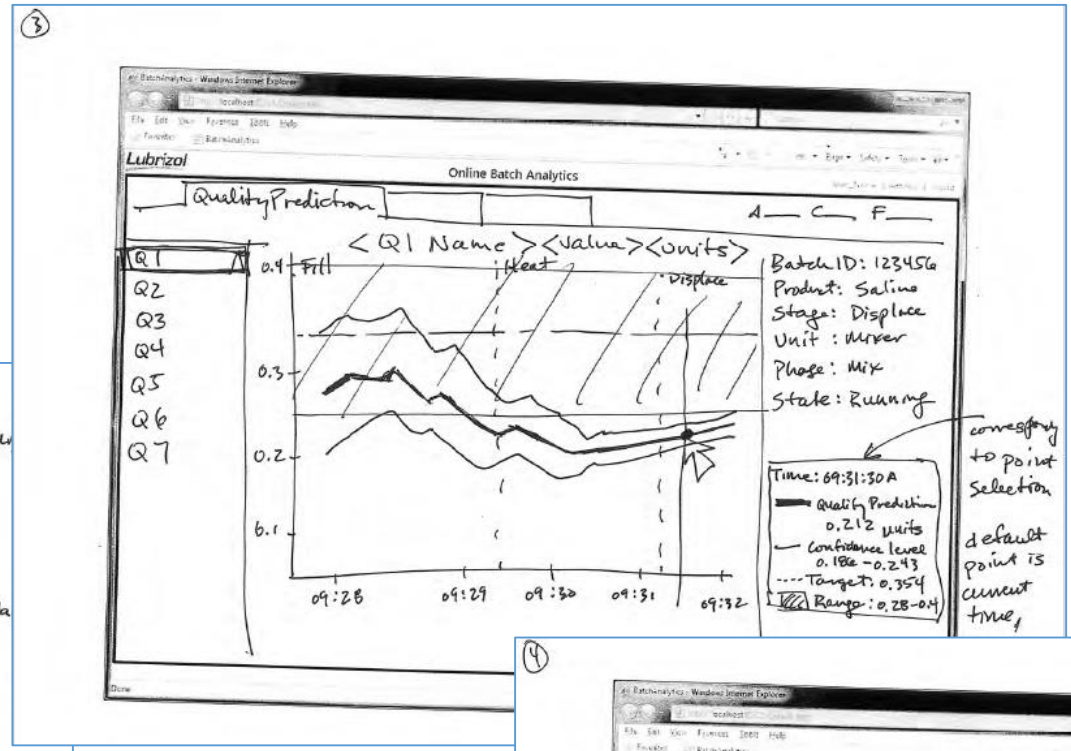
- In product stage, expression defines start of operation (parameter.path = value)

