C Experimental Data

This appendix contains data collected during the CodaConsole usability study. In it, you will find demographic information, quantitative data, and qualitative data. The section containing demographic information includes information obtained from the participants using the Background Questionnaire. The section containing quantitative data represents the raw data collected during the Tutorial and Exercise segments of the study. The section containing qualitative data represents the results of the Evaluation Questionnaire that participants were asked to complete at the conclusion of the Exercises. The materials used to collect this information are available in Appendix B : "Materials".

C.1 Demographic Data

Question	N1	N2	N4	E1	E2	E3
Gender?	Male	Male	Female	Male	Male	Male
Highest Degree?	HS	Masters	Bachelors	Masters	Masters	Masters
Job Title?	Student	Student	Student	Student	Student	Student
Field of Study?	CS	CS	CS	CS	CS	CS
Level of Study?	Ph.D.	Ph.D.	Ph.D.	Ph.D.	Ph.D.	Ph.D.
Year in Program?	2	1	2	6	5	8
HCI Experience?	Yes	Yes	No	No	No	No
Frequency of Computer Use?	Daily	Daily	Daily	Daily	Daily	Daily

Figure C.1: Demographics

This table shows the demographics of participants in our usability study. Participants N1 and N2 each had some prior experience in human-computer interaction. N1 had worked on several shipping applications for the MacIntosh. N2 had worked as an interface researcher in the labs of two different companies (total of 3 years). In addition, N2 has a masters in CS with an emphasis in HCI.

Question	N1	N2	N4	E1	E2	E3
Operating System Proficiency?						
DOS/Windows	✓	✓	✓	✓	✓	✓
MacOS	✓	✓			✓	✓
Flavor of Unix	✓	✓	✓	✓	✓	✓
Others	✓					✓

Figure C.2: Proficiency with Various Operating Systems

This table shows each of the participant's proficiency with various operating systems.

Question	N1	N2	N4	E1	E2	E3
Use Window Environment?	Yes	Yes	Yes	Yes	Yes	Yes
DEC Windows				✓		
MacIntosh	✓	✓	✓	✓	✓	✓
MS-Windows	✓	✓	✓	✓	✓	✓
NeXTStep	✓		✓	✓	✓	✓
Presentation Manager	✓					
Sun/OpenLook or View			✓	✓		✓
X windows	✓	✓	✓	✓	✓	✓
Other		✓				✓

Figure C.3: Use of Various Windowing Systems

This table shows each participant's experience with various windowing systems.

Question	N1	N2	N4	E1	E2	E3
Used Unix-based System?	Yes	Yes	Yes	Yes	Yes	Yes
How frequently?	Daily	Daily	Daily	Daily	Daily	Daily
Years experience?	2	5+	5+	5+	5+	5+
Rate ability?	Good	Excel't	Ok	Good	Good	Excel't

Figure C.4: Experience with Unix-based Operating Systems

This table shows each participant's experience using Unix-based operating systems.

X Window Manager Preferences	N1	N2	N4	E1	E2	E3
mwm		✓			✓	
twm			✓			✓
tvtwm				✓		
ctwm			✓		✓	
AfterStep	✓					

Figure C.5: Window Manager Preferences

This table shows each participant's preferred X window manager.

Editor Proficiencies?	N1	N2	N4	E1	E2	E3
vi				✓	✓	
emacs						
gnu-emacs	✓					
Epoch					✓	
Xemacs						

Figure C.6: Editor Proficiencies

This table shows each user's proficiency with commonly used editors available under Unix. The editor marked with a represents the user's preferred Unix-based editor.

Document Tool Proficiencies?	N1	N2	N4	E1	E2	E3
scribe				✓		
latex						✓
frame			✓		✓	✓
word				✓		

Figure C.7: Document Processing Proficiencies

This table shows each participant's proficiency with various document processing tools commonly used available for Unix. The one marked with a represents the user's preferred document processing tool. User E3 has no preference.

Have you ever maintained or compiled any Unix applications, either here at Carnegie Mellon or elsewhere?

⇒ `(N1) gnu-gcc | vscm`
⇒ `(N2) java compiler; misc. other stuff`
⇒ `(N4) No`
⇒ `(E1) rpc2, scylla, informix, gdb, ghostscript, ghostview, gmax, flex, bison, etc.`
⇒ `(E2) many (tcl/tk, epoch, …)`
⇒ `(E3) cboard, mdos, pilot-link`

File System Usage	N1	N2	N4	E1	E2	E3
Experience with AFS?	Yes	Yes	Yes	Yes	Yes	Yes
How frequent?	Daily	Daily	Daily	Daily	Daily	Daily
home directory?	Yes	Yes	No*	Yes	No	No
e-mail?	Yes	Yes	Yes	Yes	Yes	No
Knowledge of Coda?	Yes	No	Yes	Yes	Yes	Yes
Experience with Coda?	No	No	No	Yes	Yes	Yes

Figure C.8: Distributed File System Experience

This table shows each participant's experience with afs and with Coda. N4 notes that, although her home directory is not in AFS, it used to be located there. Below are the user's responses to the question "What do you know about Coda?".

