

UNDERSTANDING “JUST ENOUGH” COMPUTER USERS:  
MOTIVATION STYLE AND PROFICIENCY

By  
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A THESIS

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

In Computer Science

MICHIGAN TECHNOLOGICAL UNIVERSITY

2012

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This thesis has been approved in partial fulfillment of the requirements for the Degree of MASTER OF SCIENCE in the Department of Computer Science.

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# Table of Contents

Table of Contents.....	5
List of Figures.....	8
List of Tables.....	10
Abstract.....	14
1 Introduction.....	15
2 Goals and Hypotheses.....	17
3 Background.....	18
3.1 Daily Computer Users.....	18
3.2 Motivation Style.....	19
3.2.1 Amotivation.....	19
3.2.2 Intrinsic Motivation.....	20
3.2.3 Extrinsic Motivation.....	21
3.3 Competence.....	23
3.4 Satisficing Compared to Just Enough.....	23
3.5 Skill Transfer .....	23
3.6 Unfamiliar and Familiar Tasks.....	24
3.7 Stumble .....	24
3.8 Ethnographic Methods.....	25
3.9 Think Aloud Protocol.....	26
4 Method.....	27
4.1 Participant Selection.....	27
4.1.1 Participant Population.....	28
4.1.2 Method for Selecting Participants.....	28
4.1.3 The Need for a Specific Population.....	28
4.1.4 Procedures for Assuring Participation Is Voluntary.....	28
4.1.5 Compensation.....	28
4.1.6 Deception.....	29
4.1.7 Privacy and Confidentiality.....	29
4.1.8 Potential Risks.....	29
4.1.9 Informed Consent.....	29
4.1.10 Conflict of Interest.....	30
4.2 Pre-Questionnaire.....	30
4.3 Motivation Inventory.....	30
4.3.1 Inventory Source.....	30
4.3.2 Inventory Questions.....	31
4.3.3 Scoring Inventory.....	33
4.3.4 Statistical Analysis Method.....	35
4.3.5 Pilot Study of Inventory.....	35
4.4 Demographic Questionnaire.....	36

4.5 Participant Interview.....	36
4.6 Observation Method.....	36
4.6.1 Directing Observations .....	37
4.6.2 Documenting Observations.....	38
4.6.3 Analyzing Observations.....	38
4.6.4 Setting.....	39
4.6.5 Familiar and Unfamiliar System.....	40
4.6.6 Familiar and Unfamiliar Software.....	40
4.7 Post Questionnaire.....	46
5 Results.....	47
5.1 Pre-Questionnaire Results.....	47
5.2 Inventory Results.....	49
5.2.1 Parametric or Non Parametric Statistics.....	49
5.2.2 Required Correlation.....	51
5.2.3 Separating Into Groups.....	51
5.2.4 Differences Between Extrinsic and Intrinsic.....	55
5.2.5 Data Screening.....	58
5.2.6 Other Characteristics of Inventory Respondents.....	60
5.3 Quantitative Observation Results.....	62
5.3.1 Differences Between Extrinsic and Intrinsic in Code Results.....	63
5.3.2 Relationships Found in Extrinsic and Intrinsic.....	66
5.4 Qualitative Observation Results.....	69
5.4.1 Introducing Observed Participants.....	69
Extrinsic Participants.....	70
Intrinsic Participants.....	72
5.4.2 Individual Performance and Characteristics.....	73
Extrinsic Participants.....	73
Intrinsic Participants.....	75
5.4.3 Examples of Performance Difficulties.....	78
Example One: Alice.....	78
Example Two: Molly.....	81
5.4.4 JE User vs. Intrinsic: Marsha and Rebecca.....	83
5.4.5 JE User vs. Intrinsic: Walter and Mike.....	84
5.4.6 More on Resist.....	86
5.4.7 More on Persist.....	91
5.4.8 More on Quit.....	93
5.4.9 Use Help or Not.....	96
5.4.10 Lowest Interest and Lowest Perceived Choice.....	97
5.4.11 Test Effects.....	99
Changes in Emotion.....	100
Learning Without Teaching.....	100
Factors Impacting Performance.....	103