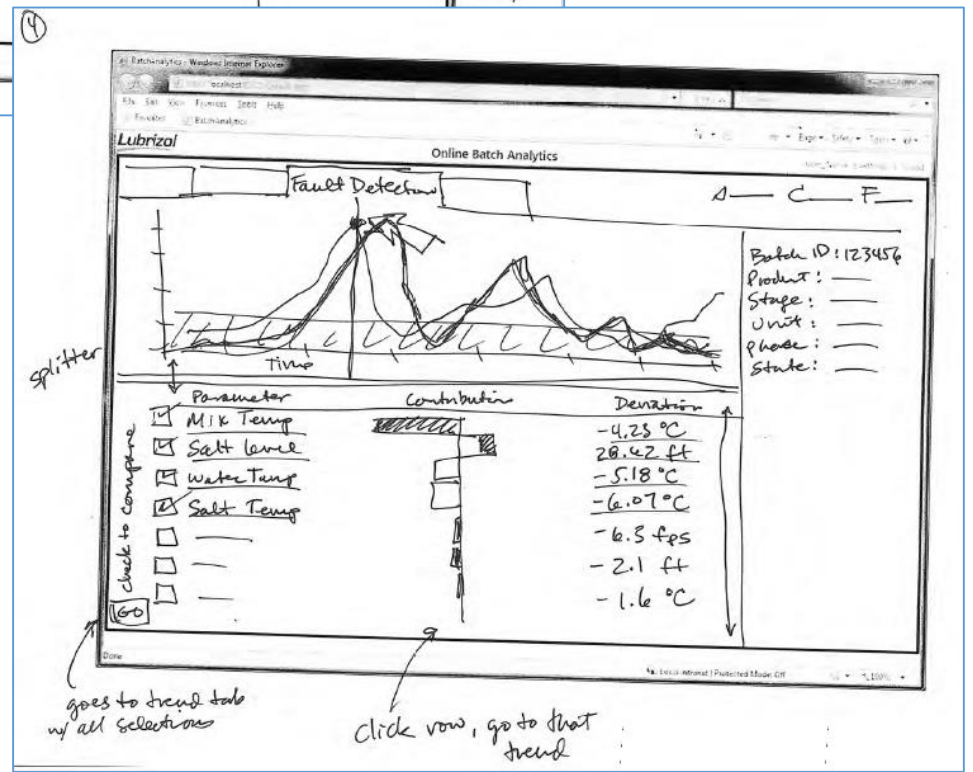
Balsamiq wireframing



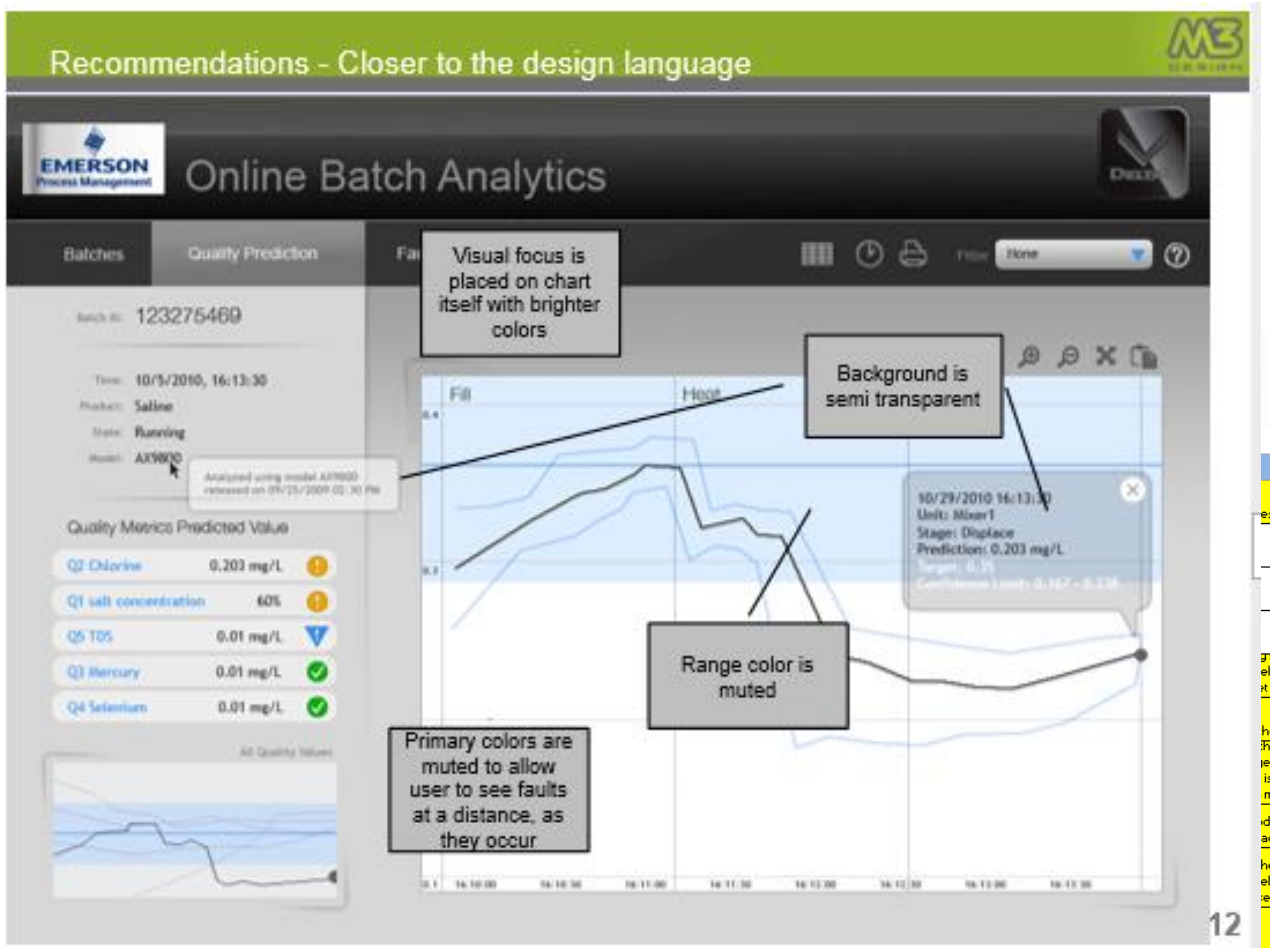
Designing the Solution: Sketching







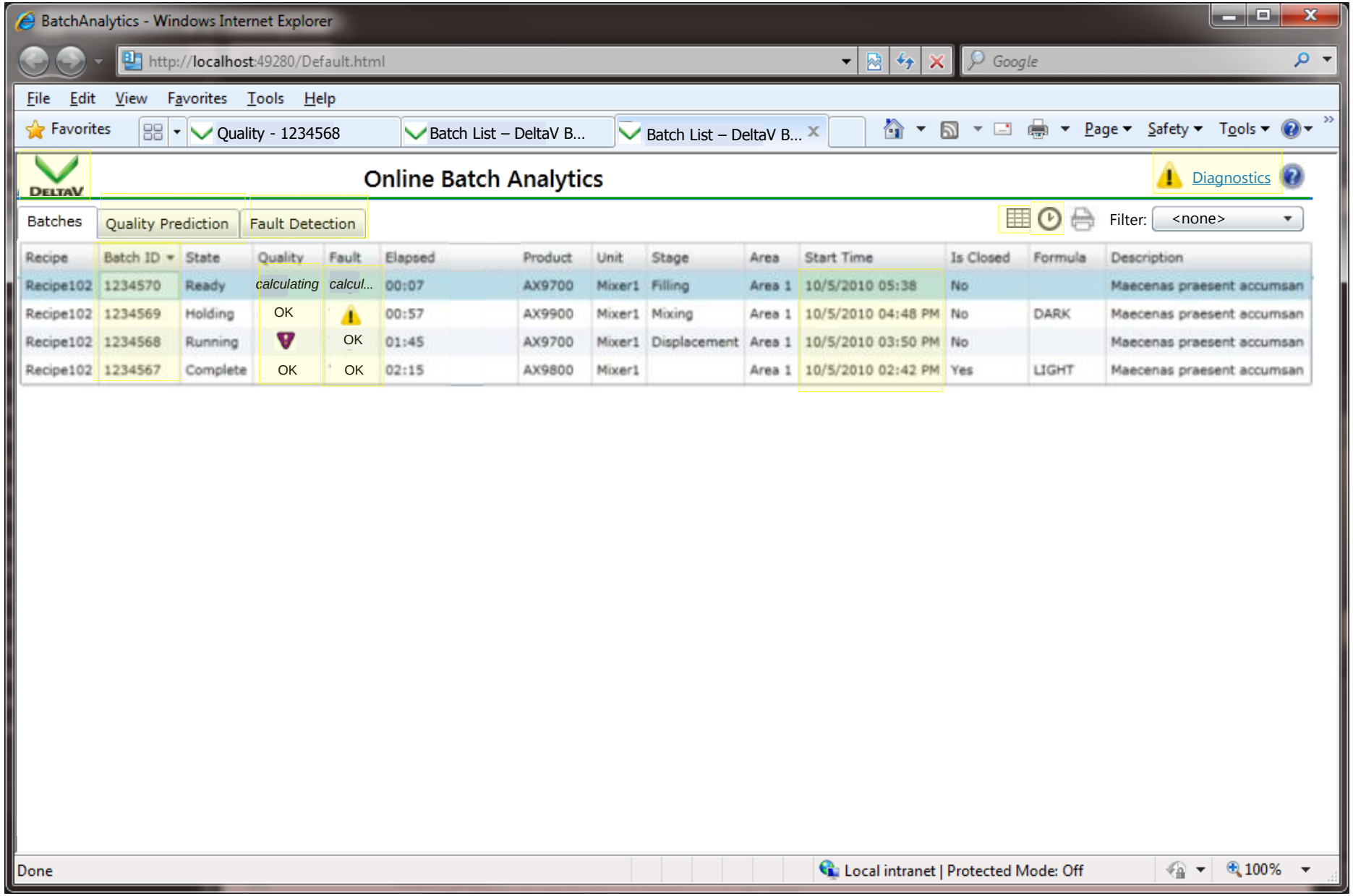
Designing the Solution: Design Language (contract)



Designing the Solution: Icons (offshore)

			Paul's comments	Context of Use	Description	Options	Old Icon	Dimension
			es with trashcan		ribbon; clears all rows/stage definitions			32
					indicates cell is checked, may use WPF control or font character			16
					expands grouping, like Windows 7 Explorer			16
					collapses grouping, like Windows 7 Explorer			16
			g same chart as generate el, with checkmark? Or report t of paper		ribbon; creates report for problems with data that should be fixed before generating the model			32
			he dice, no background		ribbon; randomizes batch groupings to train or test set			32
			he same 'go' badge with Quick es, chart with blue and yellow is what we will end up with for model, so this would work		ribbon; ultimate goal of application -- generates models using configured data			32
			da (eigenvalue) with or without adsheet background		ribbon; e.g. stats with export badge, creates a spreadsheet with eigenvalues and other advanced statistics to judge goodness of model			32
			he double arrow, maybe with the el and server (put the model on erver)		ribbon; deploys the generated models for batch monitoring			32
					ribbon; queries batch monitoring to see if the current modeling project would conflict with any existing models, displays in a dialog box			32
53		deployment status	use 'info' badge instead of deploy					
54	goodness indicators:		Try them as flat monochromatic, symbols (more like a font character)		display with cell in grid to indicate whether a data value is good or bad, or in between			16
55		good	Try them as flat symbols (more like a font character)		green circle with white checkmark			16
56		mostly good	should be white fill, amber outline is OK		either yellow/amber (since these are in between red& green) or red circle outline with white fill			16
57		acceptable	can we increase contrast on these?		similar to above (mostly good amber/red decision) circle outline with bottom half filled			16
58		bad	can we increase contrast on these?		red circle with center dot fill			16

Designing the Solution: Click-through prototyping, Cognitive Walkthrough



Implementing the Solution: UI Specification

DeltaV

DeltaV v12
User Interface Specification

Batch Analytics

Author: Paul Daly

RELEASE HISTO
Version 1 07/07/2

Abstract

This document presents the user interface design for the v12 Batch Anal
and personas involved.

Screen Type: Detail
Description: Fault Detection View for a batch ID
User Goal: view the graph of a batch for the two modeled values, see the individual parameters contributing to the faults and select to deep dive
Screen Design:

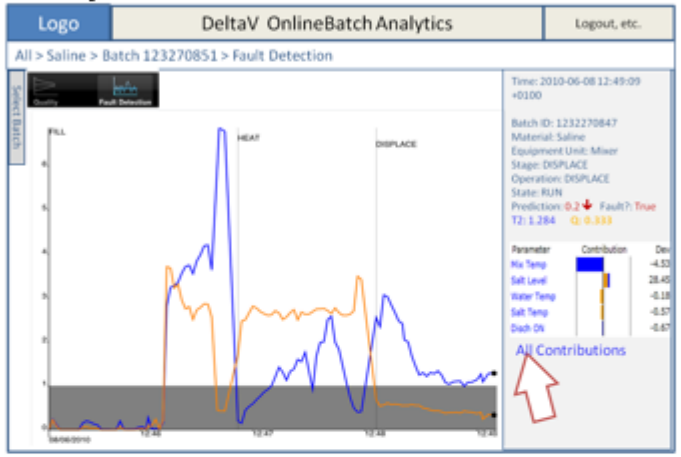


Figure 8: Fault Detection View

Screen Details:
To do:
- Labels: Measured (Q), Unmeasured (T2)
- Color scheme (blue/ gold are ok)
- How to indicate clickability (affordance)
- Add comment icon in the general controls area – popup window logs Batch ID (user) where from (node), free text, [OK]

3.1.4. Contributions

Screen ID: BARuntime-004
Title: Contributions
Screen Type: Detail
Description: Contributing parameter graph for a batch ID
User Goal: view all parameters contributing to the model, select one to see a trend

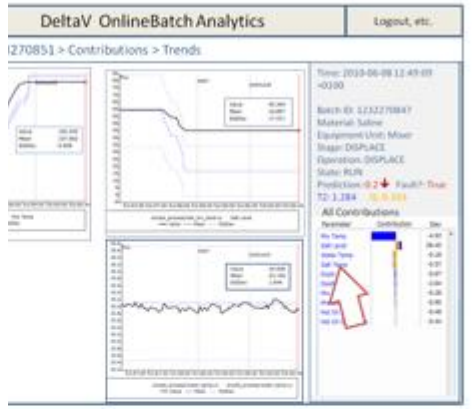


Figure 10: Trend Viewer (3 selections)

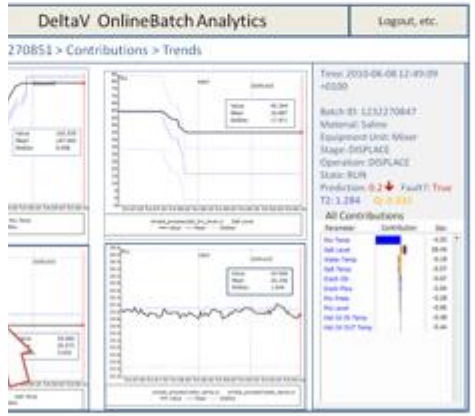


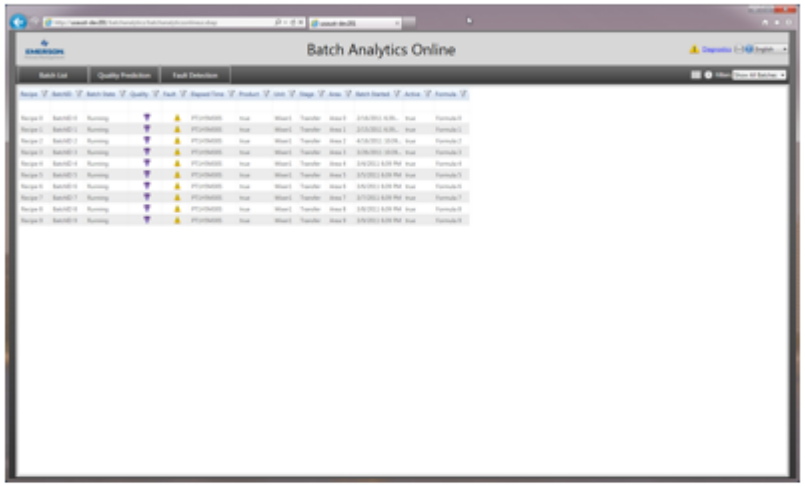
Figure 11: Trend Viewer (4 selections)

Implementing the Solution: UI Inspection and Heuristics

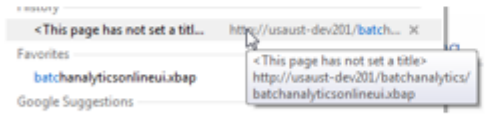
UI Review of BOWS as of 5/19/11 state

I checked against M3 visual design, and UI spec. Also captured some notes from reviews with Dawn.

