E Analysis

In this Appendix you will find an analysis of the data and comments found in Appendices C (Experimental Data) and D (Transcripts). This analysis begins by examining the amount of time each user spent on individual screens of the tutorial to determine which aspects of the tutorial (and of the interface) were the most confusing. The analysis continues by looking at user performance on the exercises. It concludes by examining the qualitative data collected—both the user responses to a questionnaire completed at the end of the study and spontaneous comments collecting during the course of the tutorial and exercises. In each section, I present the analysis of the data, a list of findings, and a summary of those findings. I conclude this Appendix with a hierarchical listing of all the findings.

E.1 Identifying Tutorial Difficulties

In this section, I analyze the amount of time each user spent on each screen of the tutorial. I begin the section by presenting a Keystroke-Level Model (KLM) analysis [7] of the amount of time necessary to complete the required activities (such as clicking on this button or double-clicking on another) of each screen. After deducting this time estimate from the amount of time each user spent on the screen, I calculate the user's reading rate on that screen. I then average each user's reading rate over all screens of the tutorial to estimate that user's overall reading rate. Using this reading rate, I identify screens that were either easier or harder for a user to comprehend. I conclude this section with a list of Tutorial Results and a table summarize which users contributed to each result.

E.1.1 Keystroke-Level Model

Each screen of the tutorial required the user to read some text and perform some actions. At a minimum, the user was required to click on an OK button to continue the tutorial. For each screen, we present a KLM model of the required actions. The model includes only those actions that *every* user was expected to take. The same model is applied to every user; thus, one source of error occurs when the user deviates from the expected actions. These models do not account for reading time.

Mental operators were added to the models according to the rules of Card, Moran, and Newell [7]. Those mental operators appearing in light gray were eliminated according to Rule #1 of their algorithm. I make one additional assumption regarding the use of the **M** operator. That is, an **M** operator does not precede any action the user performs in response to explicit tutorial instructions unless:

1. The instructions leave a decision to the user.
2. The user must search a list of two or more elements to find the specified item in the instructions.
3. Users in the study had difficulty finding the specified item according to the directions given in the tutorial. (Note that further use of the specified item, or similar ones on other screens, do not require additional **M** operators.)

The intuition for this assumption is that the mental preparation for any action taken based upon explicit instruction is overlapped with the reading of that instruction. The exceptions listed above represent situations in which the user's mental preparation during the reading of the instruction is insufficient for performing the action. Any **M** operators appearing in dark gray were eliminated by this assumption.

As part of the models, I include **W** operators. Such an operator is added whenever users might have been required to wait because of the design of the instructions. Because it is impossible to tell how much of that delay overlapped with reading, I ignore all wait times (as indicated by their dark gray color). At worst, the analysis will produce false-positives: screens identified as difficult that are not. The models specify these wait times only to ease *later* identification of these false positives.

Screen ID	Screen Name	Required Actions	KLM Operators
11	Introduction10	Indeterminate wait (ignored)	W
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
13	UrgencyColors1	Point to "Control Panel" indicator light	M**P**[indicator]
		Double-click left button	M**BBBB**[left]
		System Response Time	**R**
		Point to "Urgency Colors" tab	M**P**[command]
		Click left button	M**BB**[left]
		System Response Time	**R**
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]

14	Urgency Colors2	Indeterminate number of color choices:	(Assume 1)
		Point to down arrow button	**MP**[command]
		Click left button	M**BB**[left]
		Point to new color name	**MP**[command]
		Click left button on new color name	M**BB**[left]
		Point to commit button	**MP**[command]
		Click left button	M**BB**[left]
		Point to close button	**MP**[command]
		Click left button	M**BB**[left]
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
16	Network2	Indeterminate wait (minimal – ignored)	W[1.5sec]
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
19	Task2	Point to scrollbar	**MP**[command]
		Click left button	M**BB**[left]
		Click left button	**MBB**[left]
		Point to "writing thesis" entry	**MP**[command]
		Double-click left button	M**BBBB**[left]
		System Response Time	**R**
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
20	Task3	Search for three sections	**M**
		Search for two subsections	**M**
		Look at User Data's left and right lists	**M**
		Look at "writing thesis" definition	**M**
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
21	Task4	Search for choices	**M**
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
22	Task5 (See Open Window)	Search for choices	**M**
23	Task6	Point to scrollbar	**MP**[command]
		Click left button	M**BB**[left]
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
24	Task7	Point to scrollbar	**MP**[command]
		Click left button	M**BB**[left]

		Point to scrollbar	**MP**[command]
		Click left button	M**BB**[left]
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
25	Task8	Point to down arrow button	**MP**[command]
		Click left button	M**BB**[left]
		Point to “New…”	**MP**[command]
		Click left button	M**BB**[left]
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
26	Task9	Home to keyboard	**H**[keyboard]
		Type new name (15 characters)	**M**15**K**[name]
		Type <Return>	**MK**[<Return>]
		Home to mouse	**H**[mouse]
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
27	Task10	Home to keyboard	**H**[keyboard]
		Indeterminate number of paths entered:	(Assume 2)
		Type path (~15 characters)	**M**15**K**[path]
		Type <Tab>	**MK**[<Tab>]
		Press <Tab> twice	**M**2**K**[<Tab>]
		Type <Return>	M1**K**[<Return>]
		Home to mouse	**H**[mouse]
		Point to SAVE button	**MP**[command]
		Click left button	M**BB**[left]
		Point to OK button	**MP**[command]
		Click left button	M**BB**[left]
29	Task12 (See Open Window)	Find “screen capture”	**M**
32	Task15	Point to down arrow button	**MP**[command]
		Click left button	M**BB**[left]
		Point to “New…”	**MP**[command]
		Click left button	M**BB**[left]
		Home to keyboard	**H**[keyboard]
		Type name and hit <Return> (13 chars)	M13**K**[name]
		Type path1 and hit <Return> (22 chars)	M22**K**[path]
		Type path2 and hit <Return> (18 chars)	M18**K**[path]
		Home to mouse	**H**[mouse]
		Point to save button	**MP**[command]
		Click left button	M**BB**[left]
		Point to close button	**MP**[command]

		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
33	Task16	Point to down arrow button	MP[command]
		Click left button	MBB[left]
		Point to “writing”	MP[command]
		Click left button	MBB[left]
		Home to keyboard	H[keyboard]
		Type “ with latex” (11 chars)	M11K[name]
		Home to mouse	H[mouse]
		Point to save button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
34	Task17	Point to name entry area	MP[command]
		Click left button	MBB[left]
		Home to keyboard	H[keyboard]
		Delete “latex” (5 chars)	M5K[delete]
		Type “scribe” and <Return> (7 chars)	M7K[name]
		Home to mouse	H[mouse]
		Point to “latex” program	MP[command]
		Click left button	MBB[left]
		Home to keyboard	H[keyboard]
		Hit <Delete> key	MK[delete]
		Home to mouse	H[mouse]
		Point to “xdvi” program	MP[command]
		Click left button	MBB[left]
		Home to keyboard	H[keyboard]
		Hit <Delete> key	MK[delete]
		Home to mouse	H[mouse]
		Point to “scribe tools” program	MP[command]
		Click left button	MBB[left]
		Point to save button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
36	Task19	Select three tasks for hoarding:	Requires 3 each of:
		Point to task name	MP[command]
		Click left button	MBB[left]
		Point to hoarded tasks list	MP[command]
		Click right button	MBB[right]
		Point to OK button	MP[command]
		Click left button	MBB[left]

40	Advice2	Indeterminate wait (ignored)	W[10sec]
		Point to weak miss entry	MP[command]
		Double-click left button	MBBBB[left]
		System Response Time	R
		Point to DON'T FETCH button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
42	Advice4	15 second wait (reading may overlap)	W[13sec]+W[15sec]
		Point to YES, PLEASE WAIT…	MP[command]
		Click left button	MBB[left]
		Point to chosen button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
44	HoardWalk1	Point to "Hoard Walk" indicator light	MP[indicator]
		Double-click left button	MBBBB[left]
		System Response Time	R
		Point to WALK NOW button	MP[command]
		Click left button	MBB[left]
		Indeterminate wait	W
		Point to close button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
45	HoardWalk2 (See Open Window)	Wait for hoard walk advice request	W[4sec]
48	HoardWalk5	Indeterminate number, N, of node expansion/contraction pairs:	(Assume 4)
		Point to node	MP[command]
		Double-click left button	MBBBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
49	HoardWalk6	Point to FETCH? Button	MP[command]
		Click left button	MBB[left]
		Point to FINISH HOARD WALK button	MP[command]
		Click left button	MBB[left]
		Point to close button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]

50	Space1	Event delay	W[3sec]
		Point to “Space” indicator light	MP[indicator]
		Double-click left button	MBBBB[left]
		System Response Time	R
		Point to HELP button	MP[command]
		Click left button	MBB[left]
		Point to help window’s OK button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
52	Space3	Event delay	W[3sec]
		Point to help button	MP[command]
		Click left button	MBB[left]
		Point to help window’s ok button	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]
53	Space4 (See Close Window)	Event delay	W[1.5sec]
59	EventConfiguration3	Point to indicator listbox	MP[command]
		Click left button	MBB[left]
		Point to “Advice”	MP[command]
		Click left button	MBB[left]
		Point to event listbox	MP[command]
		Click left button	MBB[left]
		Point to “Read Disconnected Cache Miss”	MP[command]
		Click left button	MBB[left]
		Point to indicator listbox	MP[command]
		Click left button	MBB[left]
		Point to “Network”	MP[command]
		Click left button	MBB[left]
		Point to event listbox	MP[command]
		Click left button	MBB[left]
		Point to “Operating Disconnected”	MP[command]
		Click left button	MBB[left]
		Point to OK button	MP[command]
		Click left button	MBB[left]

15	Open Window	Point to choice	**MP**[choice]
18		Double-click left button	**MBBBB**[left]
22		System Response Time	**R**
29		Point to OK button	**MP**[command]
39		Click left button	**MBB**[left]
45			
47			
54			
57			
17	Close Window	Point to close button	**MP**[command]
28		Click left button	**MBB**[left]
35		Point to OK button	**MP**[command]
38		Click left button	**MBB**[left]
41			
53			
56			
61			
1-10	Continue Tutorial	Point to OK button	**MP**[command]
12		Click left button	**MBB**[left]
30-1			
37			
43			
46			
51			
55			
58			
60			
62			

Figure E.1: GOMS Analysis of Tutorial Screens

This table contains a GOMS analysis of each screen of the tutorial that requires the user to perform one or more actions. Any screens not explicitly listed in the table are assumed to require the user to click on the OK button, as analyzed in the final entry of the table. The GOMS operators shown in the right-most column of this table, with the exception of the **W** operator, are defined by Card, Moran, and Newell [7]. The **W** operator represents the maximum amount of time the user could have to wait for an event to occur. Because these wait times largely overlap with reading time, they are ignored for the remaining analysis.