5.5 Post Observation Questionnaire Results.....	104
5.6 JE User Questionnaire Results.....	107
6 Discussion.....	108
7 Future Work.....	111
Weaknesses.....	111
Strengths.....	111
Bigger Sample.....	112
Describing the Group.....	112
Test Conditions.....	113
8 Conclusions.....	114
9 Reference List.....	115
10 Table of Appendices.....	119

# List of Figures

**Figure 1: Motivation Styles, adapted from Ryan and Deci (2000) ‘Taxonomy of Human Motivation’. Low interest and enjoyment are on the left ranging to high interest and enjoyment on the right..... 21**

**Figure 2: Extrinsic, Intrinsic, and Other based on high and low external regulation and high and low interest/enjoyment factors..... 34**

**Figure 3: Screenshot of Obscure Company Webmail, an unfamiliar software for participants. (Fair use of copyrighted material: see Appendix A.) ..... 41**

**Figure 4: Screenshot of GMX Webmail, an unfamiliar software for participants. (Fair use of copyrighted material: see Appendix A.) ..... 42**

**Figure 5: Screenshot of IBM Lotus Symphony, the word processor that was unfamiliar software for participants. (Fair use of copyrighted material: see Appendix A.) ..... 43**

**Figure 6: Side by side comparison of webmail "compose" button: Obscure, GMX, and Gmail. (Fair use of copyrighted material: see Appendix A.) ..... 44**

**Figure 7: Venn Diagram of Extrinsic, Intrinsic, and Other based on grouping variable of inventory factors external regulation and interest/enjoyment..... 52**

**Figure 8: Extrinsic, Intrinsic, High-High, & Low-Low of all Inventory Respondents. Key to “XX, XX%”: total count, percent of all 66 respondents..... 53**

**Figure 9: Digital Natives Compared to Total of Each Group..... 54**

**Figure 10: Mean Age by Extrinsic and Intrinsic. Error bars represent standard deviation. 55**

**Figure 11: Mean Amotivation by Extrinsic and Intrinsic. Error bars indicated standard deviation..... 56**

**Figure 12: Mean Perceived Choice by Extrinsic and Intrinsic. Error bars represent standard deviation..... 56**

**Figure 13: Mean Perceived Competence by Extrinsic and Intrinsic. Error bars represent standard deviation..... 57**

**Figure 14: Mean Perceived Competence by Extrinsic and Intrinsic. Error bars represent standard deviation..... 57**

**Figure 15: Graphic Explanation of Phase 2 and Phase 3..... 63**

**Figure 16: Stumbles shown for phase 2 and phase 3 for each extrinsic participant..... 65**

**Figure 17: Comparing 9 Extrinsic and 7 Intrinsic for Stumble and Fall Performance. Intrinsic are on the left and extrinsic are on the right..... 68**

**Figure 18: Alice Basics..... 78**

**Figure 19: Screenshots of Old and New “Groups” and “Add” Contact To Group buttons. (Fair use of copyrighted material: see Appendix A.) ..... 80**

**Figure 20: Molly Basics..... 81**

**Figure 21: Screenshot of "Contacts" button behind "Mail" in Gmail. Doesn't look like a button with no rectangle or color change. (Fair use of copyrighted material: see Appendix A.) ..... 82**

**Figure 22: Marsha Basics..... 83**

**Figure 23: Rebecca Basics..... 83**

**Figure 24: Walter Basics..... 84**

**Figure 25: Mike Basics..... 85**

**Figure 26: Olivia Basics..... 86**

**Figure 27: Mike Basics..... 89**

**Figure 28: Miranda Basics..... 90**

**Figure 29: Marsha Basics..... 91**

**Figure 30: Walter Basics..... 92**

**Figure 31: Lilly Basics..... 94**

**Figure 32: Screenshot of "Contacts" button behind "Mail" in Gmail. Doesn't look like a button with no rectangle or color change. (Fair use of copyrighted material: see Appendix A.) ..... 94**

**Figure 33: Lucy Basics..... 95**

**Figure 34: Beth Basics..... 96**

**Figure 35: Comparing Lilly & Olivia. Both are the lowest interest and choice of all 16 observed participants..... 98**

**Figure 36: Comparing Lilly and Olivia Performance. No bar means zero occurrences of that code..... 98**

**Figure 37: Mary Ann Basics..... 99**

**Figure 38: Self Rating of Max Stress for extrinsic and intrinsic participants on a scale of 1 to 10 where 10 is high and 1 is low. There are only 7 intrinsics so no red bar for intrinsic on the far right..... 106**