Batch List Tab



IE Tab – not following spec – need Emerson icon, name (e.g. "Batch List – Emerson Batch Analytics", "Quality - <BATCH_ID>" Maybe need to set the title: in my history it shows up like this:



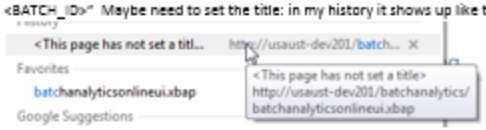
Banner:

- Need tooltips on all icons
- Use new logo icon (blue text on silvered background)
- Use brushed metal background, tiled
- Try server icon for diagnostics; replace text hyperlink
- ? remove print functionality? (use browser—but browser functionality cuts page off, no print preview
- Investigate ability to configure logo and title separately (backdoor, not in BAADMIN)

BOWS UI TestoRama 6/9/11

Batch List Tab

- IE Tab – not following spec – need Emerson icon, name (e.g. "Batch List – Emerson Batch Analytics", "Quality - <BATCH_ID>" Maybe need to set the title: in my history it shows up like this:



- Could be related to the page history navigation in XBAP? Can we set title for each page?
- Print is cutting off half the screen – doesn't fit to page

Banner:

- Dawn prefers Emerson logo with transparent background (on brushed metal background)
- Help icon looks stretched, should be 16x16 like the server icon next to it

Tab Bar:

- Tab styles are not correct – selected should have black text, hover should have blue text (203,18,100) and outline:

-
- Layout and clock icons look stretched
  - UI Spec had a checkmark indicator on the active option in the popup menu, vs. selection highlight
- Label should be "Filter:" with colon
- Toolbar floats fine, but covers tabs when you minimize. I am fine with a minimum width ~700px (where they all fit), though I don't know if that is respected by IE

Datagrid:

- On launch, No batch is selected -- by default top batch is selected, and one is selected at all times
- Selection doesn't follow mouse – example:
  - Select BatchID9 (left click)
  - Right Click on BatchID5
  - EXPECTED: Selection changes to BatchID5, context menu for BatchID5
  - ACTUAL: Selection adds BatchID5, context menu for BatchID9
  - Issue: right click should change selection, grid should not support multiple selection – right click 'appears' to select additional row, but original is still selected.

TI Nspire

Texas Instruments Educational Solutions

Product Goal: Help teachers teach, and students learn, mathematics through the *power of visualization* and dynamic/interactive math

My UX Goal: consistency across platform (handheld/desktop, Windows/Mac), between applications

My role: UX Manager and Lead (+ UX Designer, UX Researcher).
Working with multiple Product Managers, Architects, Dev Leads, QA, Tech Writers, MarCom

Cross-Platform
Multiple Applications:
- Statistics
- Spreadsheet
- Geometry
- Graphing
- Dynamic Notes
- Calculator
- Science & Data Collection

Ancillary Applications:
Navigator, Connect

WIRED Top-Grade Gear for Back-to-School

2. TI-NSPIRE CX CAS

Need a heavy-lifting calculator for diff eq? The rechargeable CX CAS won't buckle, whether you're graphing 3-D models or doing matrix operations. The 100 MB of storage means you can save documents and graphs to view on the 3.2-inch display.

WIRED Hundreds of preprogrammed equations. Color screen eliminates multiple-graph confusion.

TIRED Tiny touchpad can be unresponsive. $175 Texas Instruments

Rating: 8 out of 10

Understanding the problem: working with subject matter experts & researchers

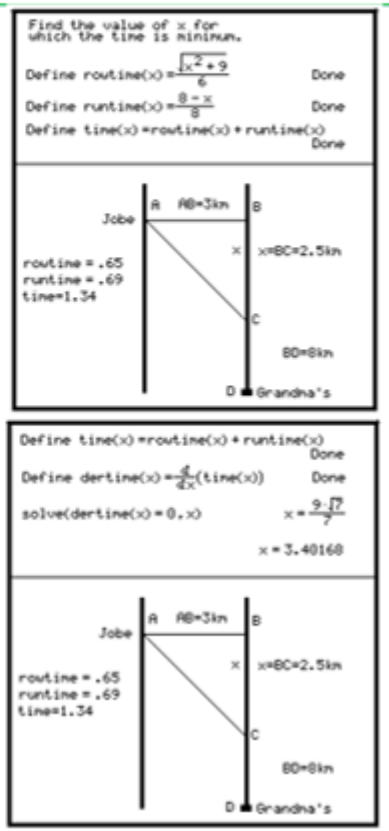
Epic

“Row and Run” Problem - Original

Jobe is in a row boat at point A, which is 3km directly off shore from point B. Jobe wants to row to point C, yet to be determined, and run to point D (Grandma’s House) , which is 8km south of point B (lighthouse) . The time is of the utmost importance, so Jobe needs to get from point A to point D in the least possible time. Assume that Jobe rows at 6km/hr and runs at 8km/hr.

Constituent User Stories & Metadata

- Student creates a model of the problem on the device. The model includes:
  - Definitions of the rowing, running and total travel times: *rowtime*, *runtime* and *time*
  - Realistic dynamic geometric sketch using the above definitions
- Student analyzes different paths Jobe could follow by dragging point *C*
- Student calculates the “minimum path” by solving the problem symbolically:
  - Student defines *dertime* derivative of function *time*
  - Student calculates the zero of *dertime*
  - Student approximates the zero of *dertime*



Designing the Solution: Framework & Standards

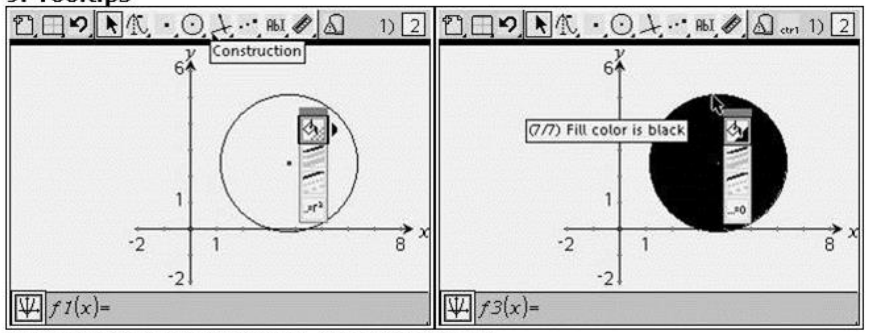
Phoenix: Device UI Framework

Card View: Device UI Framework

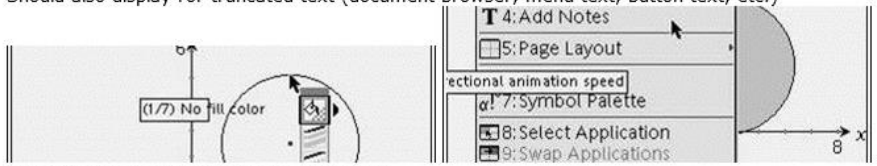
TI-Nspire GUI

Control Set Specification

9. Tooltips



In P1: used for widget toolpallette, and attributes menu
Activated by hover, P2 should also be activated by selection/focus
Should also display for truncated text (document browser, menu text, button text, etc.)



Note: bugs with displaying attribute tooltips

Desired Behavior:
mouse—displays immediately on hover, 2s timeout
arrow—displays on selection, same timeout; display for truncated text should not timeout
NOTE: MS Windows XP displays tooltips on selection in the Start menu; also it uses tooltips to display truncated text in File Explorer and other areas. Tooltip displays on top of truncated text, and doesn't timeout until mouse is moved.