⇒ `(N1) It's AFS++`

⇒ `(N4) it's a file system (apparently). Also, Coda people walk around with notebooks a lot.`

⇒ `(E1) Medium-level familiarity with implementation details. High familiarity with design.`

⇒ `(E2) Mostly user level things (hoard, spy, cfs …)`

⇒ `(E3) Have browsed source code and suggested bug fixes.`

Related Experience	N1	N2	N4	E1	E2	E3
Knowledge of Briefcase?	No	No	No	Yes	No	Yes
Experience with Briefcase?	No	No	No	No	No	No

Figure C.9: Related Experience with Briefcase

This table shows each participant's knowledge of and experience with Briefcase. Only two users had prior knowledge of Briefcase. Below are their responses to the question "What do you know about Briefcase?".

⇒ `(E1) utility to provide some (minimal) degree of synchronization of files between different machines. Users must explicitly name all files to keep synch.`

⇒ `(E3) it syncs in some lame fashion a user-defined set of files (if you can call what they have a file system, which is debatable).`

C.2 Quantitative Data

Screen Identifier	Time Required (in seconds) N1	N2	N4	Novice Avg	Time Required (in seconds) E1	E2	E3	Expert Avg	Overall Avg	StdDev
Introduction	**626.3**	**516.0**	**391.3**	**511.2**	**544.0**	**629.1**	**352.4**	**508.5**	**509.9**	**116.5**
Introduction1	32.4	25.8	50.6	36.3	33.1	27.4	14.3	24.9	30.6	11.9
Introduction2	29.7	19.9	7.8	19.1	21.4	21.2	12.2	18.3	18.7	7.7
Introduction3	29.7	22.4	16.4	22.8	22.5	24.5	7.4	18.1	20.5	7.7
Introduction4	79.7	57.8	43.5	60.3	59.4	71.3	44.4	58.4	59.4	14.4
Introduction5	82.0	66.9	35.1	61.3	62.5	75.2	46.0	61.2	61.3	17.7
Introduction6	58.4	46.2	27.7	44.1	56.5	67.0	39.9	54.5	49.3	14.2
Introduction7	83.7	85.2	55.8	74.9	79.2	98.1	42.9	73.4	74.1	20.6
Introduction8	19.7	13.1	13.6	15.5	15.7	35.7	5.4	18.9	17.2	10.2
Introduction9	63.0	57.0	55.4	58.5	66.6	78.0	60.5	68.4	63.4	8.2
Introduction10	108.3	85.3	59.4	84.3	87.9	93.8	45.7	75.8	80.1	23.2
Introduction11	39.6	35.9	26.0	33.8	39.2	36.3	33.9	36.5	35.1	5.0
Urgency Colors	**186.8**	**150.5**	**172.2**	**169.8**	**221.2**	**204.1**	**82.8**	**169.4**	**169.6**	**49.1**
UrgencyColors1	44.2	26.8	22.8	31.3	38.7	43.5	28.2	36.8	34.0	9.2
UrgencyColors2	142.6	124.3	149.4	138.8	182.5	160.5	54.5	132.5	135.6	44.2
Network	**96.6**	**79.8**	**84.0**	**86.8**	**90.1**	**108.5**	**101.8**	**100.1**	**93.5**	**10.9**
Network1	71.0	52.9	46.6	56.8	60.0	79.7	68.9	69.5	63.2	12.3
Network2	13.2	18.1	18.0	16.4	19.1	18.9	20.9	19.6	18.0	2.6
Network3	12.0	8.4	19.1	13.2	10.7	10.1	11.7	10.8	12.0	3.7
Task	**1575.8**	**1502.2**	**917.2**	**1331.7**	**1413.7**	**1310.9**	**897.8**	**1207.5**	**1269.6**	**294.2**
Task1	66.5	74.1	61.6	67.4	79.4	68.5	44.1	64.0	65.7	12.2
Task2	57.8	83.2	41.5	60.8	89.4	70.0	56.4	71.9	66.4	18.0
Task3	179.8	137.0	57.0	124.6	115.6	115.0	70.1	100.2	112.4	44.8
Task4	16.6	34.6	18.9	23.4	22.0	17.4	12.6	17.3	20.3	7.6
Task5	59.4	26.7	8.3	31.5	26.1	48.3	14.9	29.8	30.6	19.6
Task6	203.8	82.6	42.6	109.7	63.6	44.1	60.1	55.9	82.8	61.1
Task7	133.1	134.8	85.0	117.6	117.7	112.5	73.7	101.3	109.5	25.1
Task8	25.0	29.6	20.6	25.1	18.1	25.1	15.4	19.5	22.3	5.2
Task9	55.2	24.4	27.7	35.8	39.2	33.7	25.4	32.8	34.3	11.7
Task10	118.6	268.3	100.2	162.4	204.3	148.3	80.4	144.3	153.4	71.0
Task11	7.2	16.3	9.3	10.9	37.5	18.0	10.4	22.0	16.4	11.1
Task12	40.8	32.7	32.4	35.3	43.4	42.1	31.2	38.9	37.1	5.6
Task13	47.4	64.2	63.4	58.3	53.1	57.1	37.2	49.1	53.7	10.3
Task14	10.6	11.9	11.1	11.2	16.0	25.2	8.9	16.7	14.0	6.0
Task15	106.2	75.9	78.6	86.9	94.3	73.6	58.4	75.4	81.2	16.8
Task16	75.9	47.2	45.2	56.1	45.5	71.4	58.5	58.5	57.3	13.7
Task17	152.3	130.2	57.4	113.3	110.1	99.8	89.7	99.9	106.6	32.9