# List of Tables

Table 1: Rubric for Coding Observation Transcripts.....39

Table 2: Detail of Near Skill Transfer: work flow comparison of unfamiliar webmail software.....44

Table 3: Summary of Pre-Questionnaire self report answers for each observed participant ordered by motivation style. ....47

Table 4: Results from Pre-Questionnaire: What would you say your main reasons are for using a computer now. Ordered alphabetically by code name.....48

Table 5: Inventory Skewness and Kurtosis by Factor.....50

Table 6: Homogeneity of Inventory Factors.....50

Table 7: Summarizing Parametric or Non Parametric Analysis.....51

Table 8: Pearson Correlation of Interest/Enjoyment & Perceived Choice.....51

Table 9: All 66 Respondents by Motivation Style.....53

Table 10: Significant Differences in Inventory Scores, Age, & Digital Native.....57

Table 11: Minimum & Maximum Scores for Extrinsic and Intrinsic.....58

Table 12: Mean & Standard Deviation for Each Group: n=66 Inventory Respondents, n=16 Observation Participants, n=9 Extrinsic Observed, n=7 Intrinsic Observed.....59

Table 13: Summary of Correlations: n=66 Inventory Respondents & n=16 Observed Participants .....60

Table 14: Digital Native Significant Correlations for Observed Participants.....61

Table 15: Occurrences of Each Code for Extrinsic & Intrinsic in Phases 2 & 3.....62

Table 16: Extrinsic and Intrinsic Have Significant Differences in Phase 2, Phase 3, and total occurrences.....63

Table 17: Total Persist and Quit Occurrences for Extrinsic and Intrinsic.....64

Table 18: Comparing Phase 2 and Phase 3: No Significant Differences.....64

Table 19: Occurrences of Each Code for Extrinsic & Intrinsic in Phases 2 & 3. Asterisk indicates statistically significant difference for this code between extrinsic and intrinsic.....65

Table 20: Total Occurrences of Each Code for Extrinsic and Intrinsic.....66

Table 21: Extrinsic Group Significant Relationships.....66

Table 22: Intrinsic Group Significant Relationships.....67

Table 23: Mean Number of Code Occurrences for Extrinsic and Intrinsic.....67

Table 24: Extrinsic Participant Code Occurrences for Phases 2, 3, and total. Asterisk denotes digital native (Molly and Lucy). “Time Persisting” is how long the coded persists each took.....74

Table 25: Intrinsic Participant Codes for Phases 2 & 3. Asterisk denotes digital native (Beth, Jane, Peter, and Roger). “Time Persisting” is how long the coded persists each took.....75

Table 26: Comparing Intrinsic Digital Native Inventory Scores Ordered from Lowest Perceived Competence to Highest.....	76
Table 27: Comparing Intrinsic Digital Non-Native Inventory Scores Ordered from Lowest Perceived Competence to Highest.....	77
Table 28: Comparing Marsha & Rebecca.....	84
Table 29: Comparing Walter & Mike.....	85
Table 30: Post Observation Questionnaire Results including feedback from participant: maximum stress self rating on a 1 to 10 scale with 10 being high and 1 being low.....	104
Table 31: Max Stress Self Rating of Participant by intrinsic (left) and extrinsic (right) on a scale of 1 to 10 with 10 being high and 1 is low. Ordered from low stress to high for both groups.....	106
Table 32: Results: motivation inventory all 66 respondents, mean raw scores per person.....	141
Table 33: Parametric Independent Samples T test: are extrinsic and intrinsic different in all 66 inventory respondents. Test run with IBM SPSS statistics software.....	143
Table 34: Parametric Pearson Correlation test: all 66 inventory respondents. Run using IBM SPSS statistics software.....	143
Table 35: Non Parametric Spearman's rho correlations: all 66 inventory respondents. Run using IBM SPSS statistics software.....	144
Table 36: Results motivation inventory, age, experience, self rating of competence, performance codes from transcripts for all 16 observed participants per person.....	145
Table 37: Descriptive statistics of all 16 observed participants. Run using IBM SPSS statistics software.....	146
Table 38: Descriptive statistics, 16 observed separated into 9 extrinsic and 7 intrinsic. Run using IBM SPSS statistics software.....	146
Table 39: Non Parametric Mann-Whitney U test Mean Rank: 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.....	147
Table 40: Non Parametric Mann-Whitney U test 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.....	148
Table 41: Parametric Independent Samples T test 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.....	148
Table 42: Pearson Correlations for all 16 observed participants.....	149
Table 43: Non Parametric Spearman's rho correlation tests for all 16 observed participants. Run with IBM SPSS statistics software.....	151
Table 44: Parametric Pearson Correlation for 9 extrinsic separate from 7 intrinsic. Run using IBM SPSS statistics software.....	152
Table 45: All 16 Observed Participants: separated by 9 extrinsic and 7 intrinsic for all code	