2.4 Large Icon Buttons

2.4.1 Single-state Large Icon Buttons

States	
Up	The icon is in its basic state ~~and the text has a white outline to enable it to be seen on a variety of backgrounds.~~
In Focus	The text is enclosed in a white box with a 2px black border to indicate focus. Icon also has 2px black border
Down *(mouse down behavior)*	Icon is checker-boarded with a gray pixel pattern and text is reversed to white within a black box. 2px selection border is displayed.
Unavailable	The command or state that is associated with the icon is not currently available. Icon will be in a "grayed out" state.

out

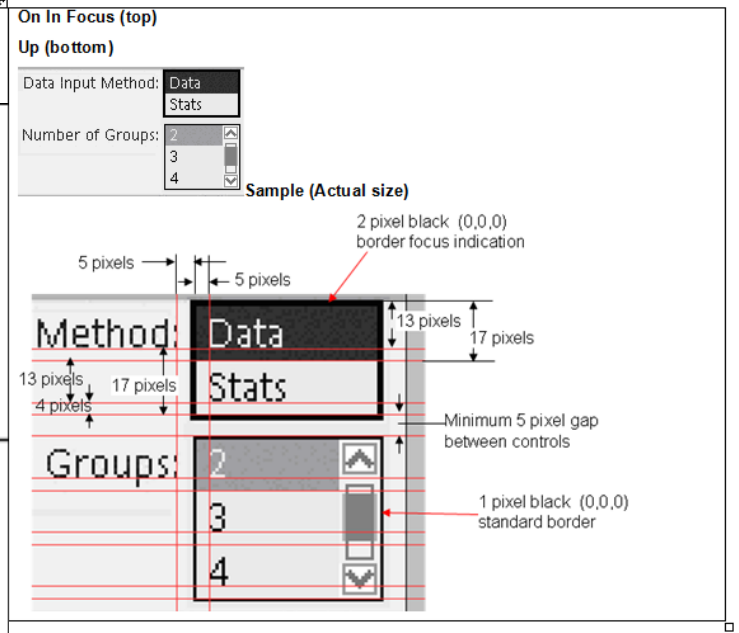
detailed layout specifications see Section 3.5 in Appendix B.

nts

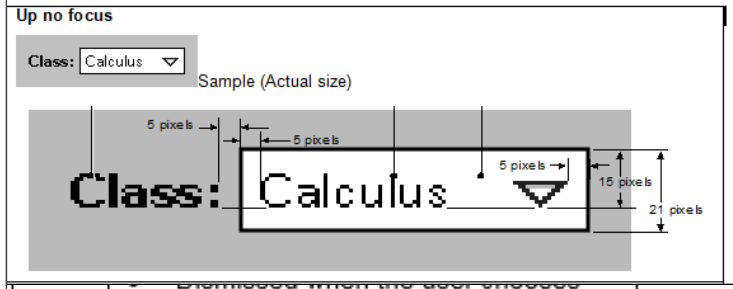
Event	User Action	Icon State Prior to Event	Icon State After Event
nple Mouse Driven Events (follow standard platform behavior)			
	Mouse Down	Up	Down
Off Active (Not gable)	Mouse Drag	Down	Up
On Active (Not gable)	Mouse Drag	Up	Down
	Mouse Drag	Down	Icon is "hovering" in a new position in the Down state.

Status Palette (Rightmost Area)

3.6.2 Standard List Box

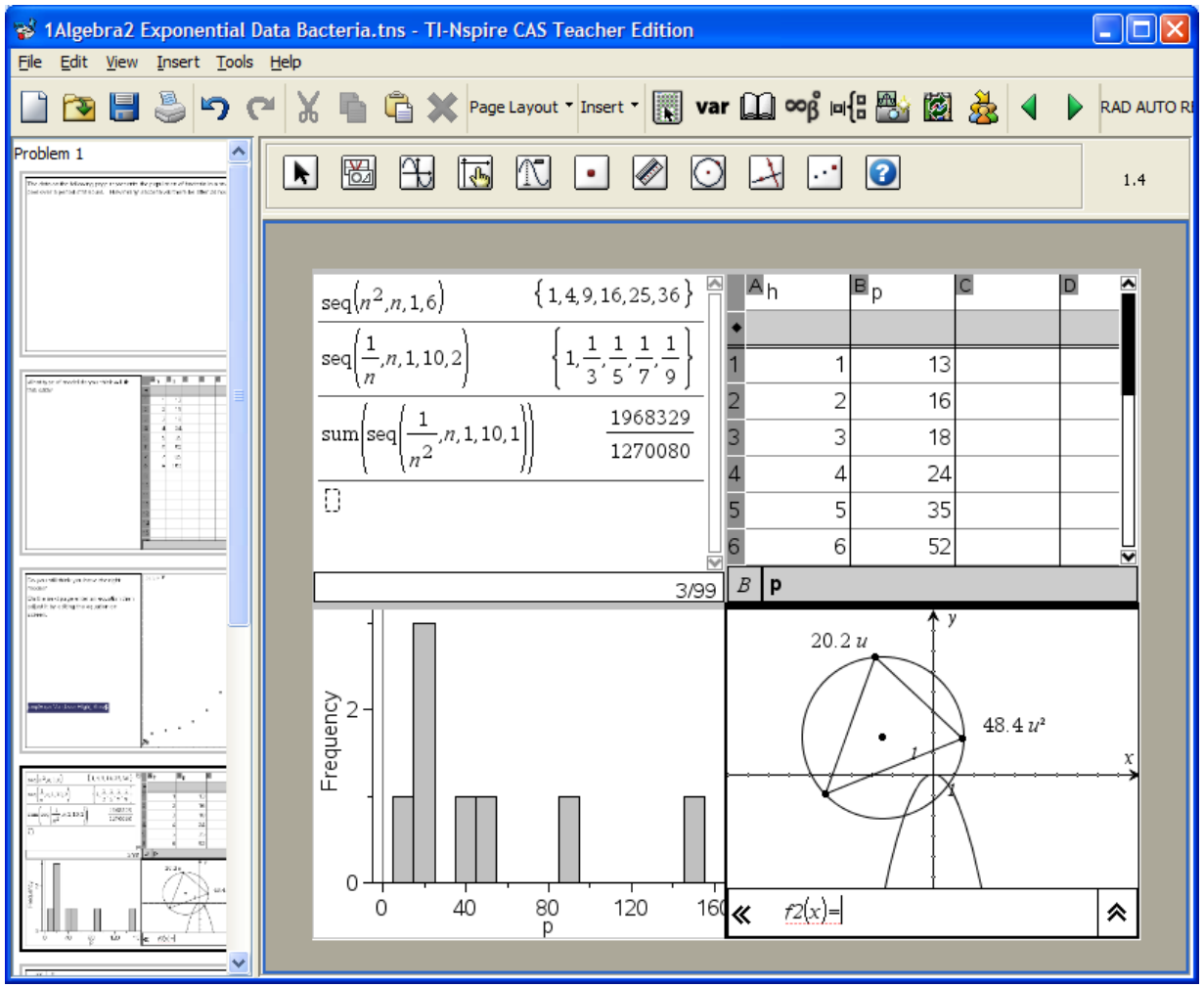


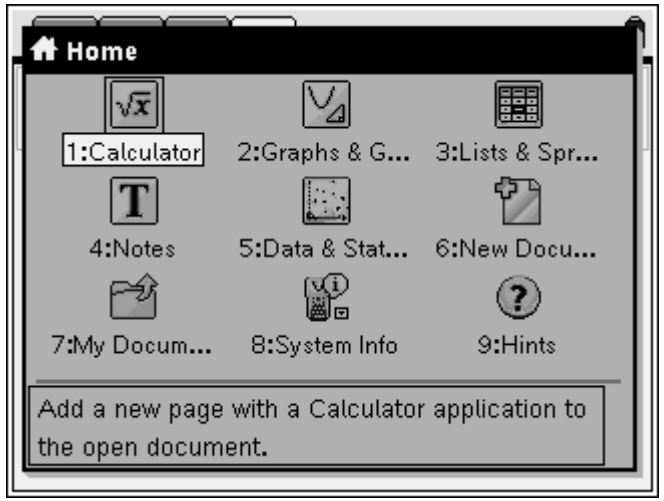
3.6.3 Drop-down List Box and Combo Box

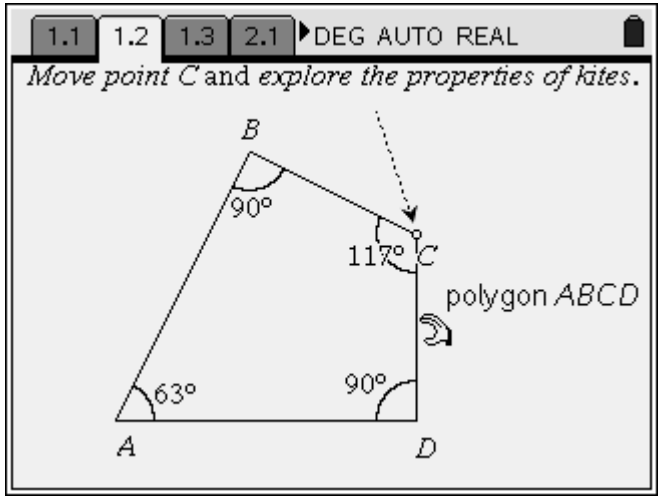


an item or presses the Esc key
- The Menu Bar is not movable by the user

Designing the Solution: Cross Platform







Implementing the Solution: Defining and Maintaining standards: menus, fonts, icons, key map

Application Framework Story

Story ID: 014_001

Story Title(s): Context Menu Updates

Story Description:

Review each application to ensure the options in the context menu cover
quent actions, remove unnecessary options, and identify if additional co
sary.

Proposed Behavior:

Development work will be to change existing dialog boxes to reflect the changes for
new functionality added for this user story.