	Word	GOMS Operators						
Screen ID	Count	**W**	**K**	**B**	**P**	**H**	**M**	**R**
Initial	??	0	0	0	0	0	0	0
Introduction1	86	0	0	2	1	0	1	0
Introduction2	65	0	0	2	1	0	1	0
Introduction3	68	0	0	2	1	0	1	0
Introduction4	206	0	0	2	1	0	1	0
Introduction5	226	0	0	2	1	0	1	0
Introduction6	162	0	0	2	1	0	1	0
Introduction7	257	0	0	2	1	0	1	0
Introduction8	50	0	0	2	1	0	1	0
Introduction9	219	0	0	2	1	0	1	0
Introduction10	242	0	0	2	1	0	1	0
Introduction11	109	0	0	2	1	0	1	0
UrgencyColors1	81	0	0	8	3	0	1	2
UrgencyColors2	341	0	0	10	5	0	4	0
Network1	150	0	0	6	2	0	1	1
Network2	31	0	0	2	1	0	1	0
Network3	27	0	0	4	2	0	1	0
Task1	177	0	0	6	2	0	1	1
Task2	157	0	0	10	3	0	4	1
Task3	188	0	0	2	1	0	5	0
Task4	31	0	0	2	1	0	2	0
Task5	35	0	0	6	2	0	2	1
Task6	110	0	0	4	2	0	2	0
Task7	303	0	0	6	3	0	3	0
Task8	54	0	0	6	3	0	3	0
Task9	57	0	16	2	1	2	3	0
Task10	165	0	38	4	2	2	7	0
Task11	19	0	0	4	2	0	1	0
Task12	85	0	0	6	2	0	2	1
Task13	135	0	0	2	1	0	1	0
Task14	49	0	0	2	1	0	1	0
Task15	138	0	53	10	5	2	2	0
Task16	116	0	11	8	4	2	2	0
Task17	154	0	14	12	6	6	3	0
Task18	62	0	0	4	2	0	1	0
Task19	147	0	0	14	7	0	7	0
Task20	226	0	0	2	1	0	1	0
Task21	38	0	0	4	2	0	1	0
Advice1	199	0	0	6	2	0	1	1
Advice2	115	0	0	8	3	0	1	1
Advice3	255	0	0	4	2	0	1	0
Advice4	105	0	0	6	3	0	2	0
Advice5	95	0	0	2	1	0	1	0
HoardWalk1	157	0	0	10	4	0	1	1
HoardWalk2	141	0	0	6	2	0	1	1
HoardWalk3	261	0	0	2	1	0	1	0
HoardWalk4	150	0	0	6	2	0	1	1
HoardWalk5	166	0	0	18	5	0	5	0
HoardWalk6	70	0	0	8	4	0	1	0
Space1	161	0	0	10	4	0	2	1
Space2	30	0	0	2	1	0	1	0
Space3	75	0	0	6	3	0	2	0
Space4	17	0	0	4	2	0	1	0
Tokens1	54	0	0	6	2	0	1	1
Tokens2	34	0	0	2	1	0	1	0
Tokens3	17	0	0	4	2	0	1	0
EventConfig1	133	0	0	6	2	0	1	1
EventConfig2	255	0	0	2	1	0	1	0
EventConfig3	67	0	0	18	9	0	5	0
EventConfig4	29	0	0	2	1	0	1	0
EventConfig5	35	0	0	4	2	0	1	0
TokenExpiry	111	0	0	2	1	0	1	0

Figure E.2: Count of GOMS Operators per Tutorial Screen

For each screen in the Tutorial, this table shows the number of words the users had to read (including words shown in Help screens users were directed to read) as well as the number of actions users were required to take to complete the screen of instructions. The actions come in seven forms. User could be required to wait (**W**), though all wait times are ignored; they could be required to type some characters (**K**); they could be required to click the mouse (**B**); they could be required to point with the mouse (**P**); they could be required to move their hands from the mouse area to the keyboard area (**H**); they could be required to make a decision to perform some action (**M**); or they could be required to wait for the system to display a window of the interface (**R**). For a detailed listing of the actions required for each screen, please refer to Section E.1.1.

Operator	Estimated Time Required
K	0.20
B[button]	0.10
P[location]	1.10
H[location]	0.40
M	1.20
R	0.10

Figure E.3: Operators of the Keystroke-Level Model
The **K**, **B**, **P**, **H**, and **M** operators estimate the amount of time necessary to type a single key (both the up-stroke and the down-stroke), click a single mouse button (either the up-stroke or the down-stroke), point to a location on the screen with the mouse, move the hands to either the mouse or the keyboard, and mentally prepare for some action respectively [7,21]. The **R** operator represents system response time and is assumed to be 0.1 seconds for all instances appearing in the models. (Actual display times for individual windows appear in Figure C.15)

E.1.2 Screen Difficulty Analysis

Using the GOMS models presented in Section E.1.1 above, I calculate the amount of time each user spent comprehending each screen of the Tutorial. Given the total amount of time the user spent on a given screen, I subtract the time necessary to perform all required actions. This later time is calculated by the following equation:

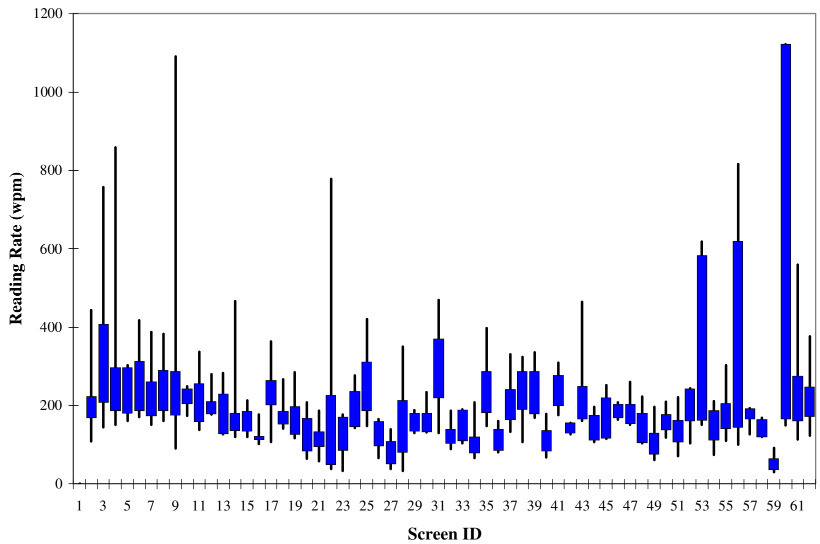
$$ActionTime = N_K T_K + N_B T_B + N_P T_P + N_H T_H + N_M T_M + N_R T_R$$

$$\text{where} \quad N_X = \text{the number of X operators, and}$$

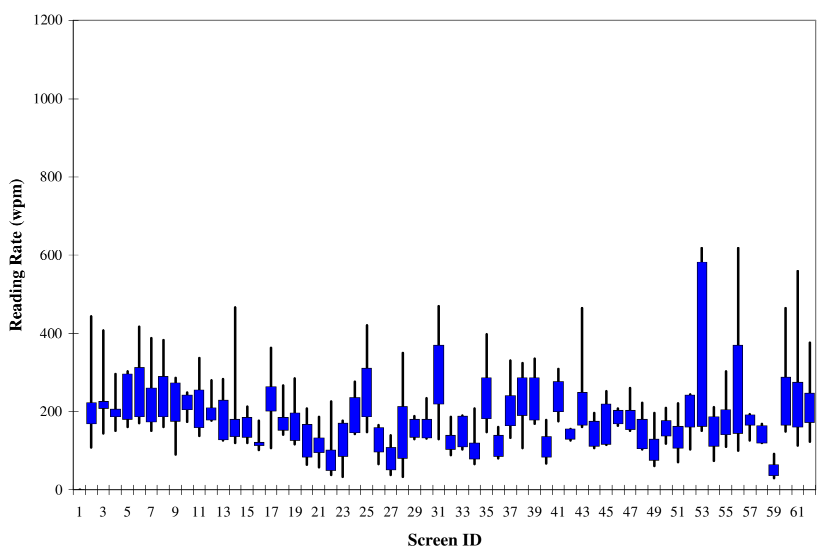
$$T_X = \text{the time required for an X operator.}$$

The values for N_X for each screen appear in Figure E.2. The values of the T_X appear in Figure E.3

After calculating the total amount of time a user spent understanding a given screen of the tutorial, I can use the total word count of that screen to calculate the user's screen reading rate. Figure E.4(a) shows the range of reading rates on each screen of the tutorial. The line identifies the high and low reading rates; the bar represents the range excluding the highest and lowest values. Participants whose reading rates were much above 600 wpm could not have read the entire tutorial; they had to have been skimming [7]. For this reason, I eliminated any reading rates above 652 wpm (a total of seven screens from four users) and recalculated each user's average and standard deviation. The resulting graph is shown in Figure E.4(b).



(a) Original Reading Rates

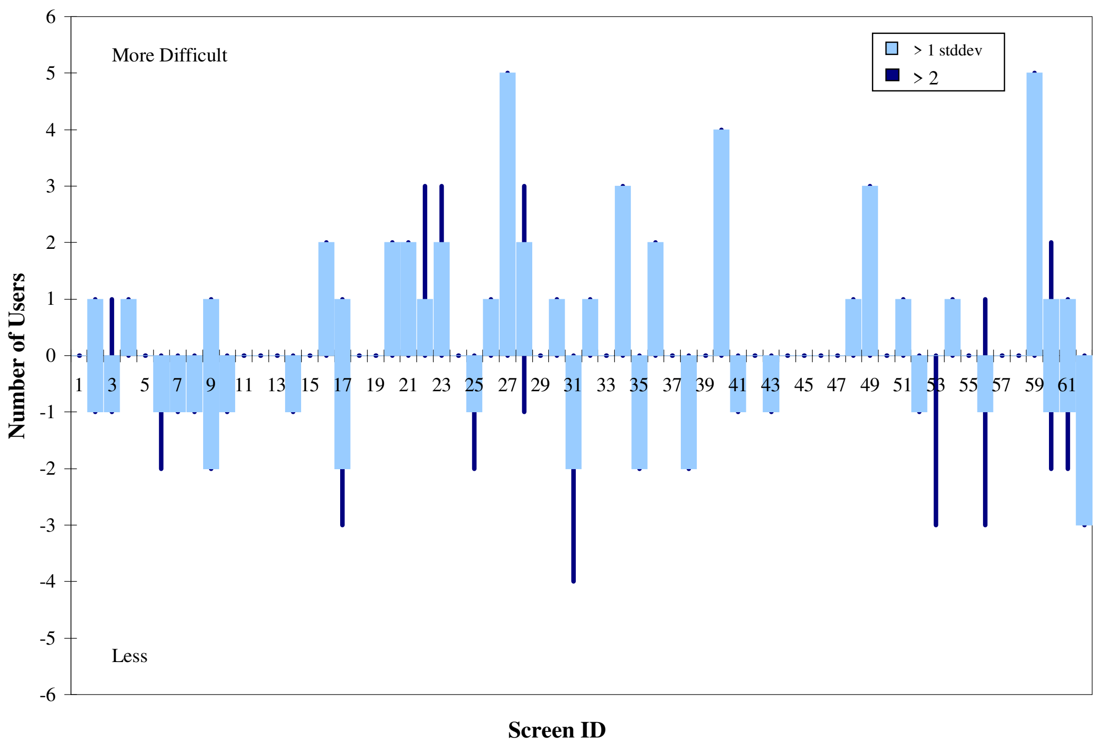


(b) Reading Rates (sans skimming)

Figure E.4: Range of Reading Rates

These graphs show the range of reading rates observed from the six novice and expert users. View (a) shows the original reading rates; view(b) shows the reading rates after elimination of those rates above the expected skimming rate. Each screen of the Tutorial is shown along the x-axis (Screen ID numbers correspond to those of Appendix B). The line shown for each screen represents the range. The bar represents the range after excluding the minimum and maximum reading rates.