(continued from previous page)

Screen	**Time Required (in seconds)**			**Novice**	**Time Required (in seconds)**			**Expert**	**Overall**	
Identifier	**N1**	**N2**	**N4**	**Avg**	**E1**	**E2**	**E3**	**Avg**	**Avg**	**StdDev**
Task18	24.3	22.2	16.9	21.1	18.2	29.1	13.3	20.2	20.7	5.7
Task19	104.1	117.7	69.2	97.0	122.9	93.7	77.9	98.2	97.6	21.4
Task20	65.8	72.2	59.1	65.7	85.1	104.2	43.6	77.6	71.7	21.1
Task21	25.2	15.9	11.0	17.4	11.9	13.5	15.2	13.5	15.4	5.1
Advice	**302.8**	**331.5**	**226.0**	**286.8**	**296.7**	**337.6**	**203.2**	**279.2**	**283.0**	**55.7**
Advice1	71.1	65.0	45.9	60.7	61.2	74.6	39.7	58.5	59.6	13.9
Advice2	63.3	107.3	56.1	75.6	85.3	87.4	44.0	72.2	73.9	23.5
Advice3	80.3	68.4	53.5	67.4	77.6	91.3	59.1	76.0	71.7	14.1
Advice4	49.7	53.7	44.8	49.4	44.5	52.4	45.5	47.5	48.4	4.1
Advice5	38.3	37.1	25.6	33.7	28.1	31.8	14.9	24.9	29.3	8.6
Hoard Walk	**406.1**	**473.2**	**307.8**	**395.7**	**446.0**	**472.5**	**355.9**	**424.8**	**410.2**	**67.2**
HoardWalk1	73.4	71.5	60.7	68.5	95.5	91.2	54.7	80.5	74.5	16.2
HoardWalk2	61.5	76.4	37.8	58.6	59.3	78.0	42.6	60.0	59.3	16.7
HoardWalk3	98.2	95.7	79.9	91.3	87.2	93.3	77.6	86.0	88.7	8.5
HoardWalk4	49.2	62.4	48.4	53.3	64.1	61.5	38.8	54.8	54.1	10.1
HoardWalk5	72.1	105.5	53.2	76.9	63.8	94.6	103.4	87.3	82.1	22.0
HoardWalk6	51.4	61.5	27.8	46.9	76.0	53.8	38.7	56.2	51.5	16.9
Space	**109.4**	**160.9**	**99.4**	**123.2**	**152.7**	**125.7**	**132.1**	**136.8**	**130.0**	**23.9**
Space1	62.6	89.7	54.1	68.8	78.0	70.4	76.3	74.9	71.9	12.5
Space2	10.8	28.0	13.7	17.5	13.7	19.6	15.2	16.2	16.8	6.2
Space3	25.0	34.4	25.2	28.2	50.4	29.6	34.5	38.2	33.2	9.4
Space4	10.7	8.3	5.7	8.2	10.2	5.6	5.7	7.2	7.7	2.4
Tokens	**54.4**	**58.9**	**39.9**	**51.1**	**50.3**	**47.8**	**65.5**	**54.5**	**52.8**	**8.9**
Tokens1	33.0	27.0	19.5	26.5	28.1	21.4	47.3	32.3	29.4	10.0
Tokens2	13.2	17.1	9.4	13.2	15.4	21.1	12.6	16.4	14.8	4.0
Tokens3	8.1	14.1	11.0	11.1	6.7	5.2	5.6	5.8	8.5	3.5
Event Configuration	**263.9**	**316.8**	**243.6**	**274.8**	**302.7**	**256.0**	**322.0**	**293.6**	**284.2**	**33.7**
EventConfig1	51.4	67.0	45.5	54.6	45.6	51.4	52.2	49.7	52.2	7.9
EventConfig2	129.8	104.2	93.3	109.1	131.1	95.7	113.2	113.3	111.2	16.5
EventConfig3	56.7	123.6	75.1	85.1	104.7	81.5	144.7	110.3	97.7	32.8
EventConfig4	14.3	8.7	6.4	9.8	4.2	13.2	4.2	7.2	8.5	4.4
EventConfig5	11.6	13.8	22.4	15.9	17.0	14.1	7.7	12.9	14.4	5.0
Token Expiry	**29.6**	**41.3**	**20.3**	**30.4**	**32.6**	**31.6**	**56.6**	**40.3**	**35.3**	**12.4**
Entire Tutorial	**3656.6**	**3770.4**	**2503.4**	**3310.1**	**3554.6**	**3530.7**	**2579.5**	**3221.6**	**3265.9**	**568.0**

Figure C.10: Timing Data Collected During the Tutorial

This table contains the time required for each user to complete each individual screen of the tutorial. In addition, we provide the total time required for all screens. For each screen, we calculate the average and standard deviation. All times are in seconds.