Graphs & Geometry

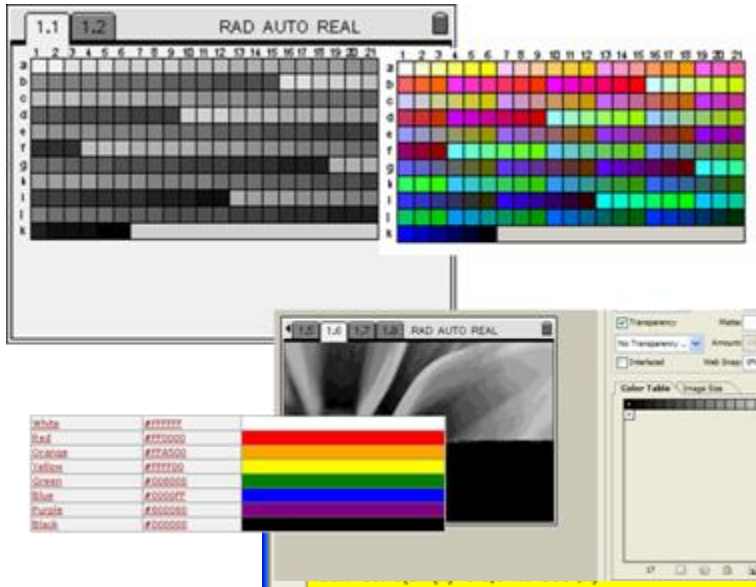
UC Status	Context	G2 menu	H menu	I menu	
	Background	1. Recent > 2. Select 3. Hide/Show Grid 4. Zoom > 5. Text		1. Recent > 2. Hide/Show (Tool) 3. Select 4. Hide/Show Grid(only in analytic space) 5. Window/Zoom >(only in analytic space) 6. Text 7: Delete All 8: Erase Geometry Trace	Maybe: Hide scope] Delete All [J Erase Geom high importa PGM: Shoul match Menu says "Windo for either th G&G contex [John: "Hide "Window/Zo only in the c analytic spa Incorporate
	Axes	1. Recent > 2. Attributes 3. Hide Axes			Trace settin

TI Characters Reference
06-4-2008

u 21D2	right double arrow	⇒
u 21D0	left double arrow	⇐
u 21D4	left-right double arrow	⇔
u 2318	Apple command key	⌘
u 25AB	White small square	▫
u 263A	white smiling face	☺
u 2605	black	★
u F___	TI Wi	
u F___	TI Ste	
u F108	TI Lo	
u F109	TI Tal	
u F10A	TI Me	
u F10B	TI ES	
~~u F10C~~	~~TI Sh~~	
u F10D	TI Sto	
u F10E	TI Ctr	
~~u F10F~~	~~TI Cle~~	
u F045	TI Ha	

Base Key	Ctrl then Key	Ctrl & Key	Shift then Key	Shift & Key	Windows	Macintosh	Emulator (keyboard)
Arrow Up	Up in Hierarchy	Up in Hierarchy		Extend selectio	same, only hold dow	same, only hold down	same
Arrow Right	Next card	Next card		Extend selectio	same, only hold dow	same, only hold down	same
Arrow Left	Previous card	Previous card		Extend selectio	same, only hold dow	same, only hold down	same
Arrow Down	Down in Hierarchy	Down in Hierarchy		Extend selectio	same, only hold dow	same, only hold down	same
Center Click	Grab	Grab			spacebar/ mouse cli	spacebar/mouse click	NA
esc	Undo	Undo	Redo	Redo	ESC key (Ctrl state n	ESC key (Ctrl state no	same
home(symbol)	File/Edit/Page Tools me	File/Edit/Page Tools menu			NA (toolbar icons)	NA (toolbar icons)	Ctrl+F12
tab	Switch focus betwee	Switch focus betwee	Move focus in	Move focus in	same Ctrl+ & Shift+ b	same Cmd+ & Shift+ b	same
menu	Launch context menu	Launch context menu	Favorites?	Favorites?	NA; right-mouseclick	NA; Ctrl+mouseclick o	Ctrl+F10
= (equals)	≠ (not equal to)	≠ (not equal to)			same Ctrl+	same Cmd+	same
ctrl	NA	NA			No 'sticky key' CTRL	No 'sticky key' CTRL/C	same
| (vertical bar)	Factorial (!)	Factorial (!)					Shift \
a	select all in PE	select all in PE	A	A	NA, Select All?	NA, Select All?	same
b	Check & Store in PE	Check & Store in PE	B	B	*NA(typically Bold)*	*NA(typically Bold)*	same
c	copy	copy	C	C	same Ctrl+	same Cmd+	same
← (backspace)	clear	clear			Delete key is mapped	Delete key is mapped	same
□Flag (I18N)	template palette	template palette			NA	NA	NA
< (less than)	≤ (less than or equal to	≤ (less than or equal to)			?same Ctrl+	?same Cmd+	Shift ,
↑ (shift)	caps lock	caps lock	NA	NA	CapsLock key	CapsLock key	same
d	Data Collection (Start)		D	D			same
var	sto□	sto□			*Ctrl+L maps to VAR*	*Cmd+L maps to VAR*	NA

Designing the Solution: Special Research



Implementing Dual Mouse-Cursor mode in Nspire Handheld

Definitions:
Mouse/Pointer: continuous free-moving pointer that allows for focus change, hover, selection, dragging
Cursor: 'I-beam' (text input) or discrete selection indicator (menu/list navigation)
Continuous-primary apps: Graphs & Geometry, Data & Statistics, Data Collection/Science
Discrete-primary apps/utilities: Calculator, Notes, Lists & Spreadsheet, Program Editor,
Mixed usage: Catalog, Symbol Palette, Template Palette, Page Sorter, Doc Browser

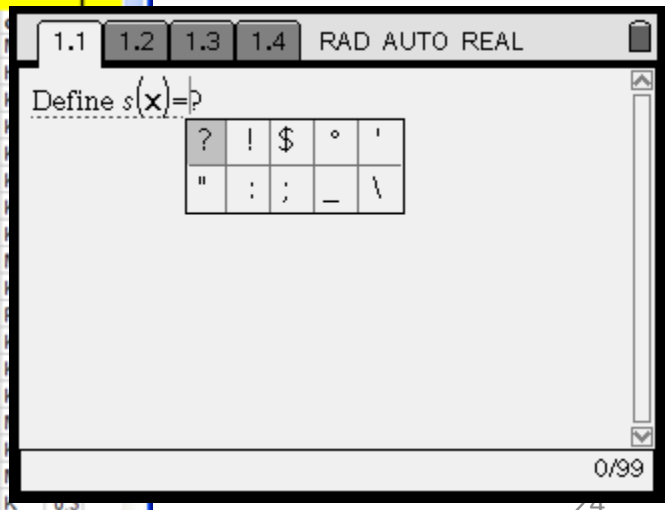
History

TI-Nspire was originally designed as a dual-input handheld. The first release (P1R1) had a navigation control (raised button) surrounded by four discrete arrow keys. The navigation 'button' allowed for 16 direction movement, and controlled the mouse pointer. The arrows navigated the text cursor or discrete selection in four directions.

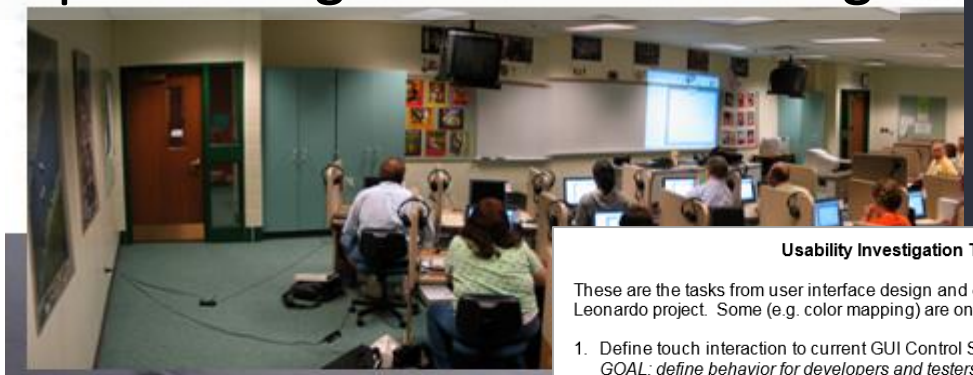
The GUI was designed to accommodate mouse selection. For example, there was a top 'toolbar' that accessed system menu (now Tools) and application menu (now Menu). Early testing showed that the navigation button was very tedious—slow, jerky—so we added features to 'get around' the navigation, like the tab key (very small in P1R1) and menu key. However, users still intuitively used the mouse to navigate to the toolbar and around dialogs instead of using the (less noticeable) navigation keys, which led to impressions that the device was too tedious to use.
...e navigation button was that users expected a 'click'
...ion was relegated to a separate button (as was