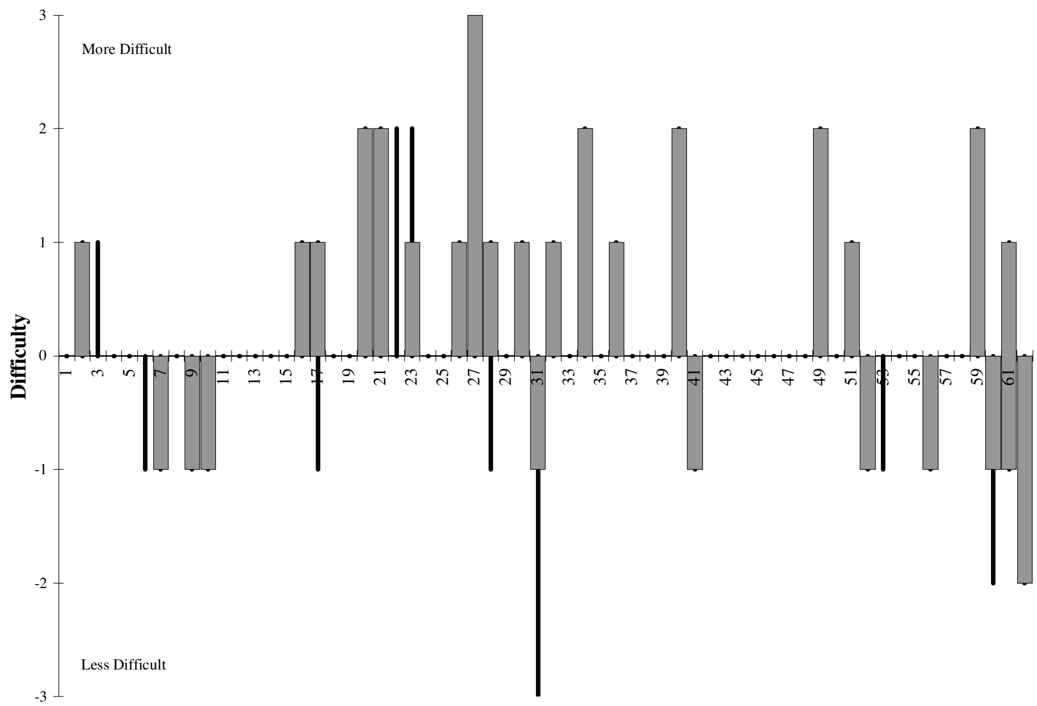
By averaging a user's screen reading rates over all screens of the tutorial, I estimate the user's overall reading rate and standard deviation. Using these values, I can identify as difficult those screens that slowed the user down well below their average reading rate. Figure E.5 shows three figures. The first one identifies screen difficulty as measured across all users. The second two identifies screen difficulty as measured across only the novice users and only the expert users.



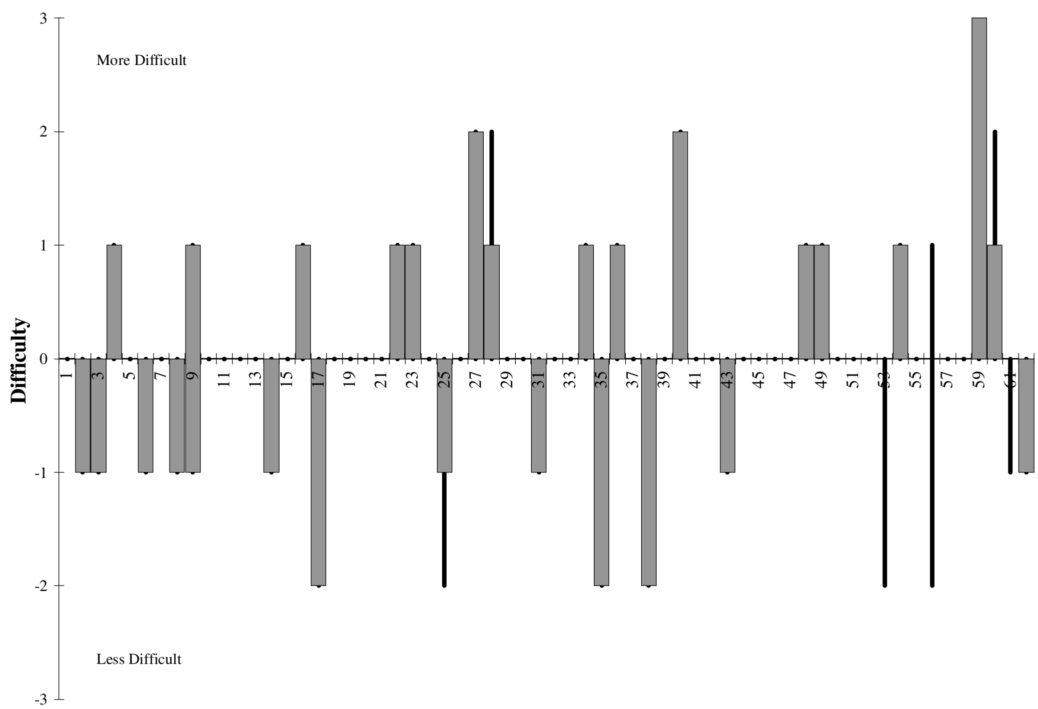
(a) All

Figure E.5: Screen Difficulty Analysis

These three graphs show the results of the screen difficulty analysis. Along the x-axis we see each screen of the Tutorial, as identified in Appendix B . Along the y-axis we see the number of users finding each screen more or less difficult. Each bar represents the total number of users whose reading rate fell outside of one standard deviation of their average reading rate. Each line represents the total number of users whose reading rate fell outside two standard deviations. View (a) presents the results of including both the novice and expert users. View (b) examines just the novice users. View (c) examines just the expert users.



(b) Novice Users Only



(c) Expert Users Only

E.1.3 List of Tutorial Results

Tutorial Result #1: (Screen 16) Two users had difficulty with the "Operating Disconnected" event.

Tutorial Result #2: (Screen 20) Two novice users experienced difficulty orienting to the "Task Definition" window.

Tutorial Result #3: (Screen 21) Two novice users had difficulty understanding explanation of the different ways to view task definitions.

Tutorial Result #4: (Screen 22) Three users had difficulty finding the "writing thesis" task in the "Task Definition" window (under either the "predefined list" or the "contains" list).

Tutorial Result #5: (Screen 23) Three users experienced difficulty orienting to the "Data Definition" window.

Tutorial Result #6: (Screen 27) Five users had difficulty entering data into the "Data Definition" window.

Tutorial Result #7: (Screen 28) Three users had difficulty closing "Data Definition" window.

Tutorial Result #8: (Screen 34) Three users had difficulty modifying a task definition.

Tutorial Result #9: (Screen 36) Two users had difficulty prioritizing tasks or understanding the "Task Unavailable" event notification.

Tutorial Result #10: (Screen 40) Four users experienced difficulty orienting to the "Advice Information" window.

Tutorial Result #11: (Screen 49) Three users experienced difficulty completing hoard walk advice request.

Tutorial Result #12: (Screen 59) Five users had difficulty examining event configurations.

Tutorial Result #13: (Screen 60) Two expert users had difficulty confirming their answer regarding event configuration.

E.1.4 Summary of Tutorial Results

Tutorial	Novice Users			Expert Users		
Screen ID	N1	N2	N4	E1	E2	E3
16: Network2			✓			✓
20: Task3	✓	✓				
21: Task4		✓	✓			
22: Task5	✓		✓		✓	
23: Task6	✓	✓				✓
27: Task10	✓	✓	✓	✓	✓	
28: Task11		✓		✓	✓	
34: Task17	✓	✓		✓		
36: Task19		✓		✓		
40: Advice2		✓	✓	✓	✓	
49: HoardWalk6	✓	✓		✓		
59: EventConfiguration3		✓	✓	✓	✓	✓
60: EventConfiguration4				✓		✓

Figure E.6: Difficult Tutorial Screens by User

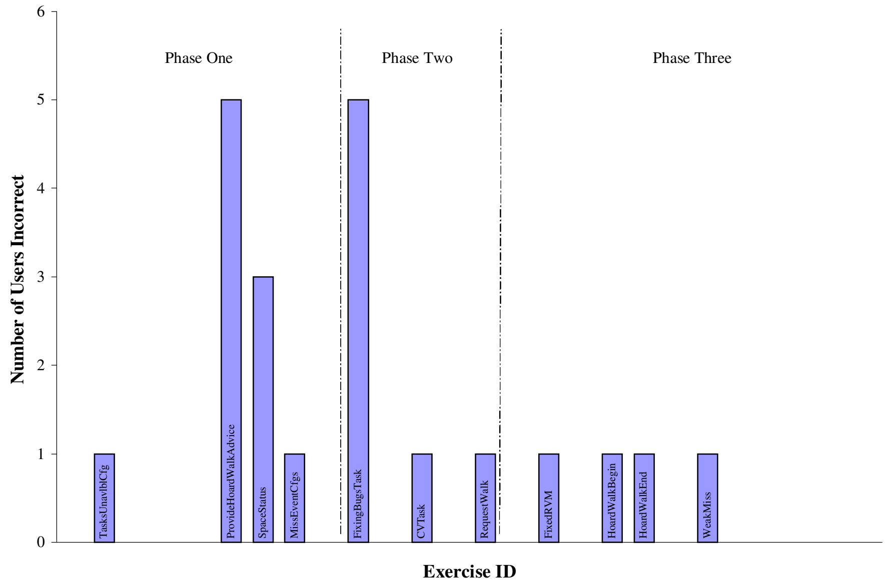
This table shows which user's reading performance suggests that an individual screen of the Tutorial was difficult. A checkmark indicates the user read the screen at a rate at least one standard deviation below their average reading rate.

E.2 Identifying Exercise Difficulties

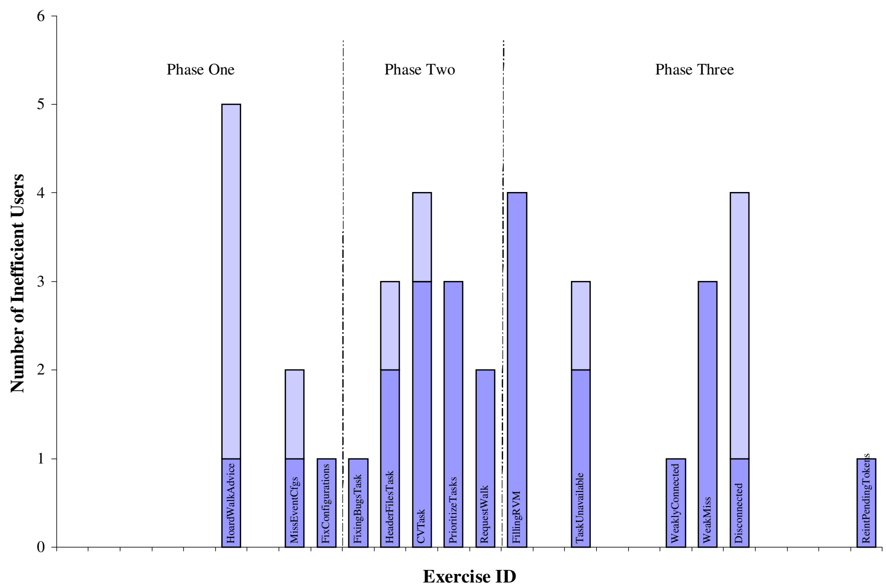
In this section, I analyze the user's responses to each of the exercise. My goal is to identify those exercises which users found difficult. I use two metrics in this analysis. Exercises are identified as difficult if more than one user responded incorrectly or if more than one user responded inefficiently. In this section, I begin by presenting the two metrics as well as a graphical representation of the data. I then list each of the findings. I conclude the section with a table summarizing which users provided the evidence for each finding.

E.2.1 Metrics

In this section, I describe the two metrics used in identifying difficult exercises. The first metric looks at the accuracy of each user's response. Accuracy is measured by comparing the user's response to a key. For each correct item, the user scores a point. These scores appear in Figure C.13. The second looks at the efficiency of each user's response. Efficiency is measured by counting the number of actions a user took to respond to an exercise and comparing that value to the number required for an expert user (expert Coda user *and* expert interface user) with foreknowledge of the question. These scores appear in Figure C.14. In Figures E.7(a) and E.7(b), you will find bar charts showing the number of users who responded incorrectly and the number responding inefficiently to each exercise.



(a) Number of Users Answering Incorrectly



(b) Number of Users Answer Inefficiently

Figure E.7: Exercise Analysis

These two figures show the results of the exercise difficulty analysis. In each figure, the X-axis shows Exercise ID and the Y-axis shows the number of users. View (a) shows the number of users who answered a given exercise incorrectly. The lack of a bar signifies that no users answered that exercise incorrectly. View (b) shows the number of users who answered a given exercise inefficiently. The dark gray segment shows the number of users exceeding 2*PAR on a given exercise while the light gray segments shows the number exceeding 3*PAR. The lack of a bar signifies that no users answered that exercise inefficiently.