Screen Identifier	Time Required (in seconds) N1	N2	N4	Novice Avg	Time Required (in seconds) E1	E2	E3	Expert Avg	Overall Avg	StdDev
Exercises Introduction	72.0	50.6	54.7	59.1	65.8	74.6	52.5	64.3	61.7	10.5
Phase One	**1028.2**	**950.2**	**1169.6**	**1049.3**	**882.5**	**774.6**	**888.2**	**848.4**	**948.9**	**136.7**
Choose Urgency Colors	10.1	25.1	17.4	17.5	21.9	9.2	13.1	14.7	16.1	6.5
Network Conditions	67.3	42.4	83.0	64.2	40.9	46.9	64.3	50.7	57.5	16.8
Task Unavailable	111.3	88.6	62.9	87.6	85.0	74.0	79.4	79.5	83.5	16.3
Fix Task Unavailable	17.7	20.4	13.3	17.1	27.8	14.3	18.2	20.1	18.6	5.2
Token Expiration	26.5	15.5	16.5	19.5	22.3	17.7	26.0	22.0	20.8	4.9
Hoarding Details	112.7	91.9	85.6	96.7	101.3	103.2	99.4	101.3	99.0	9.4
Provide HW Advice	379.4	427.4	579.8	462.2	290.9	266.0	281.3	279.4	370.8	120.3
Space Status	39.4	70.9	65.8	58.7	77.7	33.5	33.4	48.2	53.5	20.2
Miss Events	209.1	135.2	206.4	183.6	168.8	157.1	227.8	184.6	184.1	35.7
Fix Miss Events	54.5	32.6	38.6	41.9	45.8	52.6	45.0	47.8	44.9	8.3
Phase Two	**1264.4**	**1326.8**	**1381.2**	**1324.1**	**1859.5**	**1127.7**	**1372.0**	**1453.1**	**1388.6**	**248.8**
Read Blizzard Bkgd	95.3	102.3	99.9	99.2	87.6	92.2	103.9	94.6	96.9	6.3
Define Bugs Task	425.5	394.9	335.1	385.2	830.9	305.8	386.8	507.8	446.5	193.2
Define Header Task	191.0	188.3	219.9	199.7	299.9	191.4	344.3	278.5	239.1	66.8
Define CV Task	355.2	352.9	259.6	322.6	352.6	202.8	189.0	248.1	285.4	78.4
Prioritize Tasks	193.4	276.6	423.3	297.8	271.8	241.0	249.7	254.2	276.0	78.0
Request HW	4.0	11.6	43.3	19.6	16.7	94.3	98.4	69.8	44.7	42.1
Phase Three	**794.2**	**726.9**	**770.2**	**763.8**	**623.0**	**666.6**	**831.8**	**707.1**	**735.5**	**79.2**
Read Incident Bkgd	74.7	98.4	79.5	84.2	82.4	99.7	140.4	107.5	95.9	24.1
Read Game Bkgd	37.4	60.1	46.8	48.1	50.0	68.1	17.2	45.1	46.6	17.9
Run Game	15.4	12.7	9.8	12.6	24.1	11.1	29.3	21.5	17.1	7.9
Filling RVM	33.3	35.2	59.7	42.7	37.6	37.1	76.3	50.3	46.5	17.5
Fixing RVM	Ø	21.1	16.6	18.9	31.8	27.4	24.8	28.0	24.3	5.8
Task Unavailable	116.0	118.4	134.4	122.9	121.6	69.0	92.4	94.3	108.6	23.7
Begin Hoard Walk	73.3	45.4	40.5	53.1	19.4	17.1	56.0	30.8	41.9	21.5
Task Available/End	38.6	20.5	32.4	30.5	10.2	22.4	11.3	14.6	22.6	11.3
Operating Weakly	46.9	57.7	41.3	48.6	37.2	64.5	61.1	54.3	51.5	11.2
Weak Miss	99.3	45.4	95.8	80.2	41.5	54.4	45.2	47.0	63.6	26.7
Operating Disco	51.9	57.0	58.3	55.7	33.4	40.1	79.0	50.8	53.3	15.9
Disco Miss	35.0	66.7	54.8	52.2	48.9	47.2	60.4	52.2	52.2	11.1
Operating Strongly	23.5	7.2	25.5	18.7	12.3	16.6	21.3	16.7	17.7	7.0
Token Expiry	79.8	29.4	19.9	43.0	23.6	33.9	41.6	33.0	38.0	21.8
Reintegration Pending	69.1	51.7	54.9	58.6	49.0	58.0	75.5	60.8	59.7	10.4
All Exercises	**3726.0**	**3725.4**	**3943.8**	**3798.4**	**4174.4**	**3385.4**	**3728.2**	**3762.7**	**3780.5**	**263.3**

Figure C.11: Timing Data Collected During the Exercises

This table contains the time required (in seconds) for each user to complete each exercise. In addition, we table includes the total time for all exercises, as well as for the three phases. For each exercise, we calculate the average and standard deviation. The computer-recorded time for the final exercise (Reintegration Pending) for user N4 was lost. The time reported is calculated from the video recording of the session.