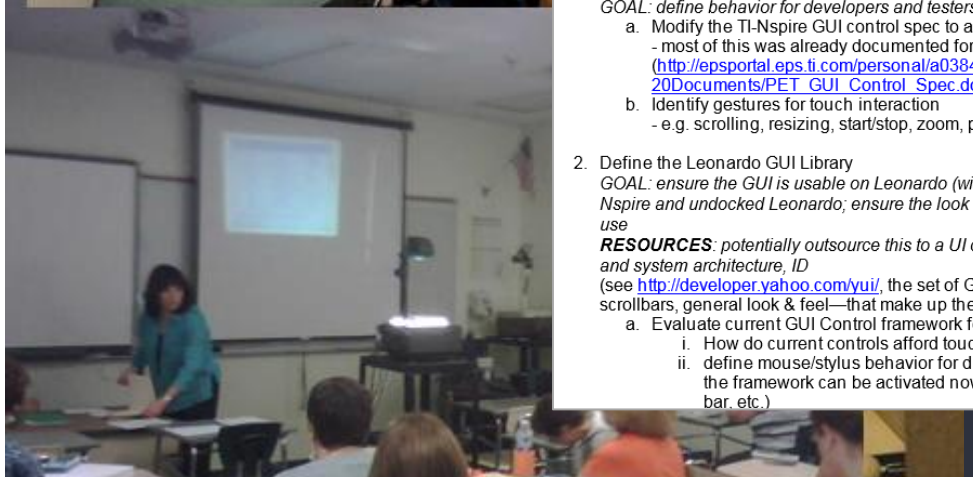
2	Current Keypad					Preconditions: working on a calculator page in an unsaved document Task: solve(sin(x)=0.8|0°≤x<360°,x) Simplified Keypad-shortcuts using shortcut					Preconditions: working on a calculator page in an unsaved document Task: solve(sin(x)=0.8|0°≤x<360°,x) Simplified Keypad-shortcuts using arrow				
3	step	user action	system response	comp	time	step	user action	system response	comp	time	step	user action	system response	comp	time
4		mentally prepare		M	1.2		mentally prepare		M	1.2		mentally prepare		M	1.2
5		move finger to s key		H	0.4		move finger to s key		H	0.4		move finger to s key		H	0.4
6	1	press s key	s appears on display	K	0.28	1	press s key	s appears on display	K	0.28	1	press s key	s appears on display	K	0.28
7	2	press o key	o appears on display	K	0.28	2	press o key	o appears on display	K	0.28	2	press o key	o appears on display	K	0.28
8	3	press l key	l appears on display	K	0.28	3	press l key	l appears on display	K	0.28	3	press l key	l appears on display	K	0.28
9	4	press v key	v appears on display	K	0.28	4	press v key	v appears on display	K	0.28	4	press v key	v appears on display	K	0.28
10	5	press e key	e appears on display	K	0.28	5	press e key	e appears on display	K	0.28	5	press e key	e appears on display	K	0.28
11	6	press (key	(appears on display	K	0.28	6	press (key	(appears on display	K	0.28	6	press (key	(appears on display	K	0.28
12		mentally prepare		M	1.2		mentally prepare		M	1.2		mentally prepare		M	1.2
13	7	press sin key	sin( )) appears on di	K	0.28	7	press trig key		K	0.28	7	press trig key		K	0.28
14	8	press x key	x appears on display	K	0.28			trig pop-up appears.	R	0.4			trig pop-up appears.	R	0.4
15	9	press) key	) appears on display	K	0.28	8	press 1 key	sin(pasted	K	0.28	8	press enter key	sin(pasted	K	0.28
16		mentally prepare		M	1.2	9	press x key	sin(x)) appears	K	0.28	9	press x key	sin(x)) appears	K	0.28
17	10	press = key	= appears on display	K	0.28	10	press) key	) appears on display	K	0.28	10	press) key	) appears on display	K	0.28
18		mentally prepare		M	1.2		mentally prepare		M	1.2		mentally prepare		M	1.2
19	11	press 0 key	0 appears on display	K	0.28	11	press = key	= appears on display	K	0.28	11	press = key	= appears on display	K	0.28
20	12	press . key	. appears on display	K	0.28		mentally prepare		M	1.2		mentally prepare		M	1.2
21	13	press 8 key	8 appears on display	K	0.28	12	press 0 key	0 appears on display	K	0.28	12	press 0 key	0 appears on display	K	0.28

GOMS – KLM!!



Implementing the Solution: Testing



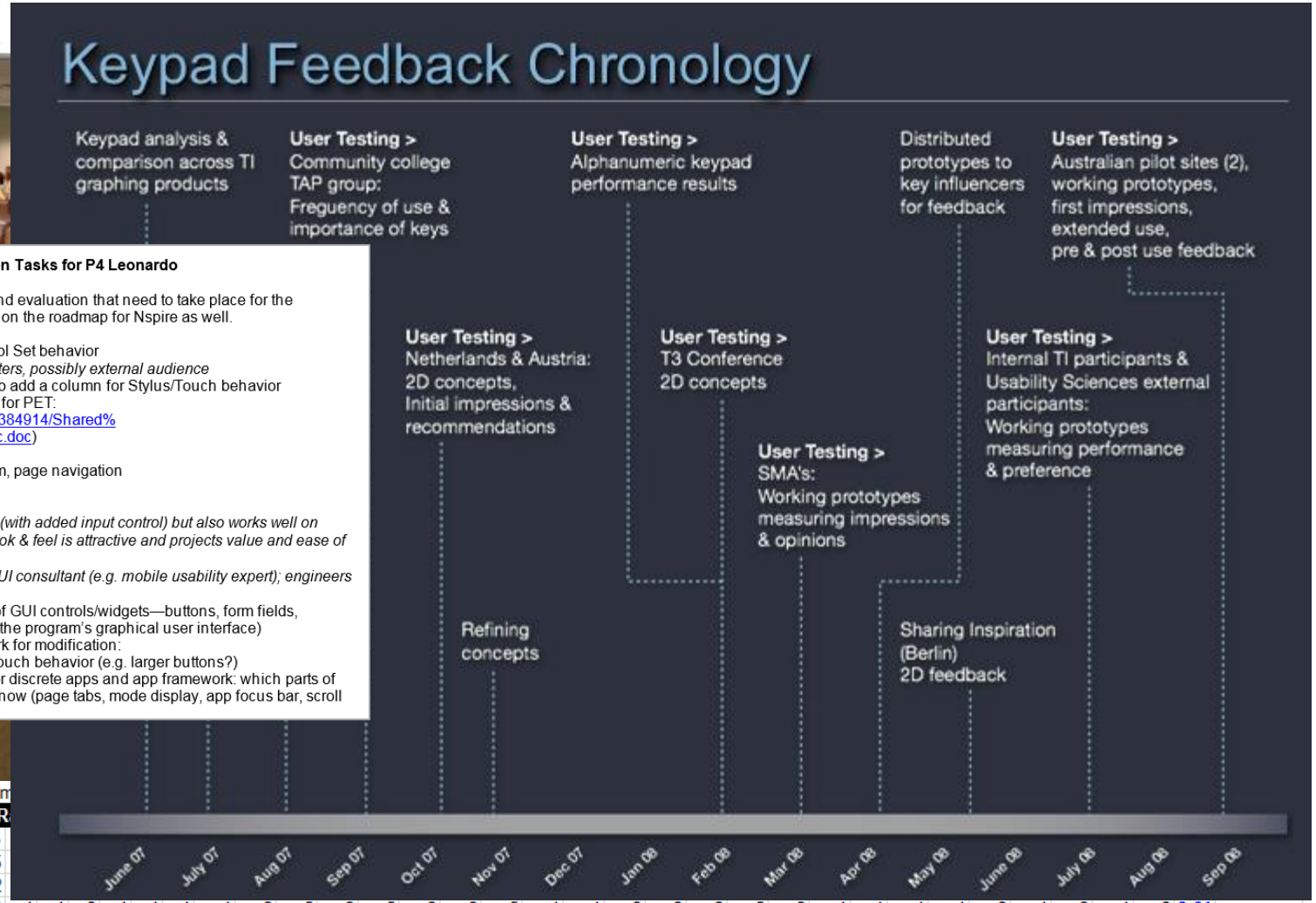


Usability Investigation Tasks for P4 Leonardo

These are the tasks from user interface design and evaluation that need to take place for the Leonardo project. Some (e.g. color mapping) are on the roadmap for Nspire as well.

1. Define touch interaction to current GUI Control Set behavior
   GOAL: define behavior for developers and testers, possibly external audience
   a. Modify the TI-Nspire GUI control spec to add a column for Stylus/Touch behavior
      - most of this was already documented for PET:
      (http://epsportal.eps.ti.com/personal/a0384914/Shared%20Documents/PET_GUI_Control_Spec.doc)
   b. Identify gestures for touch interaction
      - e.g. scrolling, resizing, start/stop, zoom, page navigation

2. Define the Leonardo GUI Library
   GOAL: ensure the GUI is usable on Leonardo (with added input control) but also works well on Nspire and undocked Leonardo; ensure the look & feel is attractive and projects value and ease of use
   ***RESOURCES**: potentially outsource this to a UI consultant (e.g. mobile usability expert); engineers and system architecture, ID*
   (see http://developer.yahoo.com/yui/, the set of GUI controls/widgets—buttons, form fields, scrollbars, general look & feel—that make up the program's graphical user interface)
   a. Evaluate current GUI Control framework for modification:
      i. How do current controls afford touch behavior (e.g. larger buttons?)
      ii. define mouse/stylus behavior for discrete apps and app framework: which parts of the framework can be activated now (page tabs, mode display, app focus bar, scroll bar, etc.)



The System Usability Scale (SUS) is a simple, ten-item scale giving a global view of subjective assessm

	INPUT	Note: R																																					
	System Usability Scale (SUS)	P1	P2	P3																																				
1	I think I would like to use this system frequently	4	5	5																																				
2	I found the system unnecessarily complex	3	4	2																																				
3	I thought the system was easy to use	3	4	3	4	4	3	4	4	4	4	2	5	3	5	3	2	5	4	4	3	3	3	5	3	4	4	4	4	2	4	3	4	3	3.61				
4	I think that I would need the support of a technical person to be able to use this system	3	1	1	3	2	3	3	2	2	2	2	1	2	3	2	3	4	1	1	3	4	1	2	3	2	2	1	1	2	2	5	2	2	2.21				
5	I found the various functions in this system were well integrated	4	4	4	4	4	5	4	4	3	4	4	4	4	5	4	4	5	5	3	4	5	4	5	4	5	4	4	5	4	3	3	4	4	4.12				
6	I thought there was too much inconsistency in the system	2	2	1	2	2	2	2	3	2	2	2	1	2	2	5	2	1	4	2	2	2	1	1	2	1	2	1	5	1	2	3	2	1	2.03				
7	I would imagine that most people would learn to use this system very quickly	4	2	2	4	4	3	4	2	4	4	4	4	4	3	4	3	4	3	2	2	2	3	5	3	3	4	3	4	2	2	3	4	3	3.24				
8	I found the system very cumbersome to use	4	2	2	2	2	1	2	2	2	2	2	1	2	3	2	2	1	2	2	3	2	2	2	3	1	2	3	3	3	2	4	2	2	2.18				
9	I felt very confident using the sysytem	3	4	4	4	4	3	3	4	4	3	4	4	4	5	3	4	3	3	4	3	1	3	5	3	3	4	4	4	2	3	2	3	3	3.42				
10	I needed to learn a lot of things before I could get going with this system	4	3	2	4	2	3	3	3	3	2	3	1	3	3	2	1	4	3	2	2	4	4	2	4	2	2	2	1	2	4	3	2	3	2.67				
	I think it would be easy to teach someone how to use this product	3	4	3	4	4	4	4	4	3	4	3	5	3	3	3	3	4	4	3	3	4	4	5	2	3	4	4	4	3	3	2	3	2	3.45				
	OUTPUT																																						
	SUS Score	55	68	75	70	78	68	68	63	70	73	70	93	70	75	63	65	78	70	73	60	55	70	90	58	83	75	75	75	60	60	40	73	65		69.02			