E.2.2 List of Exercise Results

Exercise Result #1: Five users provided incorrect hoard walk advice.

Exercise Result #2: Three users could not accurately describe the current space status.

Exercise Result #3: Five users failed to completely define the "fixing bugs" task.

Exercise Result #4: Five users provided hoard walk advice inefficiently.

Exercise Result #5: Two users found the events to be configured inefficiently.

Exercise Result #6: Three users defined "Header Files" task inefficiently.

Exercise Result #7: Four users defined "CV" task inefficiently.

Exercise Result #8: Three users prioritized tasks inefficiently.

Exercise Result #9: Two users requested hoard walk inefficiently.

Exercise Result #10: Four users described "RVM Filling" event inefficiently.

Exercise Result #11: Three users described "Task Unavailable" event inefficiently.

Exercise Result #12: Three users provided "Weak Miss" advice inefficiently.

Exercise Result #13: Four users described "Operating Disconnected" event inefficiently.

Exercise Result #14: Two users reorganized task to hoard subtask at a different priority.

E.2.3 Summary of Exercise Results

	Novice Users			Expert Users		
ID	**N1**	**N2**	**N4**	**E1**	**E2**	**E3**
1		✓	✓	✓	✓	✓
2	✓			✓	✓	
3	✓	✓	✓		✓	✓
4	✓	✓	✓		✓	✓
5	✓					✓
6				✓	✓	✓
7	✓	✓	✓	✓		
8		✓	✓			✓
9			✓			✓
10		✓	✓		✓	✓
11	✓	✓		✓		
12	✓	✓		✓		
13	✓	✓	✓			✓
14		✓	✓			

Figure E.8: Exercise Findings by User

This table shows which users had difficulty with particular aspects of the exercises, including the accuracy and efficiency of their response.

E.3 Identifying Qualitative Opinions

In this section, I summarize the comments users made on the Evaluation Questionnaire. The raw data are presented in Appendix C.3. I begin by presenting a list of general comments made on the Evaluation Questionnaire. I then summarize that list to indicate which users made each of the comments.

E.3.1 List of Qualitative Results

Qualitative Result #1: Users did not appreciate question about reintegration after it had not been covered in the Tutorial.

Qualitative Result #2: Expert users had difficulty understanding distinction between <Tab> and <Enter>.

Qualitative Result #3: Expert users thought the Tutorial went into too much detail.

Qualitative Result #4: Expert user was confused by the distinction between the Hoard Walk indicator and the Task indicator.

Qualitative Result #5: Users had difficulty finding events in the Event Configuration tab of the Control Panel.

Qualitative Result #6: Novice user thought the "first level interface" provided too little detail to determine what was going on.

Qualitative Result #7: Expert user confused by the "no such file" indication.

Qualitative Result #8: Expert user finds he must explicitly think about how to structure his task definitions.

Qualitative Result #9: Expert user finds editing file/directory lists (in "Data Definition" windows) tricky

Qualitative Result #10: Expert user unsure whether or not a program was available.

Qualitative Result #11: Novice user dislikes having to enter pathnames.

Qualitative Result #12: Novice user accidentally deletes entire task rather than single element.

Qualitative Result #13: Novice user dislikes having fetch time expressed in seconds.

Qualitative Result #14: Expert user confused by behavior of "Save" buttons, in particular whether all tasks are saved at once.

Qualitative Result #15: Expert user confused by creating a new task vs. changing the name of an old one.

Qualitative Result #16: Expert user afraid of missing an event notification.

Qualitative Result #17: Expert user finds graphical user interfaces tedious.

Qualitative Result #18: Expert user would like to have the ability to stop long transfers over weak network connections.

Qualitative Result #19: Users like being able to see the status of the network and of hoard walks.

Qualitative Result #20: Users like being able to configure the event notifications.

Qualitative Result #21: Users like the "easy to define" tasks.

Qualitative Result #22: User likes that the system keeps track of the importance of missing objects.

Qualitative Result #23: Expert user likes that the system automatically tracks of file accesses for programs.

E.3.2 Summary of Qualitative Results

	Novice Users			Expert Users		
ID	**N1**	**N2**	**N4**	**E1**	**E2**	**E3**
1	✓			✓	✓	✓
2				✓	✓	
3				✓	✓	
4				✓		
5	✓					✓
6	✓					
7						✓
8				✓		
9					✓	
10					✓	
11	✓					
12		✓				
13			✓			
14					✓	
15					✓	
16					✓	
17						✓
18					✓	
19		✓			✓	✓
20			✓	✓		
21	✓	✓	✓		✓	
22		✓				
23					✓	

Figure E.9: Qualitative Findings by User

This table shows which users made each of the qualitative comments listed above.

E.4 Identifying Spontaneous Opinions

In this section, you will find a listing of the comments made by users during the course of the usability study. Each comment is given a unique number. The listing presents the comments in numerical order for easy reference. Following the listing, I present a table summarizing which users made each comment at what point(s) during the study.

E.4.1 List of Spontaneous Comments

Comment #1: Participants frustrated by window placement.

Comment #2: (See Comments #80 and #209-234).

Comment #3: Participants have difficulty entering data in Data Definition window.

Comment #4: Windows do not resize.

Comment #5: Participants confused that changing name and saving creates a new defn.

Comment #6: Participant expects a button to delete an element from the “contains” list.

Comment #7: Interface alphabetizes caps and uncaps.

Comment #8: Meters shown at 1% have no visible color.

Comment #9: User confused by two-color blinking.

Comment #10: User confused that two indicators open the same advice request.

Comment #11: Users confused by different windows appearing from one indicator light.

Comment #12: User expects <Enter> to make the help window disappear.

Comment #13: Users confused when help window grabs and maintains focus.

Comment #14: (See Comments #249-252.)

Comment #15: System should predict if hoarding a task will cause space problem.

Comment #16: (See Comments #268-272.)

Comment #17: User guesses location of event in indicator list.

Comment #18: Users have difficulty finding definitions in predefined lists.

Comment #19: User loses data after selecting task from listbox.

Comment #20: User wants to click on disabled meta-information.

Comment #21: User concerned that entire pathname is not visible.

Comment #22: System double-selects under certain circumstances.

Comment #23: User finds it strange that a single-click selects an item for “contains” list.

Comment #24: User experiences window overload.

Comment #25: User wants feedback regarding “health” of Venus.

Comment #26: User has difficulty finding task in Task Information window.

Comment #27: (See Comment #261.)

Comment #28: User confused about what object needs to be fetched.

Comment #29: User confused by file becoming unavailable.

Comment #30: Password visible on Authentication Information window.

Comment #31: User expresses confusion between Hoard Walk and Task indicators.

Comment #32: User expects “commit” to close Control Panel window (as feedback).

Comment #33: User confused because indicator stops blinking.

Comment #34: User has difficulty finding “black down-arrow button”.

Comment #35: Users think they should literally make up pathnames.

Comment #36: User confused by lack of feedback when directory does not exist.

Comment #37: User bothered by addition of empty entry widget.

Comment #38: User confused about how system notifies if “everything” is turned off.

Comment #39: User confused about extent of “commit” button’s action.

Comment #40: (See Comment #41.)

Comment #41: User concerned that he might miss an indicator state change.

Comment #42: User has difficulty prioritizing tasks.

Comment #43: Newly hoarded task may not be visible in list of hoarded tasks.

Comment #44: User dislikes font choice.

Comment #45: User expects “help” on the indicator lights window.

Comment #46: User surprised that a double-click is required to open indicator window.

Comment #47: Screen of tutorial partially covers a window of the interface.

Comment #48: (See Comment #1.)

Comment #49: (See Comments #253-262.)

Comment #50: Meters do not cover multiple orders of magnitude well.

Comment #51: Meters do not convey relative information.

Comment #52: Nothing is hoarded, yet 70% of cache is full.

Comment #53: User finds the scrollbars ugly.

Comment #54: User annoyed that a list with six elements must be scrolled.

Comment #55: User doesn’t recognize slider lines as widgets controlling screen layout.

Comment #56: User dissatisfied with Data Definition window.

Comment #57: User wants Data Definition window to indicate the size of subtree.

Comment #58: User dislikes default meta-information for directories.

Comment #59: User expected "save" button to also close the window.

Comment #60: User unsure as to why there is a "save as" button.

Comment #61: User doesn't believe system ensures program executables exist.

Comment #62: User has difficulty deselecting a chosen element from "contains" list.

Comment #63: User confused about how to select tasks to be hoarded.

Comment #64: User would like to drag tasks within the list of hoarded tasks.

Comment #65: (See Comments #253-262.)

Comment #66: Requests needing immediate attention require too many steps.

Comment #67: User concern that 15 seconds is wrong default timeout.

Comment #68: User would like a count-down timer on advice requests.

Comment #69: (See Comment #253-262.)

Comment #70: User dislikes checkboxes, would prefer checkmarks.

Comment #71: User dislikes "All Tasks Needing Data" pseudo-task.

Comment #72: User notices an upper-case/lower-case inconsistency.

Comment #73: Peer mistaken for child in tree widget.

Comment #74: Task indicator turns green before hoard walk completes.

Comment #75: Space help button is too small.

Comment #76: User wants expert help for space problems.

Comment #77: Number unreadable on meter.

Comment #78: User dislikes directive to not use "Destroy Tokens" and "New Tokens".

Comment #79: Urgency labels on the Event Configuration Tab are not lined up.

Comment #80: Distinction between different modes of operation unclear.

Comment #81: User surprised he must commit changes to the event configurations.

Comment #82: Priorities need label.

Comment #83: User notices inconsistent task name between exercises and interface.

Comment #84: Color used to highlight in Exercises window bad with pink background.

Comment #85: End of task name is hidden behind meter.

Comment #86: User does not believe the Space meter (cache).

Comment #87: User wants to modify all event notifications at once.

Comment #88: User would prefer more obvious notification of strong connectivity.

Comment #89: Certain characters, used in task names, can crash the interface.

Comment #90: User would like "balloon" help.

Comment #91: User dislikes the Urgency Colors tab of the Control Panel.

Comment #92: User wants "undo".

Comment #93: User curious how the system copes with links.

Comment #94: User would prefer not to type in pathnames.

Comment #95: Space Help window did not update to show new information.

Comment #96: Seconds too fine-grained.

Comment #97: User "saves" definition under the name "New…" and it is lost.

Comment #98: User confused by options in the weak miss timeout prod.

Comment #99: User confused by bogus Fetch Statistics in Hoard Walk Advice window.

Comment #100: User confused by instruction to define header files as a program.

Comment #101: User expects arrow keys to work in the meta-information area.

Comment #102: Users have difficulty unhoarding tasks.

Comment #103: User expects system to track and automatically hoard missing objects.

Comment #104: Submitting a password takes excessively long.

Comment #105: (See Comments #264-266.)

Comment #106: Tutorial assumes green/yellow/red.

Comment #107: User types pathname, hits a key near <Return>, and it disappears.

Comment #108: User looks under indicator light rather than indicator listbox.

Comment #109: (See Comments #253-267.)

Comment #110: User would like a tree view of Tasks.

Comment #111: User has difficulty identifying the indicator lights.

Comment #112: (See Comments #281-292.)

Comment #113: User concerned that he would use "all descendants", "all the time."

Comment #114: User thinks it strange that we have a meter on the Tasks.

Comment #115: User thinks it strange that we have both kinds of advice under Advice.

Comment #116: (See Comments #235-237.)

Comment #117: User believes the Tutorial to be out-of-sequence.

Comment #118: User confused as to what exactly is going to "flash".

Comment #119: User does not recognize Event Configuration window.

Comment #120: Advice indicator goes green too soon.

Comment #121: User disturbed by window popping up.

Comment #122: User double-clicks in empty contains list and "New…" pops up.