occurrences per participant with descriptive statistics. Also separated into Phase 2: familiar system, Phase 3: unfamiliar system, and combine phase 2 & 3.....	156
Table 46: Inter Rater Reliability Results: Rater P.M. and H.K.....	157
Table 47: Inter Rater Reliability Results: Rater S.K. and H.K.....	158
Table 48: Descriptive Statistics for all 16 observed participants. Run with IBM SPSS statistics software.....	159
Table 49: Non Parametric Mann-Whitney test Mean Ranks, comparing extrinsic and intrinsic separated for phase 2, phase 3, or combined phases 2 & 3. Test run with IBM SPSS statistics software.....	159
Table 50: Non Parametric Mann-Whitney U test: are extrinsic and intrinsic different, separated into phase 2, phase 3, and combined phase 2 & 3. Test run with IBM SPSS statistics software. ....	160
Table 51: Non Parametric Mann-Whitney U test: are phase 2 and phase 3 difference, separated into intrinsic and extrinsics. Test run with IBM SPSS statistics software.....	161
Table 52: Non Parametric Spearman's rho correlation tests: separated into phase 2, phase 3, and combined phase 2 & 3. Statistics run with IBM SPSS statistics software.....	161
Table 53: Transcript Code Rules.....	169
Table 54: Explanation of "Time" column in transcripts.....	169
Table 55: Alice Detail Summary.....	170
Table 56: Alice Familiar and Unfamiliar Transcripts.....	170
Table 57: Beth Detail Summary.....	174
Table 58: Beth Familiar and Unfamiliar Transcripts.....	174
Table 59: Jane Detail Summary.....	176
Table 60: Jane Familiar and Unfamiliar Transcripts.....	176
Table 61: Lilly Detail Summary.....	178
Table 62: Lilly Familiar and Unfamiliar Transcripts.....	178
Table 63: Lucy Detail Summary.....	183
Table 64: Lucy Familiar and Unfamiliar Transcripts.....	183
Table 65: Marsha Detail Summary.....	187
Table 66: Marsha Familiar and Unfamiliar Transcripts.....	187
Table 67: Mary Ann Detail Summary.....	194
Table 68: Mary Ann Familiar and Unfamiliar Transcripts.....	194
Table 69: Mike Detail Summary.....	199
Table 70: Mike Familiar and Unfamiliar Transcript.....	199
Table 71: Miranda Detail Summary.....	205

Table 72: Miranda Familiar and Unfamiliar Transcripts.....	205
Table 73: Molly Detail Summary.....	209
Table 74: Molly Familiar and Unfamiliar Transcripts.....	209
Table 75: Olivia Detail Summary.....	214
Table 76: Olivia Familiar and Unfamiliar Transcripts.....	214
Table 77: Peter Detail Summary.....	219
Table 78: Peter Familiar and Unfamiliar Transcripts.....	219
Table 79: Rebecca Detail Summary.....	222
Table 80: Rebecca Familiar and Unfamiliar Transcripts.....	222
Table 81: Roger Detail Summary.....	224
Table 82: Roger Familiar and Unfamiliar Transcripts.....	224
Table 83: Walter Detail Summary.....	226
Table 84: Walter Familiar and Unfamiliar Transcripts.....	226
Table 85: Wilma Detail Summary.....	232
Table 86: Wilma Familiar and Unfamiliar Transcripts.....	232

# Abstract

Among daily computer users who are proficient, some are flexible at accomplishing unfamiliar tasks on their own and others have difficulty. Software designers and evaluators involved with Human Computer Interaction (HCI) should account for any group of proficient daily users that are shown to stumble over unfamiliar tasks. We define “Just Enough” (JE) users as proficient daily computer users with predominantly extrinsic motivation style who know just enough to get what they want or need from the computer. We hypothesize that JE users have difficulty with unfamiliar computer tasks and skill transfer, whereas intrinsically motivated daily users accomplish unfamiliar tasks readily. Intrinsic motivation can be characterized by interest, enjoyment, and choice and extrinsic motivation is externally regulated.