Implementing the Solution: Iterating

Usability Enhancements for PHX2 – December 2006 Release

smaller screen size
Math Engine
Updates for consistent GUI
Catalog and symbol palette
ns & Geometry
& Spreadsheets
ment Framework
Linking/Data Flow
chPad (Calculator)
Collection
uterLink Stories

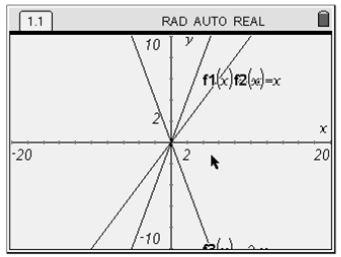
Scope Priority Spreadsheet:
Update UI (as needed) for Phx 2 device to deal with the smaller screen size
hould be minimal, as we designed PHX1 to be scaleable and created the 12px icons already. There may
e some tweaks to word wrapping with tooltips, name truncation, etc. Other dependent features:

TEXAS INSTRUMENTS

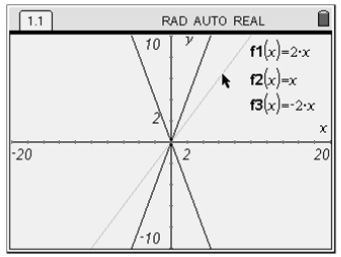
Usability Issues

- Dissatisfaction with NavPad (DPad)
- Confusion and error with cli**Solution: Single pointer controller**ns for separat pointer and cursor controls)
- Confusion about what arrow keys do
  - Icons hard to learn/understand or explain in class/training
  - Number shortcuts G**Solution: Text menus**
- Moving to text menus requires trimming menus/items
- Document model is not emphasized / highlighted by current schemes
- Tab key is crucial, but hidd**Solution: Rearrange Keys/Add Unique Keys**

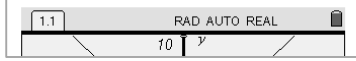
Trace All User Experience



1. starting point – note that labels are either on top of each
ISSUE: selecting a graph does not highlight it's label (nor
ISSUE: labels do not have background mask so backgroun

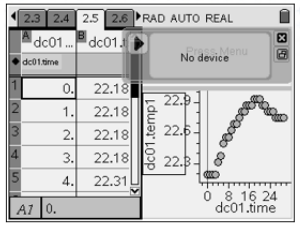


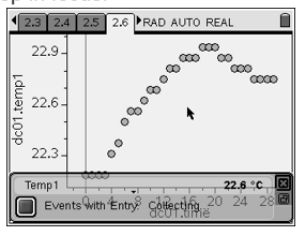
Nice if the system automatically placed them, however they are no l

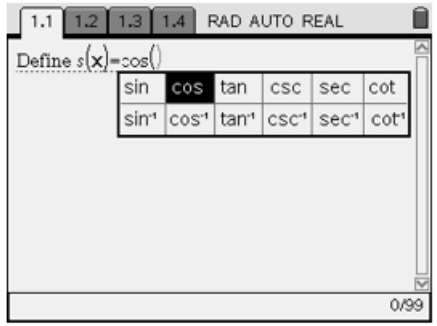


H: Transparent Console while collecting

- Currently 'ghost' when not in focus
- Let background ghost, but still keep in focus.





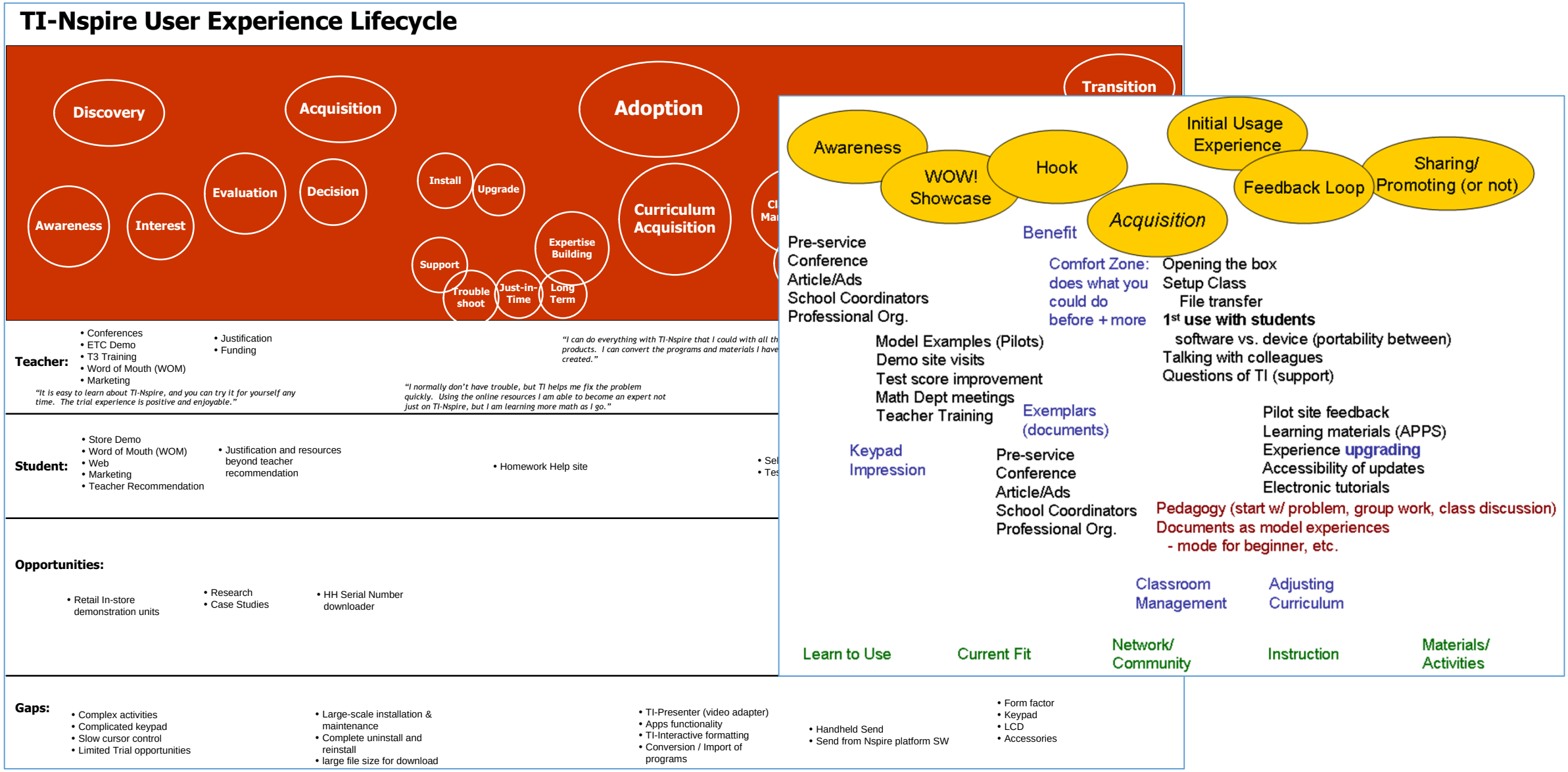


Navigation:
- Repeat key cycles through choices
- Arrows navigate grid as expected
- Mouse moves focus/selection on hover as in menus