Comment #123: User dislikes use of predefined and contains lists.

Comment #124: User failed to read instructions completely.

Comment #125: User expects meta-information for programs.

Comment #126: User unsure which window allows him to prioritize tasks.

Comment #127: User closes window without saving and loses data.

Comment #128: User notices omissions in the mock task definitions.

Comment #129: User wants interface to show what files are located on what servers.

Comment #130: User would like to be able to highlight in tutorial (as a bookmark).

Comment #131: User has difficulty finding scrollbar.

Comment #132: User expects <Back-Tab> to work in meta-information.

Comment #133: User wants cut & paste to work.

Comment #134: User disturbed by instruction to "close <u>all</u> windows" (only <u>one</u> open).

Comment #135: Visible shift when switching between definitions/configurations.

Comment #136: User confused by having to hit <Enter> after typing name of definition.

Comment #137: User types a pathname into the name of the definition.

Comment #138: User has difficulty deleting a definition.

Comment #139: User experienced an unexplained loss of a definition.

Comment #140: User confused by the "unselect" dialog box.

Comment #141: User confused by "Fetch" and "Stop Asking" toggling one another.

Comment #142: User wants the triangle icons rather than the "+" and "-" icons.

Comment #143: User would prefer the indicator lights to be alphabetized.

Comment #144: User prefers klist to Tokens indicator.

Comment #145: User would like to have a set of system defaults.

Comment #146: User would like to drag colors.

Comment #147: User searches for way to configure events.

Comment #148: (See Comments 238-248.)

Comment #149: User has forgotten primary "task".

Comment #150: User wants to be able to say "0" to Disconnected Miss Query.

Comment #151: User upset that Exercises tell him that he's done when he isn't.

Comment #152: (See Comments #219, 274 and 275.)

Comment #153: User would like to be able to see the details of program definitions.

Comment #154: User prefers for close without saving/committing to abort.

Comment #155: User doesn't recognize Hoard Walk Advice as a request for advice.

Comment #156: User confused by Hoard Walk Advice coming in under Hoard Walk.

Comment #157: User thinks it silly to have to create a task for a single directory.

Comment #158: User surprised that system saves definition automatically upon close.

Comment #159: User surprised that indicator lights are dynamic.

Comment #160: User would prefer the Urgency of Event Configurations to be in color.

Comment #161: User would prefer configuration options be checkboxes (not listboxes).

Comment #162: User suggests improved layout for the event configuration tab.

Comment #163: User thinks it strange that Control Panel is an indicator light.

Comment #164: Event configuration window should show an example notification.

Comment #165: (See Comments #254, 257 and 276.)

Comment #166: (See Comments #253-263 and 267.)

Comment #167: User confused by Phase Three of the Exercises.

Comment #168: Incident report button doesn't work while query windows visible.

Comment #169: Interface cognizant of vertical screen real estate, but not horizontal.

Comment #170: User confused about how the indicators will change colors.

Comment #171: User would like to change the background color of indicator lights.

Comment #172: User concerned about default thresholds for weak connectivity.

Comment #173: User expects program definition to contain user's configuration files.

Comment #174: (See Comment #184.)

Comment #175: User would like a "Make New Directory" button in definition window.

Comment #176: User discovered that <Backspace> key doesn't work on telos.

Comment #177: User would like hoarded tasks to appear "<priority>: <NameOfTask>".

Comment #178: User suggests that system start the request as it asks for permission.

Comment #179: Expanding/Compressing node requires three clicks.

Comment #180: Tutorial is redundant.

Comment #181: User confused by extraneous underlining.

Comment #182: (See Comment #138.)

Comment #183: User brings up a task definition to get to a data definition.

Comment #184: User confused by "already exists" dialog from "Save As" button.

Comment #185: User concerned about difficulty of determining what is necessary.

Comment #186: User likes lights to get attention and gauges to show detail.

Comment #187: User wants different sets of settings ("at school" vs. "on the road").

Comment #188: Users confused by behavior of “Save As” button.

Comment #189: Distinction between general instructions and directives unclear.

Comment #190: User wants more control over program definitions.

Comment #191: Inconsistency between name of missing object and primary task.

Comment #192: User thinks there are too many indicator lights.

Comment #193: User suggests only making abnormal indicator lights visible.

Comment #194: User needs to go backwards in Tutorial but cannot.

Comment #195: User assumes a 24 hour clock (in Tokens window).

Comment #196: User expects ^U to work correctly.

Comment #197: User misunderstands description of one of the blizzard activities.

Comment #198: User enters just a single program in each definition.

Comment #199: User hoards based upon which tasks need the most resources.

Comment #200: User confused by “questionnaire already running”.

Comment #201: User observes that the weak miss query doesn’t look “special”.

Comment #202: (See Comments #277-280.)

Comment #203: Task interface is overly complicated.

Comment #204: + and – signs have very small active area.

Comment #205: User would like graphical interface to see what’s in the cache.

Comment #206: Event configuration should contain a copy of the indicator lights.

Comment #207: User does not associate beeping with color change.

Comment #208: No feedback given when window is already visible or is iconified.

Comment #209: User confused by term “meta-information”.

Comment #210: User confused by term “program”, suggests “programs”.

Comment #211: User confused by term “subtask”, suggests “task”.

Comment #212: User concerned novices will be confused by term “RVM”.

Comment #213: User suggests “Tokens Information”, for “Authentication Information”.

Comment #214: User confused by terms “all descendants”, etc, suggests “recursive”.

Comment #215: User confused by term “Control Panel”, suggests “Alerts”.

Comment #216: User concerned novices will be confused by term “Tokens”.

Comment #217: User concerned about distinguishing a state from an event.

Comment #218: User concerned that Hoard Walk Advice shows “tasks”, not “objects”.

Comment #219: User confused by distinction between “hoarded” and “available”.

Comment #220: User uses term “cache walk”, rather than “hoard walk”.

Comment #221: User confused by term “flash”, suggests “blink”.

Comment #222: User confused by term “subtasks”, suggests “recursive”.

Comment #223: User confused by term “predefined”.

Comment #224: User believes term “advice” is being overused.

Comment #225: User unsure whether “bandwidth” refers to current or theoretical.

Comment #226: User confused by use of “advice indicator” to refer to indicator listbox.

Comment #227: User confused by term “advice”.

Comment #228: User forgets the term “cache”.

Comment #229: User confused by the term “weak”.

Comment #230: User confused by the term “questionnaire”.

Comment #231: User confused by the term “hoard walk”.

Comment #232: User confused by the term “stop asking”.

Comment #233: User confused as to what is “weak” – “my link” or “server link”.

Comment #234: User confused by the term “critical”.

Comment #235: User confused as to whether or not system has started the hoard.

Comment #236: User doesn’t understand Hoard Walk Advice offers more details.

Comment #237: User confused by similarity between “Fetch?” and “Fetch” buttons.

Comment #238: User confused because he doesn’t know bovik’s password.

Comment #239: User confused because he doesn’t know about reintegration.

Comment #240: User doesn’t understand that urgency colors affect meter colors.

Comment #241: User wonders if system would repeatedly ask about the same file.

Comment #242: User confused about whether or not an unhoarded task will be cached.

Comment #243: User wants to see Venus’ on-going activities somewhere (ala mariner).

Comment #244: User believes that program hoarding not emphasized enough.

Comment #245: User wonders who defines “substantial” [re: amount of time for fetch].

Comment #246: User doesn’t believe system can automatically hoard programs.

Comment #247: User wonders what would happen if you hoard more than will fit.

Comment #248: User wonders for how long tokens are valid.

Comment #249: Help on the Hoard Walk Progress window is not helpful.

Comment #250: Network Help window doesn’t explain why network is degraded.

Comment #251: Control Panel Help window (Event Configuration) is not helpful.

Comment #252: Task Help window doesn’t explain why task is unavailable.

Comment #253: User does not understand Task Available notification.

Comment #254: User expects Task Unavailable to be a warning rather than critical.

Comment #255: User expects a notion of yellow for Tasks.

Comment #256: User expects disconnection notification based on volumes, not servers.

Comment #257: User believes Token Expiry should be critical, not warning.

Comment #258: User surprised that Hoard Walk indicator turns yellow during walk.

Comment #259: User doesn't understand why Task indicator is red.

Comment #260: User wants indicator to warn before tokens expire.

Comment #261: User does not understand Task Unavailable notification.

Comment #262: The colors mean too many different things.

Comment #263: User misinterprets the Hoard Walk Advice event as Task Unavailable.

Comment #264: User feels that the default Normal (green) color is too dark.

Comment #265: User feels that the default Warning (yellow) color is not bright enough.

Comment #266: User feels that the default Critical (red) color is not bright enough.

Comment #267: User does not understand Hoard Walk Advice request notification.

Comment #268: User confused by task meters in Task Information window.

Comment #269: User confused by cache meter in Task Information window.

Comment #270: User confused by the cache meter in the Space Information window.

Comment #271: User confused by the disk meter in the Space Information window.

Comment #272: User confused by the meters on the Network Information window.

Comment #273: User wants system to calculate how much additional space needed.

Comment #274: User makes up answers to exercises rather than using interface.

Comment #275: User doesn't understand question asking about event configurations.

Comment #276: User would prefer Token Expiry not beep.

Comment #277: Task Help Window helps user hoard and prioritize tasks.

Comment #278: Task Help Window helps user understand meters.

Comment #279: Task Help Window helps user unhoard task.

Comment #280: Space Help Window helps user understand meters.

Comment #281: User confused by description of meta-information.

Comment #282: User confuses <Enter> (<Return>) vs. <Enter> (numeric keypad).

Comment #283: User confused by use of "Fetch?" button.

Comment #284: User confused by description of Event Configuration.

Comment #285: User confused by "same colors as the walls".

Comment #286: User confused by "pull over 5 minutes ago or risk engine damage."

Comment #287: User doesn't understand "For the record" comment.

Comment #288: User confused by Task4 screen.

Comment #289: User doesn't understand phrase "bizarre form of drag-n-drop".

Comment #290: User doesn't understand phrase "Under the X indicator".

Comment #291: User doesn't understand when to click and when to double-click.

Comment #292: User doesn't understand how to open an indicator's window.

E.4.2 Summary of Spontaneous Comments

The following pages contain a summary of the 292 comments described above. For each comment, the spreadsheet indicates which users made it and during which segments of the study. The segments are coded as follows:

- *T*: Tutorial
- *E*: Exercises
- *D*: Debriefing[3]
- *F*: Tutorial and Exercises
- *L*: Exercises and Debriefing
- *M*: Tutorial and Debriefing
- *A*: Tutorial, Exercises, and Debriefing

In addition, I provide the total number of users (*Number Reporting*) making the comment (note that a user making the comment multiple times is counted just once). Finally, if a single user made a particular comment, I identify that user under the heading *Unique User*. Comment lines that are shaded in gray indicate a comment duplicated during the organization process and document the identification number of the comment that encompasses it.

[3] An asterisk indicates that the participant made the comment to the experimenter privately, after completing the study. I code it as part of the debriefing segment for simplicity.