In our study we identified users by motivation style and then did ethnographic observations. Our results confirm that JE users do have difficulty accomplishing unfamiliar tasks on their own but had fewer problems with near skill transfer. In contrast, intrinsically motivated users had no trouble with unfamiliar tasks nor with near skill transfer. This supports our assertion that JE users know enough to get routine tasks done and can transfer that knowledge, but become unproductive when faced with unfamiliar tasks.

This study combines quantitative and qualitative methods. We identified 66 daily users by motivation style using an inventory adapted from Deci and Ryan (Ryan and Deci 2000) and from Guay, Vallerand, and Blanchard (Guay et al. 2000). We used qualitative ethnographic methods with a think aloud protocol to observe nine extrinsic users and seven intrinsic users. Observation sessions had three customized phases where the researcher directed the participant to: 1) confirm the participant’s proficiency; 2) test the participant accomplishing unfamiliar tasks; and 3) test transfer of existing skills to unfamiliar software.

# 1 Introduction

Why do some daily computer users quickly adapt to new tasks while others stumble and give up? There are daily users that are experienced and proficient that still become baffled by change. One answer might be a user's experience and confidence. But even given two daily users with similar experience and confidence levels at tasks they know, can there be other factors causing one to adopt new skills easily and the other to have difficulties?

We hypothesize that there are some "Just Enough" (JE) users, identified by having predominantly extrinsic motivation, that struggle to adapt to change or new skills. We are defining JE users as effective and proficient daily users with extrinsic motivation style. We hypothesize they have fragile proficiency and narrow problem solving in the domain of computer use because they only want to know "just enough". In contrast, proficient daily users with intrinsic motivation do not struggle but instead accomplish unfamiliar tasks easily. We sometimes refer to JE users as simply "extrinsics" and predominantly intrinsically motivated proficient daily users as "intrinsic" in this thesis.

Our research methods begin by identifying motivation style for daily users across a broad spectrum of age and perceived competency with 66 respondents completing a quantified motivation inventory. An inventory is another word for questionnaire. Participants who scored with predominantly extrinsic or intrinsic motivation style were then observed using qualitative ethnographic techniques while the participant used a think aloud protocol.

Observation directions were customized for each participant's experience. Phase one included tasks that confirmed the participant's proficiency in their familiar environment, with phase 2 directing them to do unfamiliar tasks in their familiar environment on their own. The observations ended with phase 3 in an unfamiliar environment doing the same routine tasks they already showed proficiency in, but this time on unfamiliar software. Could the participant transfer their skills?

The observer directed participants but did not teach them. We asked questions to find out what tasks the participant had never tried. Then we would ask the participant to do that task, but without giving any instruction on how to do it. Participants were expected to find their own way. The directions were customized to fit each participant's existing proficiency and experience level. We were looking for daily user's ability to accomplish new tasks on their own. We were not studying their ability to learn from a human tutor. We were not studying cognitive processes nor were we checking for retained skill acquisition.

Qualitative ethnographic methods were used to gather the nuances, attitudes, and feelings as participants coped with the unfamiliar tasks and skill transfer. Results from our study support our hypothesis that daily users with extrinsic motivation have fragile proficiency and narrow problem solving as demonstrated by their difficulty accomplishing unfamiliar tasks in their familiar system and software. In contrast, intrinsically motivated users did not have trouble with new tasks.

Skill transfer was designed to be near skill transfer, using unfamiliar webmail software in an unfamiliar operating system. JE users had some trouble with the near skill transfer, indicating that knowing enough to be proficient was not enough knowledge to transfer skills to a reasonably well designed unfamiliar software.

This thesis begins with goals of the study then background information on computer users, motivation, and the terms used in this paper. Next we describe the method of the study in detail, explaining the quantitative inventory and the ethnographic observations with quantified coding. The

results section includes the scores and analysis of the 66 inventory respondents, the selection of 16 observation participants, and the results of the three phase observations as quantified code data and as transcripts illustrating the themes found in the study. We conclude with a discussion of results, ideas for future work, and conclusions.