Name of Event	Event Configuration					Time To Begin Investigation (seconds)							
						Novice			Expert				Std
	I	Color	P	B	F	1	2	4	1	2	3	Avg	Dev
Fill RVM	S	G→R			✓	9.7	11.8	6.6	17.0	4.8	8.1	9.7	4.3
Fixing RVM	S	R→G				Ø	11.5	10.2	86.9*	14.8	5.7	10.6	3.8
Task Unavailable	T	G→R		✓	✓	6.4	9.5	5.7	5.0	3.8	4.5	4.2	0.5
Hoard Walk Begin	H	G→Y				4.9	32.3	48.7	29.7	6.2	16.2	--	--
End Walk & Task Available	H T	Y→G R→G			 ✓	19.4	18.5	11.1	10.8	14.9	13.5	--	--
Weakly Connected	N	G→Y				41.3	5.8	8.7	4.5	4.3	4.5	11.5	14.7
Weakly Connected Miss	A	G→R	✓		✓	12.3	40.5	5.3	13.6	11.1	17.3	20.6	13.5
Disconnected	N	Y→R	✓			37.9	72.9	8.3	2.9	11.1	13.6	3.0	5.6
Disconnected Miss	A	G→R	✓		✓	10.8	31.0	4.5	36.0	49.3	17.3	17.2	13.6
Strongly Connected	N	R→G				3.2	8.6	8.9	3.5	4.1	6.0	6.1	2.7
Token Expiry	K	G→Y		✓		7.1	4.5	5.8	5.0	4.1	5.0	4.9	0.6
Reintegration Pending	K R	Y→R G→R			✓	19.4	24.2	8.0	8.2	19.3	6.6	13.3	8.0

Figure C.12: Time Until Investigation Begins

This table shows the time until the user begins investigating various events. For each event, we specify how it was configured. This configuration specifies on which indicator the event was alerted to the user (A=Advice, K=Tokens, N=Network, R=Reintegration, S=Space, and T=Task), what color change occurred (R=Red, Y=Yellow, and G=Green) and whether or not the indicator popped up a window (P), beeped the bell (B), or flashed the indicator light (F). For each user and event, the time until the user began investigated the event is listed. All times are in seconds. The empty set notation (Ø) means that the user did not investigate this event. Numbers shown in gray represent data that is considered suspect because the timing overlapped with either the previous or next event.

*User E1 did not fill out an incident report until the next event occurred. At the time of the next event, the user commented that they had forgotten to fill out a form. There was, however, no observable indication that the user noticed this event when it actually occurred.

Problem Identifier	Pts	Novice Users 1	2	4	Avg	Expert Users 1	2	3	Avg	Overall Avg	StdDev
Describe current network conditions	3	3	3	3	3.0	3	3	3	3.0	3.0	0
Describe “Tasks unavailable” event & configuration	6	5	6	6	5.7	6	6	6	6.0	5.8	0.4
Fix configuration for this event	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Determine token expiration time	1	1	1	1	1.0	1	1	1	1.0	1.0	0
Describe hoarding details	12	12	12	12	12.0	12	12	12	12.0	12.0	0
Provide hoard walk advice	2	2	1	0*	1.0	1	1	1	1.0	1.0	0.6
Describe current space status	3	2	3	3	2.7	1	2	3	2.0	2.3	0.8
Describe “Weakly Connected Cache Miss” event & “Disconnected Cache Miss” event	8	6	8	8	7.3	8	8	8	8.0	7.7	0.8
Fix configuration for above events	4	4	4	4	4.0	4	4	4	4.0	4.0	0
Define “Fixing Bugs” task	9	7	8	7	7.3	9	8	7	8.0	7.7	0.8
Define “Header Files” task	5	5	5	5	5.0	5	5	5	5.0	5.0	0
Define “CV” task	6	5	6	6	5.7	6	6	6	6.0	5.8	0.4
Prioritize newly defined tasks	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Request immediate hoard walk	1	1	1	0*	0.7	1	1	1	1.0	0.8	0.4
Describe “Filling RVM” problem	3	3	3	3	3.0	3	3	3	3.0	3.0	0
Describe “Fixed RVM” problem	2	Ø	2	2	1.3	2	2	2	2.0	1.7	0.8
Describe “Task Unavailable” problem	3	3	3	3	3.0	3	3	3	3.0	3.0	0
Describe “Hoard Walk Begin” event	2	2	2	1	1.7	2	2	2	2.0	1.8	0.4
Describe “Hoard Walk End/Task Available” event	2	2	2	2	2.0	2	2	1	1.7	1.8	0.4
Describe “Operating Weakly Connected” problem	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Describe “Weak Miss” event	2	2	1	2	1.7	2	2	2	2.0	1.8	0.4
Describe “Operating Disconnected” problem	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Describe “Disconnected Cache Miss” event	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Describe “Operating Strongly Connected” problem	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Describe “Tokens Expiry Event”	3	3	3	3	3.0	3	3	3	3.0	3.0	0
Describe “Reintegration Pending Tokens” event	3	3	3	3	3.0	3	3	3	3.0	3.0	0
Total Points	92	83	89	86	86.0	89	89	88	88.7	87.3	2.4
Percentage Correct	100	90	97	93	93.3	97	97	96	96.7	95.0	2.9