	Pilots				Novices			Experts			Misc.			Number	Unique
ID	2	3	4	5	1	2	4	1	2	3	C	S	T	Reporting	User
1				T	T			M		A	T		T	6	
2								(See Comments #80 and 209-243)							
3				T	D	T		A	E	F		T		7	
4						T		F		E			T	4	
5					T	T		T	T	T			T	6	
6					F	F		A			E			4	
7			E					T		E				3	
8								T		F			F	3	
9	T		E	T	T		T	T	F	T	E		A	10	
10						T		T						2	
11								T						1	E1
12								T						1	E1
13								E	E	E	E	E		5	
14								(See Comments #249-252)							
15						E		T						2	
16								(See Comments #268-272)							
17	E	E	E	E	L	E		E		F		E		9	
18				E	E	E		E		E				5	
19								E						1	E1
20				F		E		E		E	D		E	6	
21			T					E	E				T	4	
22			E		E			L					T	4	
23				F	T			A		F	E	E		6	
24			T	T				L					E	4	
25										D*				1	E3
26								E						1	E1
27								(See Comment #261)							
28								E						1	E1
29				E		E		E		E				4	
30								E		E				2	
31		T						D						2	
32				T	F	T		D	F	E				6	
33		T				T		T	T	T			T	6	
34									T				T	2	
35									T		T			2	
36			F	E	E				T	E		T		6	
37		T	T						T					3	
38			T					T	T	F	T			5	
39									L					1	E2
40								(See Comment #41)							
41			E						L					2	
42						E			D	E			A	4	
43									D				E	2	
44										T				1	E3
45						T				T			T	3	
46		T								T				2	
47										T				1	E3
48								(See Comment #1)							
49								(See Comments #253-262)							
50							T	T		T				3	

	Pilots				Novices			Experts			Misc.			Number	Unique
ID	2	3	4	5	1	2	4	1	2	3	C	S	T	Reporting	User
51										T				1	E3
52										T				1	E3
53										T				1	E3
54					T					A				2	
55										F				1	E3
56										T				1	E3
57		F	F		F	E		E	E	F	D			8	
58										T	M			2	
59		T			F	F				F			A	5	
60						T				T				2	
61		T								T				2	
62						E				F				2	
63										T				1	E3
64			T							T				2	
65	(See Comment #253-262)														
66										T				1	E3
67										T				1	E3
68										T				1	E3
69	(See Comment #253-262)														
70				E						T				2	
71			T							M				2	
72										T				1	E3
73										T				1	E3
74										T				1	E3
75										T				1	E3
76										T			T	2	
77			E							T			T	3	
78										T				1	E3
79										T				1	E3
80			E	T						T				3	
81										E				1	E3
82		T		E		T				E				4	
83										E				1	E3
84										E			E	2	
85										E				1	E3
86										E				1	E3
87					T					L				2	
88										E				1	E3
89										D			E	2	
90										D				1	E3
91					T								T	2	
92					T	E					E			3	
93					T		T							2	
94			T	T	A								A	4	
95					T									1	N1
96					E		E							2	
97					E									1	N1
98						T								1	N2
99						E								1	N2
100						E	E					E		3	

	Pilots				Novices			Experts			Misc.			Number	Unique
ID	2	3	4	5	1	2	4	1	2	3	C	S	T	Reporting	User
101						E								1	N2
102						E	E	E	E				E	5	
103						E								1	N2
104						E							E	2	
105								(See Comments #264-266)							
106							T				T			2	
107							T				E			2	
108	E						T							2	
109								(See Comments #253 and #267)							
110								L						1	E1
111											T		T	2	
112								(See Comments #281-292)							
113										T	M			2	
114											T		T	2	
115							T				M			2	
116								(See Comments #235-237)							
117											T			1	C
118											T			1	C
119											E			1	C
120							E				E			2	
121											E		T	2	
122											L			1	C
123											L			1	C
124			T			E					E	T	F	5	
125											L			1	C
126											E			1	C
127				F							D		E	3	
128					E									1	N1
129													T	1	T
130													T	1	T
131													T	1	T
132													T	1	T
133													T	1	T
134													T	1	T
135													T	1	T
136													T	1	T
137			T									T	T	3	
138			E										T	2	
139											E		T	2	
140			E										T	2	
141													T	1	T
142			T										T	2	
143			T										T	2	
144													T	1	T
145													T	1	T
146													E	1	T
147				E		E					E	E	E	5	
148								(See Comments #238-248)							
149						E					E	E	E	4	
150													E	1	T

	Pilots				Novices			Experts			Misc.			Number	Unique
ID	2	3	4	5	1	2	4	1	2	3	C	S	T	Reporting	User
151													E	1	T
152					(See Comments #219, 274 and 275)										
153													D	1	T
154													D	1	T
155	E	E		E										3	
156	E													1	P2
157	E	E												2	
158	E													1	P2
159		T												1	P3
160		T												1	P3
161		T		E										2	
162		T								D				2	
163		T												1	P3
164		T												1	P3
165					(See Comments #254, 257 and 276)										
166					(See Comments #253-263, and 267)										
167		E												1	P3
168		E												1	P3
169			T											1	P4
170			T											1	P4
171			T											1	P4
172			T											1	P4
173			T											1	P4
174					(See Comment #184)										
175			T											1	P4
176			T											1	P4
177			T											1	P4
178			T											1	P4
179			T											1	P4
180			T											1	P4
181			E											1	P4
182					(See Comments #138)										
183			E	E										2	
184			F											1	P4
185			L					E					E	3	
186			D											1	P4
187			D											1	P4
188			D											1	P4
189				D										1	P5
190				D										1	P5
191						E								1	N2
192				D										1	P5
193				D										1	P5
194												T		1	S
195										E		E		2	
196												E		1	S
197												E		1	S
198												E		1	S
199												E		1	S
200												E		1	S

	Pilots				Novices			Experts			Misc.			Number	Unique
ID	2	3	4	5	1	2	4	1	2	3	C	S	T	Reporting	User
201		T												1	P3
202	(See Comments #277-280)														
203											D			1	C
204								T						1	E1
205										T				1	E3
206										F		T		2	
207						E								1	N2
208											E		F	2	
209								T		T				2	
210								T						1	E1
211						T			T		T		E	4	
212								T						1	E1
213								T						1	E1
214									T					1	E2
215										T				1	E3
216										T				1	E3
217										T				1	E3
218										E				1	E3
219		E			E				E					3	
220						E								1	N2
221	T													1	P2
222											T			1	C
223											T			1	C
224											M			1	C
225											T			1	C
226											T	T		2	
227											D			1	C
228					E									1	N1
229			T										T	2	
230													T	1	T
231			T											1	P4
232			T											1	P4
233			E											1	P4
234												E		1	S
235				E				T			T			3	
236		E										E		2	
237			T											1	P4
238											E			1	C
239		E		D		E		D		E	E	E	E	8	
240								T						1	E1
241								T						1	E1
242		T											E	2	
243													D	1	T
244													D	1	T
245		T												1	P3
246		T	T											2	
247			T											1	P4
248			T											1	P4
249						E				E				2	
250					E	E								2	

	Pilots				Novices			Experts			Misc.			Number	Unique
ID	2	3	4	5	1	2	4	1	2	3	C	S	T	Reporting	User
251													T	1	T
252					E									1	N1
253					E			T			E			3	
254											E			1	C
255								T		T				2	
256										T				1	E3
257			E			T				A				3	
258		T								T			T	3	
259										E				1	E3
260					T	T								2	
261		E				F	T	F	T				T	6	
262				T						E				2	
263									T					1	E2
264							T						T	2	
265			T											1	P4
266			T				T							2	
267													E	1	T
268		E		T		F		T			T		T	6	
269		E						T		T				3	
270								E						1	E1
271						T								1	N2
272														0	
273						E								1	N2
274				E										1	P5
275													L	1	T
276		T												1	P3
277											E			1	C
278								E						1	E1
279								E	E					2	
280						T								1	N2
281											T			1	C
282											T			1	C
283			T								T			2	
284											T			1	C
285								T					T	2	
286													T	1	T
287													T	1	T
288													T	1	T
289													T	1	T
290													T	1	T
291													E	1	T
292		T												1	P3
Total	8	31	52	29	29	44	14	52	24	81	51	22	74		
Unq (All)	3	9	23	5	5	10	0	14	3	31	19	7	27		
Initial Repor	8	29	47	17	16	15	4	26	8	33	19	12	37	271	

E.5 Summary of Results

In this section, you will find a summary of results found in the analysis just presented. The results are organized hierarchically by category. The order of the listed results within a given category is arbitrary.

E.5.1 General

Qualitative Result #6: Novice user thought the “first level interface” provided too little detail to determine what was going on.

Qualitative Result #17: Expert user finds graphical user interfaces tedious.

Comment #44: User dislikes font choice.

Comment #53: User finds the scrollbars ugly.

Comment #103: User expects system to track and automatically hoard missing objects.

Comment #110: User would like a tree view of Tasks.

Comment #131: User has difficulty finding scrollbar.

Comment #133: User wants cut & paste to work.

Comment #169: Interface cognizant of vertical screen real estate, but not horizontal.

Comment #176: User discovered that <Backspace> key doesn’t work on telos.

Comment #205: User would like graphical interface to see what’s in the cache.

Comment #243: User wants to see Venus’ on-going activities somewhere (ala mariner).

Comment #273: User wants system to calculate how much additional space needed.

E.5.1.1 Bugs

E.5.1.1.1 Interface

Comment #4: Windows do not resize.

Comment #7: Interface alphabetizes caps and uncaps.

Comment #8: Meters shown at 1% have no visible color.

Comment #12: User expects <Enter> to make the help window disappear.

Comment #19: User loses data after selecting task from listbox.

Comment #22: System double-selects under certain circumstances.

Comment #30: Password visible on Authentication Information window.

Comment #43: Newly hoarded task may not be visible in list of hoarded tasks.

Comment #77: Number unreadable on meter.

Comment #79: Urgency labels on the Event Configuration Tab are not lined up.

Comment #82: Priorities need label.

Comment #85: End of task name is hidden behind meter.

Comment #89: Certain characters, used in task names, can crash the interface.

Comment #95: Space Help window did not update to show new information.

Comment #97: User "saves" definition under the name "New…" and it is lost.

Comment #99: User confused by bogus Fetch Statistics in Hoard Walk Advice window.

Comment #107: User types pathname, hits a key near <Return>, and it disappears.

Comment #120: Advice indicator goes green too soon.

Comment #127: User closes window without saving and loses data.

Comment #135: Visible shift when switching between definitions/configurations.

Comment #139: User experienced an unexplained loss of a definition.

Comment #176: User discovered that <Backspace> key doesn't work on telos.

Comment #249: Help on the Hoard Walk Progress window is not helpful.

Comment #251: Control Panel Help window (Event Configuration) is not helpful.

E.5.1.1.2 Widget Library

Comment #179: Expanding/Compressing node requires three clicks.

Comment #181: User confused by extraneous underlining.

E.5.1.1.3 Coda

Comment #104: Submitting a password takes excessively long.

E.5.1.2 Cosmetic Problems

E.5.1.2.1 Global

Comment #44: User dislikes font choice.

Comment #53: User finds the scrollbars ugly.

Comment #55: User doesn't recognize slider lines as widgets controlling screen layout.

Comment #75: Space help button is too small.

Comment #135: Visible shift when switching between definitions/configurations.

E.5.1.2.2 Local

Comment #54: User annoyed that a list with six elements must be scrolled.

Comment #70: User dislikes checkboxes, would prefer checkmarks.

Comment #73: Peer mistaken for child in tree widget.

Comment #79: Urgency labels on the Event Configuration Tab are not lined up.

Comment #91: User dislikes the Urgency Colors tab of the Control Panel.

Comment #142: User wants the triangle icons rather than the "+" and "-" icons.

Comment #143: User would prefer the indicator lights to be alphabetized.

Comment #144: User prefers klist to Tokens indicator.

Comment #171: User would like to change the background color of indicator lights.

Comment #177: User would like hoarded tasks to appear "<priority>: <NameOfTask>".

E.5.1.3 Enhancements

Comment #15: System should predict if hoarding a task will cause space problem.

Comment #25: User wants feedback regarding "health" of Venus.

Comment #57: User wants Data Definition window to indicate the size of subtree.

Comment #103: User expects system to track and automatically hoard missing objects.

Comment #110: User would like a tree view of Tasks.

Comment #169: Interface cognizant of vertical screen real estate, but not horizontal.

Comment #185: User concerned about difficulty of determining what is necessary.

Comment #205: User would like graphical interface to see what's in the cache.

Comment #243: User wants to see Venus' on-going activities somewhere (ala mariner).

Comment #273: User wants system to calculate how much additional space needed.

E.5.1.4 Help

Comment #12: User expects <Enter> to make the help window disappear.