## 2 Goals and Hypotheses

The goal of this study is to find out if it is true that people can be identified as “Just Enough” users, and if there is such a group, how do they perform and what are their attitudes and feelings when using computers. The value of this work is to draw attention to an underrepresented group and show the difficulties of competent computer users who become unproductive with changed conditions. We suspect that JE users are predominantly found among older users, who will be a larger percent of the population in the near future and are an important constituency of the rising population of common users and therefore worthy of consideration (Pollock 2005).

We demonstrate that JE users, a segment of the proficient daily computer user population, are handicapped when faced with unfamiliar tasks. This has consequences for the way we design and evaluate software interactions. The presence of JE users may help explain lack of adoption of unfamiliar technology. We find that interest and enjoyment do positively correlate to competence with unfamiliar tasks. Therefore, low interest JE users can be predicted to have low adaptability with unfamiliar tasks.

As Barkhuus and Rode say in their 2012 summary paper of 24 years of HCI, “HCI is as much about evaluation as it is about development” (Barkhuus and Rode 2012). We agree that evaluation needs to have a proper representative sample of the potential users of the software. Their study finds that over 50% (2000) and 48% (2006) of subjects in HCI research were college students. Students have “significant discrepancies with ‘typical’ users” (Barkhuus and Rode 2012) due to their computer experience, youth, and general learning attitude. In our study of JE users, digital natives are mostly intrinsically motivated, and all students in the years Barkhuus and Rode mention would almost certainly be digital natives. Barkhuus and Rode add, “Lest we wish to change our field’s name to student-computer interaction we should make effort to find more representative participants”.

Human Computer Interaction evaluation studies that select intrinsically motivated users are missing the complexity of the real user population by ignoring the extrinsically motivated users that we found know “just enough” and will not easily find a way to do the unfamiliar. That is exactly the point of this study. Regular, daily, competent “Just Enough” users with their extrinsic motivation are not necessarily being represented in HCI evaluation studies. From our work here, we show a large difference between intrinsic and extrinsic users’ ability to do unfamiliar tasks. This would skew any evaluation studies that do not include extrinsic users.

Our goal is to understand JE users. Our study is designed to gather a variety of data: quantitative motivation style, quantitative performance measures, and qualitative attitudes and feelings to deepen our understanding.

## 3 Background

Computer users can be identified by their motivation style and their computer use can be defined and measured as tasks, including near skill transfer. Users attempting tasks can be observed, recorded, and analyzed using ethnographic methods and a think aloud protocol. This section reviews previous research into motivation and the methods we used in this study.

### 3.1 Daily Computer Users

There is no denying that some proficient daily users have hollow competency which becomes a problem for them, but also for industry, when those users are unproductive due to unfamiliar new interface features. Who are these users and why should anyone care?

Rapid growth and popularization of computers and hand held devices have created opportunities, while also increasing disparities in user experience and proficiency. Individuality and differences in motivation, competency, skill transfer, and experience play a role in adopting new technology. Three years ago, 3/4 of the U.S. population were accessing the internet on a computer device (U.S. Census 2009). The 2009 Census has at least 68.7% of all age householders accessing the internet at home, and 76.7% accessing the internet from some location. Future work can study how many of those are JE users.

Our study expects JE users to be able to complete routine tasks as long as the software does not change much. But the computer world is famous for its rapid rate of change. With the increasing use of web based applications and tools (Corcoran 2012), the software providers have the power to change the way tasks are done without consulting the user. So what happens to an inflexible JE user who wants things to stay the way they know?

All daily computer users vary widely in their experience, knowledge, interest, perceived choice, and motivation. They also vary widely in their ability to pick up new skills on their own. There are already large disparities in individual computer use experience and a wide variety of attitudes toward change. To illustrate the variety of individual attitudes and feelings, consider one example; some users blame themselves or technology, and others don't blame, they are ashamed when they have trouble with their computer.

Software, technology devices, and cloud computing will continue to grow (Kim et al. 2012). Users accessing an internet application leave the provider free to change the interface whenever. The user has to adapt and will need problem solving to teach themselves how to stay productive when change happens. It is reasonable to imagine that a computer user might be a resourceful problem solver in a non-computer area but inflexible and unproductive when their computer changes. For example, a classroom teacher can manage 500 children set loose on a playground while six other things go wrong, but might not be able to figure out how to send an email with an attachment if their software changes.