Figure C.13: Correctness Ratings

This table shows the score each user received on each of the exercises as well as their total and percent correct. The empty set notation (Ø) indicates the user did not perform this exercise. User N4 explained precisely which files she would have requested to have fetched during the “Provide hoard walk advice” exercises; unfortunately, she failed to actually select those objects to be fetched in the interface. Had she completed the exercise as she described, her score would have been a 1. Because of her failure to complete this exercise, she was also unable to complete the “Request immediate hoard walk” exercise – though she did the most reasonable thing given the situation.

Problem Identifier	Par	Novice Users 1	2	4	Avg	Expert Users 1	2	3	Avg	Overall Avg	StdDev
Describe current network conditions	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Describe “Task Unavailable” event & configuration	3	5	3	6	4.7	6	3	3	4.0	4.3	1.5
Fix configuration for this event	4	$\underline{3}$	4	$\underline{3}$	3.3	4	4	4	4.0	3.7	0.5
Determine token expiration time	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Describe hoarding details	4	6	$\underline{2}$*	4	4.0	6	4	$\underline{3}$	4.3	4.2	1.6
Provide hoard walk advice	10	35*	46	31	37.3	20	36	26	27.3	32.3	9.0
Describe current space status	2	2	2	2	2.0	2	2	2	2.0	2.0	0
Describe “Weakly Connected Cache Miss” event & “Disconnected Cache Miss” event	3	7	5	3	5.0	3	3	15	7.0	6.0	4.7
Fix configuration for above events	8	12*	9	8	9.7	9	17	8	11.3	10.5	3.5
Define “Fixing Bugs” task	36	62	47	40	49.7	96	44	58	66.0	57.8	20.5
Define “Header Files” task	16	26	26	25	25.7	47	37	100	61.3	43.5	29.0
Define “CV” task	21	73	46	47	55.3	57	31	37	41.7	48.5	15.0
Prioritize newly defined tasks	14	$\underline{5}$*	33*	38	25.3	27	24	37	29.3	27.3	12.2
Request immediate hoard walk	3	3	3	7	4.3	3	5	7	5.0	4.7	2.0
Describe “Filling RVM” problem	2	3	6	6	5.0	4	6	6	5.3	5.2	1.3
Describe “Fixed RVM” problem	0	Ø	0	0	0	0	2	2	1.3	0.8	1.1
Describe “Task Unavailable” problem	3	7	10	5	7.3	7	$\underline{2}$	3	4.0	5.7	2.9
Describe “Hoard Walk Begin” event	0	1	0	0	0.3	0	0	1	0.3	0.3	0.5
Describe “Hoard Walk End/Task Available” event	0	3	5	8	5.3	7	4	4	5.0	5.2	1.9
Describe “Operating Weakly Connected” problem	2	2	4	2	2.7	3	$\underline{1}$	6	3.3	3.0	1.8
Describe “Weak Miss” event	1	3	3	2	2.7	3	1	2	2.0	2.3	0.8
Describe “Operating Disconnected” problem	1	5	4	3	4.0	$\underline{0}$*	$\underline{0}$	7	2.3	3.2	2.8
Describe “Disconnected Cache Miss” event	2	2	2	2	2.0	2	4	2	2.7	2.3	0.8
Describe “Operating Strongly Connected” problem	0	2	0	2	1.3	2	1	0	1.0	1.2	1.0
Describe “Tokens Expiry Event”	0	1	3	2	2.0	2	3	2	2.3	2.2	0.8
Describe “Reintegration Pending Tokens” event	4	$\underline{1}$	$\underline{2}$	10	4.3	4	$\underline{2}$	4	3.3	3.8	3.3
Total	143	273	269	260	267	318	240	343	300	284	39
Efficiency (Score/Par)	1.0	1.9	1.9	1.8	1.9	2.2	1.7	2.4	2.1	2.0	0.3

Figure C.14: Efficiency Ratings

This table shows the number of steps each user took to perform each of these required tasks. The empty set notation (Ø) indicates that the user did not perform the task. Underlined numbers represent exercises for which this user was more efficient than the interface expert. User N1 requested significantly less data be fetched during the “Provide Hoard Walk Advice” exercise though he required more steps to provide that advice. User N1 hit the certain buttons multiple times in a row (as many as eight). Consecutive events such as this are counted as two actions for the purposes of measuring the user’s efficiency. Primarily this effects the two “event configuration” exercises and the three “task definition” exercises. User N1 prioritized tasks as he defined them so his efficiency on the “Prioritize newly defined tasks” exercise is artificially low. User N2 has an artificially high rating on this same task because he went back to reorganize the “Define ‘Header Files’ Task” while performing this task. User N2 has an artificially low efficiency score for the “Describe hoarding details” exercises because he resized the window and avoided scrolling. User E1 already had the “Network Information” window visible when he performed the “Describe ‘Operating Disconnected’ problem” exercise.