Comment #13: Users confused when help window grabs and maintains focus.

Comment #45: User expects "help" on the indicator lights window.

Comment #75: Space help button is too small.

Comment #76: User wants expert help for space problems.

Comment #90: User would like "balloon" help.

Comment #95: Space Help window did not update to show new information.

Comment #249: Help on the Hoard Walk Progress window is not helpful.

Comment #250: Network Help window doesn't explain why network is degraded.

Comment #251: Control Panel Help window (Event Configuration) is not helpful.

Comment #252: Task Help window doesn't explain why task is unavailable.

Comment #277: Task Help Window helps user hoard and prioritize tasks.

Comment #278: Task Help Window helps user understand meters.

Comment #279: Task Help Window helps user unhoard task.

Comment #280: Space Help Window helps user understand meters.

E.5.1.5 Meters

Comment #8: Meters shown at 1% have no visible color.

Comment #50: Meters do not cover multiple orders of magnitude well.

Comment #51: Meters do not convey relative information.

Comment #77: Number unreadable on meter.

Comment #268: User confused by task meters in Task Information window.

Comment #269: User confused by cache meter in Task Information window.

Comment #270: User confused by the cache meter in the Space Information window.

Comment #271: User confused by the disk meter in the Space Information window.

Comment #272: User confused by the meters on the Network Information window.

E.5.1.6 Terminology

Comment #80: Distinction between different modes of operation unclear.

Comment #209: User confused by term "meta-information".

Comment #210: User confused by term "program", suggests "programs".

Comment #211: User confused by term "subtask", suggests "task".

Comment #212: User concerned novices will be confused by term "RVM".

Comment #213: User suggests "Tokens Information", for "Authentication Information".

Comment #214: User confused by terms "all descendants", etc, suggests "recursive".

Comment #215: User confused by term "Control Panel", suggests "Alerts".

Comment #216: User concerned novices will be confused by term "Tokens".

Comment #217: User concerned about distinguishing a state from an event.

Comment #218: User concerned that Hoard Walk Advice shows "tasks", not "objects".

Comment #219: User confused by distinction between "hoarded" and "available".

Comment #220: User uses term “cache walk”, rather than “hoard walk”.

Comment #221: User confused by term “flash”, suggests “blink”.

Comment #222: User confused by term “subtasks”, suggests “recursive”.

Comment #223: User confused by term “predefined”.

Comment #224: User believes term “advice” is being overused.

Comment #225: User unsure whether “bandwidth” refers to current or theoretical.

Comment #226: User confused by use of “advice indicator” to refer to indicator listbox.

Comment #227: User confused by term “advice”.

Comment #228: User forgets the term “cache”.

Comment #229: User confused by the term “weak”.

Comment #230: User confused by the term “questionnaire”.

Comment #231: User confused by the term “hoard walk”.

Comment #232: User confused by the term “stop asking”.

Comment #233: User confused as to what is “weak” – “my link” or “server link”.

Comment #234: User confused by the term “critical”.

E.5.1.7 Widget Library

Comment #53: User finds the scrollbars ugly.

Comment #55: User doesn’t recognize slider lines as widgets controlling screen layout.

Comment #73: Peer mistaken for child in tree widget.

Comment #142: User wants the triangle icons rather than the “+” and “-” icons.

Comment #179: Expanding/Compressing node requires three clicks.

Comment #181: User confused by extraneous underlining.

Comment #204: + and – signs have very small active area.

E.5.1.8 Windows

Comment #1: Participants frustrated by window placement.

Comment #4: Windows do not resize.

Comment #24: User experiences window overload.

Comment #135: Visible shift when switching between definitions/configurations.

Comment #208: No feedback given when window is already visible or is iconified.

E.5.2 Indicator Lights

Qualitative Result #4: Expert user was confused by the distinction between the Hoard Walk indicator and the Task indicator.

Comment #10: User confused that two indicators open the same advice request.

Comment #11: Users confused by different windows appearing from one indicator light.

Comment #25: User wants feedback regarding "health" of Venus.

Comment #31: User expresses confusion between Hoard Walk and Task indicators.

Comment #46: User surprised that a double-click is required to open indicator window.

Comment #143: User would prefer the indicator lights to be alphabetized.

Comment #159: User surprised that indicator lights are dynamic.

Comment #163: User thinks it strange that Control Panel is an indicator light.

Comment #169: Interface cognizant of vertical screen real estate, but not horizontal.

Comment #186: User likes lights to get attention and gauges to show detail.

Comment #192: User thinks there are too many indicator lights.

Comment #193: User suggests only making abnormal indicator lights visible.

E.5.2.1 Notification of Events

E.5.2.1.1 General

Qualitative Result #16: Expert user afraid of missing an event notification.

Comment #9: User confused by two-color blinking.

Comment #33: User confused because indicator stops blinking.

Comment #41: User concerned that he might miss an indicator state change.

Comment #118: User confused as to what exactly is going to "flash".

Comment #121: User disturbed by window popping up.

Comment #170: User confused about how the indicators will change colors.

Comment #171: User would like to change the background color of indicator lights.

Comment #207: User does not associate beeping with color change.

Comment #262: The colors mean too many different things.

E.5.2.1.2 Specific

Tutorial Result #1: (Screen 16) Two users had difficulty with the "Operating Disconnected" event.

Tutorial Result #9: (Screen 36) Two users had difficulty prioritizing tasks or understanding the "Task Unavailable" event notification.

Comment #88: User would prefer more obvious notification of strong connectivity.

Comment #253: User does not understand Task Available notification.

Comment #254: User expects Task Unavailable to be a warning rather than critical.

Comment #255: User expects a notion of yellow for Tasks.

Comment #256: User expects disconnection notification based on volumes, not servers.

Comment #257: User believes Token Expiry should be critical, not warning.

Comment #258: User surprised that Hoard Walk indicator turns yellow during walk.

Comment #259: User doesn't understand why Task indicator is red.

Comment #260: User wants indicator to warn before tokens expire.

Comment #261: User does not understand Task Unavailable notification.

Comment #263: User misinterprets the Hoard Walk Advice event as Task Unavailable.

Comment #267: User does not understand Hoard Walk Advice request notification.

Comment #276: User would prefer Token Expiry not beep.

E.5.3 Control Panel

E.5.3.1 General

Comment #54: User annoyed that a list with six elements must be scrolled.

Comment #70: User dislikes checkboxes, would prefer checkmarks.

E.5.3.1.1 Commit Behavior

Comment #32: User expects "commit" to close Control Panel window (as feedback).

Comment #39: User confused about extent of "commit" button's action.

Comment #81: User surprised he must commit changes to the event configurations.

Comment #154: User prefers for close without saving/committing to abort.

E.5.3.2 Event Configuration

Tutorial Result #12: (Screen 59) Five users had difficulty examining event configurations.

Tutorial Result #13: (Screen 60) Two expert users had difficulty confirming their answer regarding event configuration.

Exercise Result #5: Two users found the events to be configured inefficiently.

Qualitative Result #5: Users had difficulty finding events in the Event Configuration tab of the Control Panel.

Comment #17: User guesses location of event in indicator list.

Comment #38: User confused about how system notifies if "everything" is turned off.

Comment #79: Urgency labels on the Event Configuration Tab are not lined up.

Comment #80: Distinction between different modes of operation unclear.

Comment #87: User wants to modify all event notifications at once.

Comment #119: User does not recognize Event Configuration window.

Comment #135: Visible shift when switching between definitions/configurations.

Comment #145: User would like to have a set of system defaults.

Comment #147: User searches for way to configure events.

Comment #160: User would prefer the Urgency of Event Configurations to be in color.

Comment #161: User would prefer configuration options be checkboxes (not listboxes).

Comment #162: User suggests improved layout for the event configuration tab.

Comment #164: Event configuration window should show an example notification.

Comment #170: User confused about how the indicators will change colors.

Comment #187: User wants different sets of settings ("at school" vs. "on the road").

Comment #206: Event configuration should contain a copy of the indicator lights.

E.5.3.3 Urgency Colors

Comment #91: User dislikes the Urgency Colors tab of the Control Panel.

Comment #146: User would like to drag colors.

Comment #171: User would like to change the background color of indicator lights.

Comment #264: User feels that the default Normal (green) color is too dark.

Comment #265: User feels that the default Warning (yellow) color is not bright enough.

Comment #266: User feels that the default Critical (red) color is not bright enough.

E.5.4 Tokens

Comment #30: Password visible on Authentication Information window.

Comment #104: Submitting a password takes excessively long.

Comment #144: User prefers klist to Tokens indicator.

Comment #195: User assumes a 24 hour clock (in Tokens window).

E.5.5 Space

Exercise Result #2: Three users could not accurately describe the current space status.

Exercise Result #10: Four users described "RVM Filling" event inefficiently.

Comment #50: Meters do not cover multiple orders of magnitude well.

Comment #76: User wants expert help for space problems.

Comment #95: Space Help window did not update to show new information.

Comment #270: User confused by the cache meter in the Space Information window.

Comment #271: User confused by the disk meter in the Space Information window.

Comment #280: Space Help Window helps user understand meters.

E.5.6 Network

Tutorial Result #1: (Screen 16) Two users had difficulty with the "Operating Disconnected" event.

Exercise Result #13: Four users described "Operating Disconnected" event inefficiently.

Comment #50: Meters do not cover multiple orders of magnitude well.

Comment #51: Meters do not convey relative information.

Comment #129: User wants interface to show what files are located on what servers.

Comment #172: User concerned about default thresholds for weak connectivity.

Comment #256: User expects disconnection notification based on volumes, not servers.

Comment #272: User confused by the meters on the Network Information window.

E.5.7 Advice

Tutorial Result #10: (Screen 40) Four users experienced difficulty orienting to the "Advice Information" window.

Exercise Result #12: Three users provided "Weak Miss" advice inefficiently.

Qualitative Result #18: Expert user would like to have the ability to stop long transfers over weak network connections.

Comment #28: User confused about what object needs to be fetched.

Comment #66: Requests needing immediate attention require too many steps.

Comment #67: User concern that 15 seconds is wrong default timeout.

Comment #68: User would like a count-down timer on advice requests.

Comment #98: User confused by options in the weak miss timeout prod.

Comment #103: User expects system to track and automatically hoard missing objects.

Comment #115: User thinks it strange that we have both kinds of advice under Advice.

Comment #120: Advice indicator goes green too soon.

Comment #150: User wants to be able to say "0" to Disconnected Miss Query.

Comment #178: User suggests that system start the request as it asks for permission.

Comment #200: User confused by "questionnaire already running".

Comment #201: User observes that the weak miss query doesn't look "special".

E.5.8 Hoard Walk

Tutorial Result #11: (Screen 49) Three users experienced difficulty completing hoard walk advice request.

Exercise Result #1: Five users provided incorrect hoard walk advice.

Exercise Result #4: Five users provided hoard walk advice inefficiently.

Exercise Result #9: Two users requested hoard walk inefficiently.

Qualitative Result #13: Novice user dislikes having fetch time expressed in seconds.

Comment #70: User dislikes checkboxes, would prefer checkmarks.

Comment #71: User dislikes "All Tasks Needing Data" pseudo-task.

Comment #73: Peer mistaken for child in tree widget.

Comment #96: Seconds too fine-grained.

Comment #99: User confused by bogus Fetch Statistics in Hoard Walk Advice window.

Comment #140: User confused by the "unselect" dialog box.

Comment #141: User confused by "Fetch" and "Stop Asking" toggling one another.

Comment #142: User wants the triangle icons rather than the "+" and "-" icons.

Comment #155: User doesn't recognize Hoard Walk Advice as a request for advice.

Comment #156: User confused by Hoard Walk Advice coming in under Hoard Walk.

Comment #179: Expanding/Compressing node requires three clicks.

Comment #199: User hoards based upon which tasks need the most resources.

Comment #204: + and – signs have very small active area.

Comment #235: User confused as to whether or not system has started the hoard.