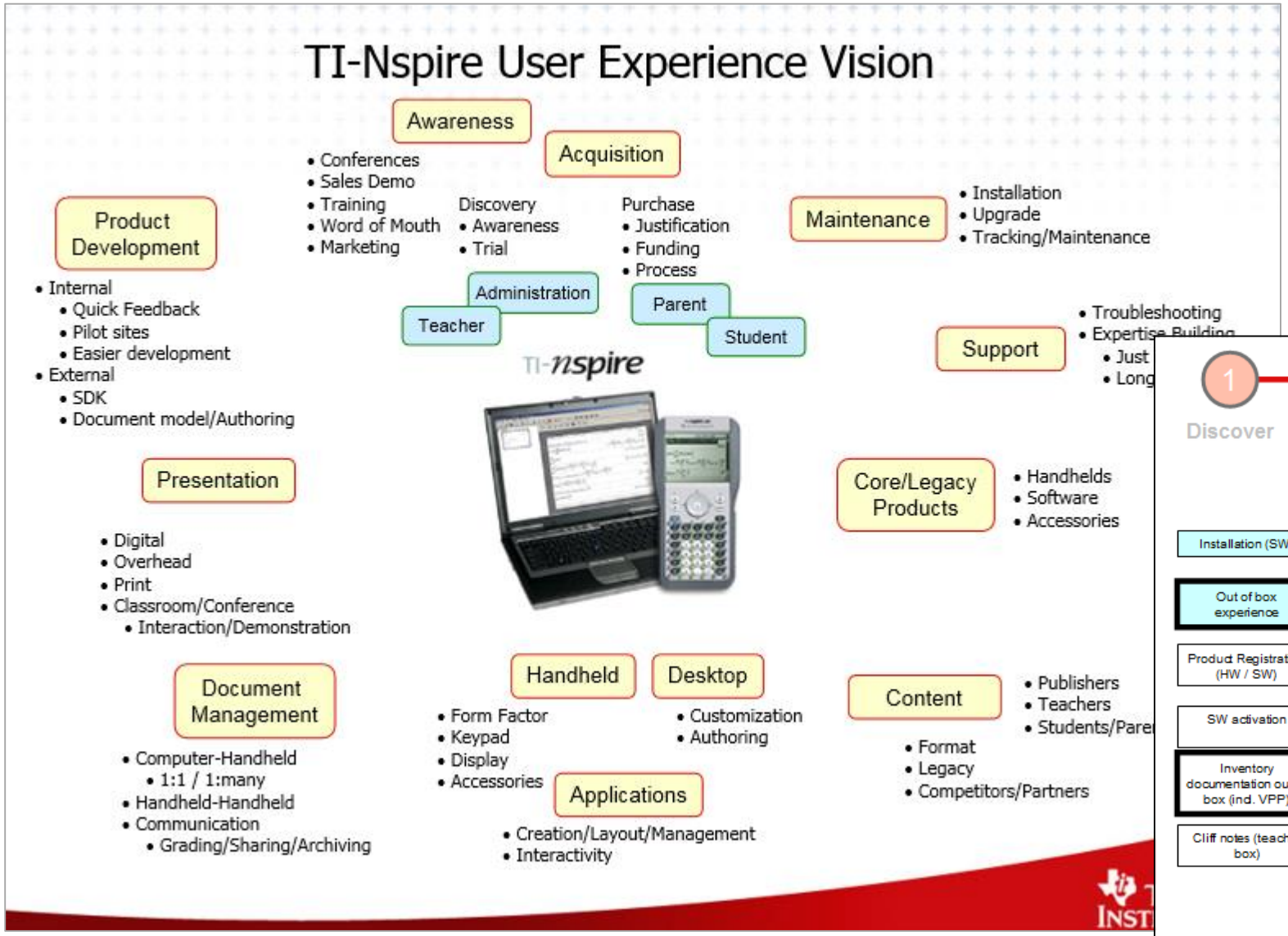
Completing/Confirm Selection:
- ENTER
- Click with mouse
- Type any character

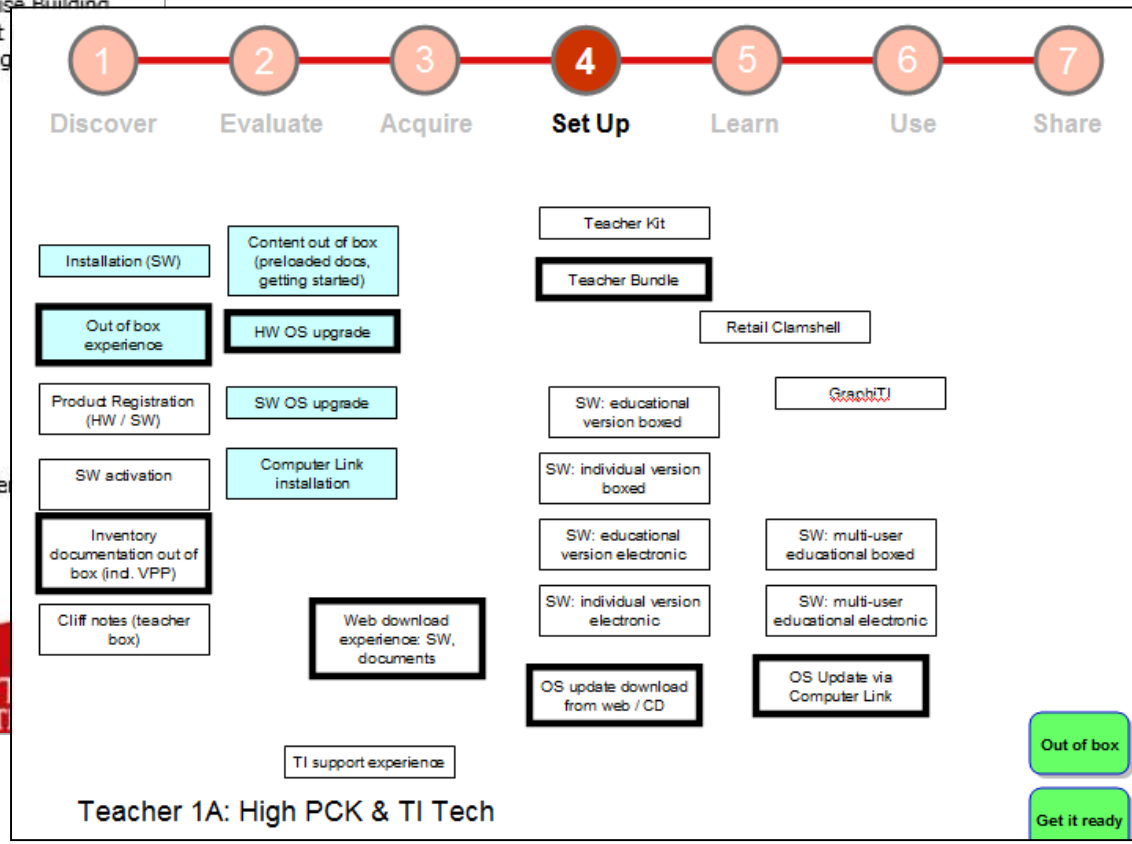
Cancel:
- ESC
- Backspace (first backspace clears popup, second deletes existing character

Implementing the Solution: Experience Mapping

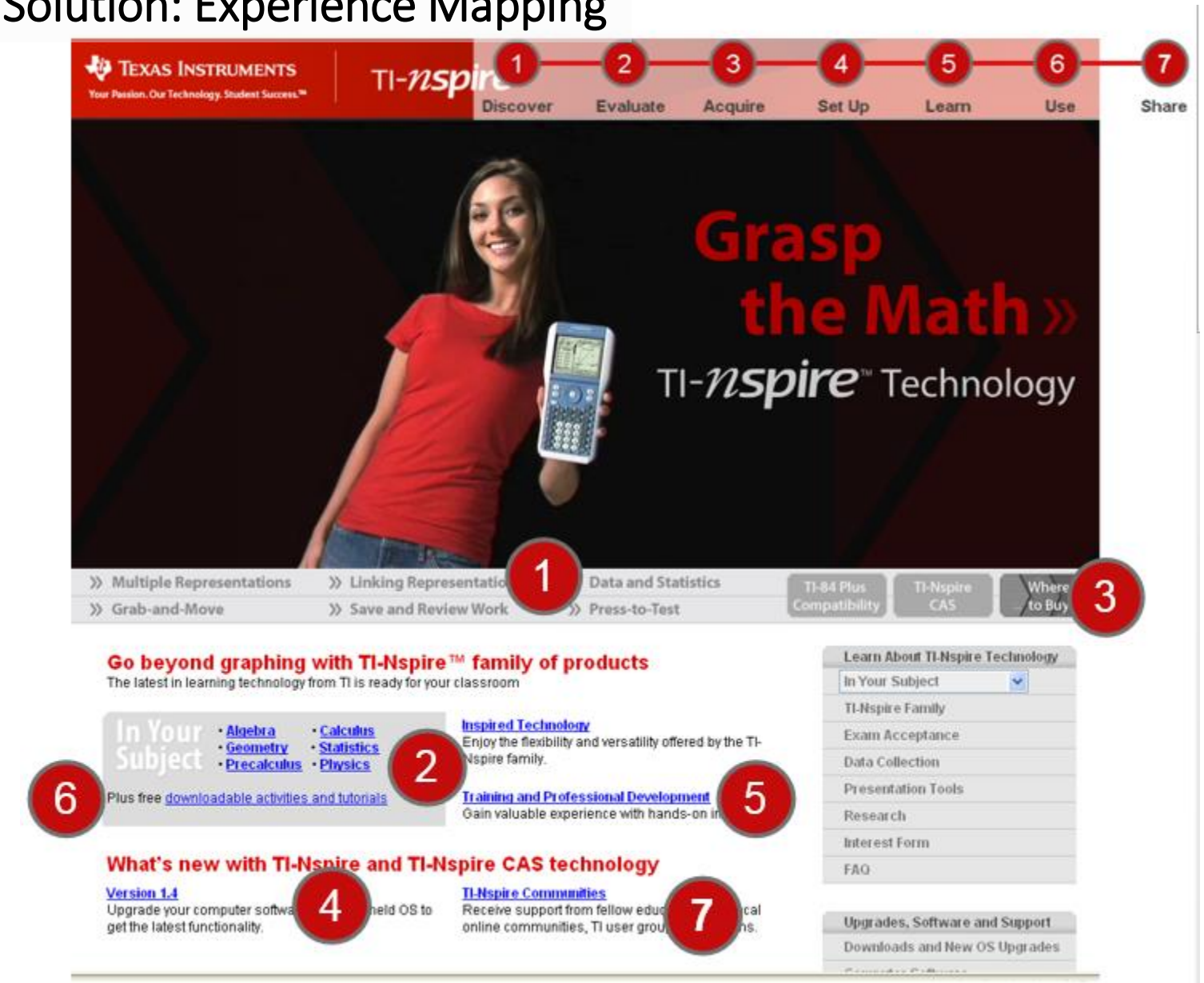


Implementing the Solution: Experience Mapping





Implementing the Solution: Experience Mapping



Discussion and Questions

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