Window	Count	Display Time (s) Min	Display Time (s) Max
Control Panel	31	0.2	1.2
Token Information	24	0.0	0.7
Space Information	24	0.1	0.7
Network Information	30	0.1	0.9
Advice Information	21	0.1	0.7
Hoard Walk Advice	32	0.0	0.8
Task Information	50	0.1	3.4

Figure C.15: Results for the TimeToDisplay Metric

This table shows the time required to display each of the relevant windows. For each window, we show the number of measurements observed over all six users during the study, the minimum display time and the maximum display time. The measurements exhibit a high variance (one typical of garbage collected languages). For this reason, we do not present the average or standard deviation since those metrics require a normal distribution to be meaningful.

C.3 Qualitative Data

This section contains all responses to the evaluation questionnaire administered shortly after each participant completed the Exercises. For responses with a fixed set of answers, the individual users choosing each response is shown, with any additional comments indicated below and identified by the participant's identification in parentheses. For example in the question below, N1 thought the tutorial was neither complete nor incomplete and N2, N4, E1, E2, and E3 thought the tutorial was complete. In addition, we see that N1, E1, E2, and E3 provided additional comments on this issue. For discussion questions, all answers are shown; the participant's identification number (in parentheses) identifies each response.

1) The following questions are related to the tutorial:
   a) The tutorial coverage was:

very complete	Incomplete	neither complete nor incomplete	complete	very complete
		N1	N2, N4, E1, E2, E3	

⇒ `(N1) The tutorial didn't address some features which could get me out of situations.  [Debriefing reveals that user was referring to the lack of material covering reintegration.]`

⇒ `(E1) The only thing not in the tutorial was the reintegration indicator, which was used in the final test.`

⇒ `(E2) (the reintegration stuff at the end was not covered)`

⇒ `(E3) didn't say anything about reintegration`

b) Understanding the tutorial was:

very difficult	Difficult	neither easy nor difficult	easy	Very easy
			N1, N2, N4, E1, E2	E3

⇒ (E1) I had some difficulty with <Tab> vs. <Enter> especially in task and subwindows.

c) Did the tutorial allow you to grasp the scope of the capabilities of the inteface?

YES: N1, N2, N4, E1, E2, E3

NO:

⇒ (N1) What was covered

⇒ (E1) At least I think to

d) Was the tutorial presented at an appropriate level of detail? (Circle all that apply.)

not appropriate, too little detail:

appropriate amount of detail: N1, N2, N4, E2, E3

not appropriate, too much detail: E1

⇒ (E1) I didn't need the Coda background, or full descriptions of all events.

⇒ (E2) (or maybe a little too much detail, but then I am not used to reading manuals ☺)

2) The following questions relate to the indicator light interface.

a) Using this interface was:

very difficult	difficult	neither easy nor difficult	easy	very easy
			N1, N2, E1	N4, E2, E3

⇒ (E1) Some confusion about which indicator to open. [Debriefing revealed that the user was referring to the Task and Hoard Walk indicators.]

b) Finding the features I wanted in the indicator lights was:

very difficult	difficult	neither easy nor difficult	Easy	very easy
		N1, E3	N2, N4, E1, E2	

⇒ (N1) Some event were not where I expected them. [Debriefing revealed user was referring to difficult finding events by their indicator in the "Event Configuration" tab.]

⇒ (E1) Some confusion about which indicator to open.

⇒ (E2) (see 3b and 6b)

⇒ (E3) a "all events" pseudo-event would have been nice; the event config dialogue box was a little clumsy

c) If you were a Coda user, how likely or unlikely would you be to keep the indicator lights visible on your screen all (or almost all) the time?

Very unlikely	Unlikely	neither likely nor unlikely	Likely	very likely
			N2, N4, E2, E3	N1, E1

⇒ (E1) Absolutely

⇒ (E3) Actually, a codacon provides immediate if terse, feedback for most events (so, ex., I know my venus hasn't died), so it might be more important to me.

d) Did the interface present information at an appropriate level of detail? (Circle all that apply.)

not appropriate, too little detail: N1, E3

appropriate amount of detail: N2, N4, E1, E2

not appropriate, too much detail:

⇒ (N1) The first level interface was appropriate, but help didn't tell me what was going on.

⇒ (E3) the "no such file" indication for task definition was pretty subtle (i.e., outright confusing).