Comment #236: User doesn't understand Hoard Walk Advice offers more details.

Comment #237: User confused by similarity between "Fetch?" and "Fetch" buttons.

E.5.9 Task

E.5.9.1 General

Comment #7: Interface alphabetizes caps and uncaps.

Comment #29: User confused by file becoming unavailable.

Comment #54: User annoyed that a list with six elements must be scrolled.

Comment #55: User doesn't recognize slider lines as widgets controlling screen layout.

Comment #92: User wants "undo".

Comment #93: User curious how the system copes with links.

Comment #126: User unsure which window allows him to prioritize tasks.

Comment #183: User brings up a task definition to get to a data definition.

Comment #185: User concerned about difficulty of determining what is necessary.

Comment #196: User expects ^U to work correctly.

Comment #203: Task interface is overly complicated.

Comment #255: User expects a notion of yellow for Tasks.

E.5.9.1.1 Lost Data

Comment #19: User loses data after selecting task from listbox.

Comment #97: User "saves" definition under the name "New…" and it is lost.

Comment #107: User types pathname, hits a key near <Return>, and it disappears.

Comment #127: User closes window without saving and loses data.

Comment #139: User experienced an unexplained loss of a definition.

E.5.9.1.2 Save Behavior

Qualitative Result #14: Expert user confused by behavior of "Save" buttons, in particular whether all tasks are saved at once.

Comment #59: User expected "save" button to also close the window.

Comment #60: User unsure as to why there is a "save as" button.

Comment #154: User prefers for close without saving/committing to abort.

Comment #158: User surprised that system saves definition automatically upon close.

Comment #184: User confused by "already exists" dialog from "Save As" button.

Comment #188: Users confused by behavior of "Save As" button.

E.5.9.2 Task Information

Tutorial Result #9: (Screen 36) Two users had difficulty prioritizing tasks or understanding the "Task Unavailable" event notification.

Exercise Result #8: Three users prioritized tasks inefficiently.

Exercise Result #11: Three users described "Task Unavailable" event inefficiently.

Exercise Result #14: Two users reorganized task to hoard subtask at a different priority.

Qualitative Result #10: Expert user unsure whether or not a program was available.

Comment #15: System should predict if hoarding a task will cause space problem.

Comment #18: Users have difficulty finding definitions in predefined lists.

Comment #26: User has difficulty finding task in Task Information window.

Comment #42: User has difficulty prioritizing tasks.

Comment #43: Newly hoarded task may not be visible in list of hoarded tasks.

Comment #63: User confused about how to select tasks to be hoarded.

Comment #64: User would like to drag tasks within the list of hoarded tasks.

Comment #82: Priorities need label.

Comment #85: End of task name is hidden behind meter.

Comment #89: Certain characters, used in task names, can crash the interface.

Comment #102: Users have difficulty unhoarding tasks.

Comment #110: User would like a tree view of Tasks.

Comment #114: User thinks it strange that we have a meter on the Tasks.

Comment #138: User has difficulty deleting a definition.

Comment #157: User thinks it silly to have to create a task for a single directory.

Comment #177: User would like hoarded tasks to appear “<priority>: <NameOfTask>”.

Comment #268: User confused by task meters in Task Information window.

Comment #269: User confused by cache meter in Task Information window.

Comment #273: User wants system to calculate how much additional space needed.

Comment #277: Task Help Window helps user hoard and prioritize tasks.

Comment #278: Task Help Window helps user understand meters.

Comment #279: Task Help Window helps user unhoard task.

E.5.9.3 Definitions

Exercise Result #3: Five users failed to completely define the “fixing bugs” task.

Exercise Result #6: Three users defined “Header Files” task inefficiently.

Exercise Result #7: Four users defined “CV” task inefficiently.

Qualitative Result #8: Expert user finds he must explicitly think about how to structure his task definitions.

Qualitative Result #12: Novice user accidentally deletes entire task rather than single element.

Qualitative Result #14: Expert user confused by behavior of “Save” buttons, in particular whether all tasks are saved at once.

Qualitative Result #15: Expert user confused by creating a new task vs. changing the name of an old one.

Comment #5: Participants confused that changing name and saving creates a new defn.

Comment #19: User loses data after selecting task from listbox.

Comment #136: User confused by having to hit <Enter> after typing name of definition.

Comment #138: User has difficulty deleting a definition.

E.5.9.3.1 Task Definition

Tutorial Result #2: (Screen 20) Two novice users experienced difficulty orienting to the "Task Definition" window.

Tutorial Result #4: (Screen 22) Three users had difficulty finding the "writing thesis" task in the "Task Definition" window (under either the "predefined list" or the "contains" list).

Tutorial Result #8: (Screen 34) Three users had difficulty modifying a task definition.

Exercise Result #14: Two users reorganized task to hoard subtask at a different priority.

Comment #6: Participant expects a button to delete an element from the "contains" list.

Comment #18: Users have difficulty finding definitions in predefined lists.

Comment #22: System double-selects under certain circumstances.

Comment #23: User finds it strange that a single-click selects an item for "contains" list.

Comment #62: User has difficulty deselecting a chosen element from "contains" list.

Comment #122: User double-clicks in empty contains list and "New…" pops up.

Comment #123: User dislikes use of predefined and contains lists.

Comment #135: Visible shift when switching between definitions/configurations.

Comment #181: User confused by extraneous underlining.

E.5.9.3.2 Data Definition

Tutorial Result #5: (Screen 23) Three users experienced difficulty orienting to the "Data Definition" window.

Tutorial Result #6: (Screen 27) Five users had difficulty entering data into the "Data Definition" window.

Tutorial Result #7: (Screen 28) Three users had difficulty closing "Data Definition" window.

Qualitative Result #2: Expert users had difficulty understanding distinction between <Tab> and <Enter>.

Qualitative Result #7: Expert user confused by the "no such file" indication.

Qualitative Result #9: Expert user finds editing file/directory lists (in "Data Definition" windows) tricky

Qualitative Result #10: Expert user unsure whether or not a program was available.

Qualitative Result #11: Novice user dislikes having to enter pathnames.

Comment #3: Participants have difficulty entering data in Data Definition window.

Comment #20: User wants to click on disabled meta-information.

Comment #21: User concerned that entire pathname is not visible.

Comment #36: User confused by lack of feedback when directory does not exist.

Comment #37: User bothered by addition of empty entry widget.

Comment #56: User dissatisfied with Data Definition window.

Comment #57: User wants Data Definition window to indicate the size of subtree.

Comment #58: User dislikes default meta-information for directories.

Comment #94: User would prefer not to type in pathnames.

Comment #101: User expects arrow keys to work in the meta-information area.

Comment #113: User concerned that he would use "all descendants", "all the time."

Comment #132: User expects <Back-Tab> to work in meta-information.

Comment #175: User would like a "Make New Directory" button in definition window.

Comment #196: User expects ^U to work correctly.

E.5.9.3.3 Program Definition

Qualitative Result #10: Expert user unsure whether or not a program was available.

Qualitative Result #11: Novice user dislikes having to enter pathnames.

Comment #21: User concerned that entire pathname is not visible.

Comment #37: User bothered by addition of empty entry widget.

Comment #61: User doesn't believe system ensures program executables exist.

Comment #94: User would prefer not to type in pathnames.

Comment #107: User types pathname, hits a key near <Return>, and it disappears.

Comment #125: User expects meta-information for programs.

Comment #137: User types a pathname into the name of the definition.

Comment #153: User would like to be able to see the details of program definitions.

Comment #173: User expects program definition to contain user's configuration files.

Comment #190: User wants more control over program definitions.

Comment #196: User expects ^U to work correctly.

Comment #198: User enters just a single program in each definition.

E.5.10 Study Materials

E.5.10.1 General

Comment #1: Participants frustrated by window placement.

Comment #84: Color used to highlight in Exercises window bad with pink background.

Comment #124: User failed to read instructions completely.

E.5.10.2 Tutorial

Qualitative Result #3: Expert users thought the Tutorial went into too much detail.

Comment #47: Screen of tutorial partially covers a window of the interface.

Comment #78: User dislikes directive to not use “Destroy Tokens” and “New Tokens”.

Comment #117: User believes the Tutorial to be out-of-sequence.

Comment #130: User would like to be able to highlight in tutorial (as a bookmark).

Comment #134: User disturbed by instruction to “close all windows” (only one open).

Comment #180: Tutorial is redundant.

Comment #194: User needs to go backwards in Tutorial but cannot.

E.5.10.2.1 Clarifications

Tutorial Result #3: (Screen 21) Two novice users had difficulty understanding explanation of the different ways to view task definitions.

Comment #34: User has difficulty finding “black down-arrow button”.

Comment #35: Users think they should literally make up pathnames.

Comment #108: User looks under indicator light rather than indicator listbox.

Comment #111: User has difficulty identifying the indicator lights.

Comment #118: User confused as to what exactly is going to “flash”.

Comment #226: User confused by use of “advice indicator” to refer to indicator listbox.

Comment #237: User confused by similarity between “Fetch?” and “Fetch” buttons.

Comment #281: User confused by description of meta-information.

Comment #282: User confuses <Enter> (<Return>) vs. <Enter> (numeric keypad).

Comment #283: User confused by use of “Fetch?” button.

Comment #284: User confused by description of Event Configuration.

Comment #285: User confused by “same colors as the walls”.

Comment #286: User confused by “pull over 5 minutes ago or risk engine damage.”

Comment #287: User doesn’t understand “For the record” comment.

Comment #288: User confused by Task4 screen.

Comment #289: User doesn’t understand phrase “bizarre form of drag-n-drop”.

Comment #290: User doesn’t understand phrase “Under the X indicator”.

Comment #291: User doesn’t understand when to click and when to double-click.

Comment #292: User doesn’t understand how to open an indicator’s window.

E.5.10.2.2 Bugs

Comment #52: Nothing is hoarded, yet 70% of cache is full.

Comment #86: User does not believe the Space meter (cache).

Comment #106: Tutorial assumes green/yellow/red.

Comment #189: Distinction between general instructions and directives unclear.

Comment #194: User needs to go backwards in Tutorial but cannot.

E.5.10.2.3 Omissions

Qualitative Result #1: Users did not appreciate question about reintegration after it had not been covered in the Tutorial.

Comment #38: User confused about how system notifies if “everything” is turned off.

Comment #80: Distinction between different modes of operation unclear.

Comment #238: User confused because he doesn’t know bovik’s password.

Comment #239: User confused because he doesn’t know about reintegration.

Comment #240: User doesn’t understand that urgency colors affect meter colors.

Comment #241: User wonders if system would repeatedly ask about the same file.

Comment #242: User confused about whether or not an unhoarded task will be cached.

Comment #244: User believes that program hoarding not emphasized enough.

Comment #245: User wonders who defines “substantial” [re: amount of time for fetch].

Comment #246: User doesn’t believe system can automatically hoard programs.

Comment #247: User wonders what would happen if you hoard more than will fit.

Comment #248: User wonders for how long tokens are valid.

E.5.10.3 Exercises

Comment #149: User has forgotten primary “task”.

Comment #151: User upset that Exercises tell him that he’s done when he isn’t.

Comment #274: User makes up answers to exercises rather than using interface.

E.5.10.3.1 Clarifications

Comment #100: User confused by instruction to define header files as a program.

Comment #167: User confused by Phase Three of the Exercises.

Comment #197: User misunderstands description of one of the blizzard activities.

Comment #275: User doesn’t understand question asking about event configurations.

E.5.10.3.2 Bugs

Comment #74: Task indicator turns green before hoard walk completes.

Comment #86: User does not believe the Space meter (cache).

Comment #128: User notices omissions in the mock task definitions.

Comment #168: Incident report button doesn’t work while query windows visible.

E.5.10.3.3 Inconsistencies

Comment #72: User notices an upper-case/lower-case inconsistency.

Comment #83: User notices inconsistent task name between exercises and interface.

Comment #191: Inconsistency between name of missing object and primary task.