News stories and education advocacy efforts imply that it is in the best interests of government policy makers, educators, and business entrepreneurs to have a general public that is familiar and flexible with computers. Researchers have shown the benefits of an online populace, and even the economic necessity for individuals seeking services and information. (Hakkarainen 2012) There is enough evidence to have convinced the United Nations Educational, Scientific and Cultural Organization (UNESCO) to advocate "information literacy" since the late 1990's (Horton 2011).

Meanwhile, computer manufacturers strive to make their products user friendly and easy to learn, but they don't really understand the many barriers to learning computers for the novice and the elderly (Dickinson et al. 2010). Difficulties such as the impact of learning anxiety, negative media messages, and the exclusionary effects of specialized computer vocabulary that are attached to computers. But in the 21st century, information and technological literacy are a basic skill, required for accessing services, education, and businesses (Eisenberg 2010).

## 3.2 Motivation Style

Our study of JE users focuses on motivation as a defining quality, specifically extrinsic or intrinsic motivation style. Motivation can be reliably measured as a specific style based on years of psychology research (Ryan and Deci 2000). This makes motivation not only a good guess as a factor in success or failure, but also a measurable variable of a very unpredictable study subject, the human.

We do not intend to rigidly separate users into categories. There could be intrinsics from novice to expert and similarly with extrinsics, and there are many flavors of "Other" that are not predominantly extrinsic or intrinsic. Also, one user might change over time or even within an interest area on the computer. For example, they might have intrinsic motivation for their game system but extrinsic motivation for their computer at work.

Motivation can be studied physiologically, psychologically (cognitive and behavioral) and socially. (Carlson et al. 2000). Motivation has been heavily researched and there are many validated forms of measuring and quantifying motivation style. We are using the work of respected psychology researchers Deci and Ryan who have written definitively on studying quality and style of motivation. They separate motivation into three major categories: amotivation, extrinsic motivation, and intrinsic motivation, which break down further into subcategories (Ryan and Deci 2000).

One component of Deci and Ryan's motivation work is the Self-Determination Theory where they argue that autonomy, relatedness and competence are basic human needs that when not satisfied, lead to pathology and ill-being. Likewise, when autonomy, relatedness and competence are supported, it leads to intrinsic motivation. They define intrinsic motivation as valuing an activity and having a personal commitment as opposed to extrinsic motivation which is based on external coercion or requirements (Ryan and Deci 2000).

### 3.2.1 Amotivation

According to Deci and Ryan, motivation ranges from no motivation, called amotivation, through various forms of extrinsic motivation, to intrinsic motivation. Deci and Ryan explain that amotivation is characterized by not valuing, not feeling proficient, and not expecting action to succeed. Lack of initiative and responsibility are associated with controlling environments, disconnectedness, and mismatched challenges. These are trademarks of weak motivation (Ryan and Deci 2000). Amotivation can even be traced to specific causes in the design of curriculum or software (Martens et al. 2004). Rather than trying to increase motivation for developing curriculum and software it is recommended to avoid stifling motivation instead.

## 3.2.2 Intrinsic Motivation

What is the role of intrinsic motivation in using computers and what is already known about intrinsic motivation?

Intrinsic motivation is when one pursues activities for their own sake. Deci and Ryan link competence with intrinsic motivation, stating that, “intrinsic motivation was correlated with interest, enjoyment, felt competence, and positive coping”. Competence is a good thing, although we can't presume that all computer users seek competence. Intrinsic motivation is very autonomous, self-determining, and inherently satisfying (Ryan and Deci 2000).

Many researchers have done studies to support that curiosity and improved competence are interrelated with high intrinsic motivation. For all age groups, high intrinsic motivation leads to:

- deeper involvement in activities
- more curiosity
- trying out more complex options
- increased persistence
- higher achievement of goals
- less avoidance behavior (Martens et al. 2004).

Intrinsic motivation features exploration, curiosity, and natural activity (Oudeyer et al. 2007; Deci and Ryan 2000). Creativity, persistence, and improved performance were found to be a result of “Authentic” motivation which is described as self-conceived and including interest, excitement, and confidence (Deci and Ryan 1991).