3) The following questions relate to hoarding, both in general and specifically in terms of your preparation for operating disconnected for the duration of the blizzard.

a) Understanding the concept of hoarding was:

very difficult	difficult	neither easy nor difficult	easy	very easy
			N1, N2, E2	N4, E1, E3

⇒ `(E1) I was already quite familiar.`

⇒ `(E2) I have had experience with it before. It is nice to have the system track which files are used by which programs.`

b) Preparing for the blizzard disconnection was:

very difficult	difficult	neither easy nor difficult	easy	very easy
		E3	N1, N2, N4, E1, E2	

⇒ `(E1) I had to think about how exactly to structure the tasks.`

⇒ `(E2) trickiest part was editting [`*sic*`] the file/directory lists, wasn't sure of the tab/enter interaction`

c) My confidence in the task definitions I created in preparation for the blizzard is:

very low	low	neither low nor high	high	very high
			N1, N2, N4, E1, E2, E3	

⇒ `(N4) ask me again after the blizzard`

⇒ `(E1) I think everything will work, though I might have missed something. [Debriefing reveals that user lacks confidence based upon past knowledge of failed hoards.]`

⇒ `(E2) wasn't sure about SOSP16 proofreading, whether "gv" was available (sorry, this might have been from previous part)`

4) As we mentioned in the tutorial, our interface is adapted from the dashboard indicator lights of a car. The following questions are related to your experiences with these indicator lights.

a) Do you prefer to drive a car that uses indicator lights to one that does not?

YES (prefer one *with* indicator lights): N1, N4, E1, E2, E3

NO (prefer one *without* indicator lights): N2

⇒ (N2) Indicator lights are all right, but I prefer gauges for some measurements (eg. battery, oil pressure). Lights tend to come on only when the problem is severe. In your interface, however, they worked fine.

⇒ (N4) (especially "door ajar" on rental cars with stiff doors.)

⇒ (E2) (no experience with cars without)

⇒ (E3) I prefer both lights and guages [*sic*]

b) Dashboard indicator lights are:

Very ineffective	ineffective	neither effective nor ineffective	Effective	very effective
		N2	N1, N4, E1, E2, E3	

⇒ (N4) except when false positives cause user to ignore e.g. "check oil"

⇒ (E1) I rarely miss them.

⇒ (E3) they should blink

c) Please describe an instance of when you used the dashboard indicator lights in the last month.

⇒ (N1) I use them to tell me when to get gas.

⇒ (N2) Haven't used them.

⇒ (N4) actually, I don't own a car.

⇒ (E1) Not in the last month - but I have used them in the past for failed tail-lights.

⇒ (E2) None (have not driven in the last month)

⇒ (E3) I check "door ajar" pretty often, but otherwise I "use" them by having nothing happen.

d) Please describe a particularly memorable event when you found the dashboard indicator lights to be either particularly effective or particularly ineffective.

⇒ (N1) I have a check system light which tells me nothing. My car may be out of washer fluid or may need new spark plugs to anything in between.

⇒ (N2) On my old Dodge Dart, the oil light would come on when it was almost bone dry (nothing on dipstick). Would have preferred an oil pressure gauge.

⇒ (N4) N/A

⇒ (E1) Ineffective: the light failure sensor failed, but the taillights were fine.

⇒ (E2) low fuel warning was quite useful once, in the middle of a long trip (had lost track of gas usage).

⇒ (E3) Once my radiator had a leak. Because I have a temperature guage [*sic*], I was able to drive the car until just <u>before</u> overheating, refill it, and continue. A mere light would not have sufficed.

5) a) If you are not currently a Coda user, would you be interested in becoming one?

YES: N1, N2

NO: N4

⇒ (N2) I don’t use a laptop, but having it keep track of file usage and caching appropriately seems nice for network outages.

⇒ (N4) but I would be in I tended to travel or work at home (or if officemates tended to kick out network connection)

b) If you are currently (or have been) a Coda user, would you be interested in using this interface?

YES: E1, E2, E3

NO:

⇒ (E1) Especially with the customization options.

⇒ (E2) *much* nicer than the old hoard/spy interface. Ability to stop long transfers over weakly connected links would also be useful.

6) a) Please describe the aspect of the interface that you liked most.

⇒ (N1) I liked the cache management for hoarding. [Debriefing revealed that user was referring to the "Task Information" window.]

⇒ (N2) Easy to define tasks. I like that it tells you the state of the network and keeps track of what files are important (eg. asking if your current task is "seriously impeded").

Under AFS, when the network goes down, you just have to guess at what's going on.

⇒ (N4) task definition

configurability of event notification

⇒ (E1) Customization - deciding what pops up and what isn't so interruptive.

⇒ (E2) Simple ways to organize file lists, and to track file usage by programs. Easy to get at other system info (like bandwidth & cache usage)

⇒ (E3) Status of hoard tasks (X% available)

Status of machine, network

b) Please describe the aspect of the interface that you liked least.

⇒ (N1) I hated entering filenames. There should at least be path completion. [During debriefing, user suggested using <Tab> to do filename completion in the data and program definition windows.]

⇒ (N2) A couple of times I deleted tasks when I meant to delete an item in a task.

⇒ (N4) Places where download time is expressed in seconds (popup had it in minutes, seconds which is ok)

⇒ (E1) <Tab> vs. <Enter>: entering information on the task windows.

⇒ (E2) Occasionally I wondered what had been saved by the "save" buttons – ie, whether all tasks were saved at once. Also, the distinction between changing the name of a task and creating a new task was not completely clear. On the indicator lights – I sometimes worried that I might miss some change – perhaps and [*sic*] indication of "this has changed since you last looked at it" would be useful.

⇒ (E3) I generally find complex graphical user interfaces to be tedious. The "no such file" indication was a real challenge.