Deci and Ryan found that a byproduct of intrinsic motivation is self-esteem and general well-being even compared to people with the same level of perceived competence or capability (Deci and Ryan 1991). Motivation and competence enhance each other. Downey and Smith argue that one would expect positive attitudes to lead to increased motivation and perseverance, which then lead to increased competence (Downey and Smith 2011).

Studies show that students with high intrinsic motivation were found to do more exploring than students with low intrinsic motivation, even though both groups might have the same learning outcomes (Martens et al. 2004). Since computer users are often required to be self-regulated independent learners, intrinsic motivation could have a clear impact on results and performance.

Intrinsic motivation is a desirable attribute to have for becoming competent and probably adaptable. How does one become intrinsically motivated? First of all, intrinsic motivation is increased by a sense of belonging or relatedness (Ryan and Deci 2000). Deci and Ryan found that competence and autonomy reliably supported development of intrinsic motivation (Ryan and Deci 2000). Also they have demonstrated correlations between positive feedback and improved intrinsic motivation (Deci and Ryan 1985). Levels of intrinsic motivation are impacted by self perceptions of competence, control, and relatedness (Martens et al. 2004).

Research has shown that feeling proficient strengthens intrinsic motivation when combined with autonomy and the sense that one can get things done. As Deci and Ryan say, “choice, acknowledgment of feelings, and opportunities for self-direction” all enhance intrinsic motivation (Ryan and Deci 2000).

Intrinsic motivation is reduced by external rewards because then one does not feel in control of one's own work (Deci et al. 1999). Too much choice or control can also lead to decreases in motivation (Iyengar and Lepper 2000). Praise can support perceived competence which strength-

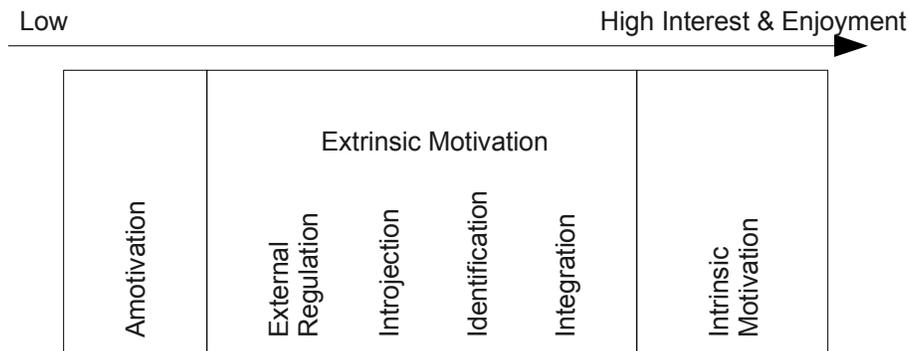
ens intrinsic motivation, or praise can become pressure, crushing perceived autonomy and squelching risk taking (Henderlong and Lepper 2002).

Historically, intrinsic motivation has been difficult to measure and previous studies relied on indirect measures like self reporting. Learning results and persistence confirm the relation between intrinsic motivation and performance (Pintrich 2003). But Deci and Ryan have created a validated and highly cited questionnaire method of measuring intrinsic motivation (Ryan and Deci 2012).

### 3.2.3 Extrinsic Motivation

Intrinsic is just one motivation category we are studying. Our main interest is the Just Enough user who we define as a proficient daily user with predominantly extrinsic motivation. Deci and Ryan explain that users with extrinsic motivation perform activities to get a “separable outcome”: a result, not the inherent satisfaction of the work (Ryan and Deci 2000).

There are four subcategories of extrinsic motivation based on regulation. Regulation is that driving force that is making you do some behavior. Is it external regulation or internal regulation? Extrinsic motivation regulations range from external regulation, which is closest to amotivation, through introjected regulation, identified regulation, and then integrated regulation, which is closest to intrinsic motivation, see Fig. 1. We are interested in external “perceived locus of causality” (Ryan and Deci 2000), which is the external regulation subcategory of extrinsic motivation, because it most clearly represents taking action due to external needs or requirements.



**Figure 1: Motivation Styles, adapted from Ryan and Deci (2000) ‘Taxonomy of Human Motivation’. Low interest and enjoyment are on the left ranging to high interest and enjoyment on the right.**

We will give a brief explanation of the other three subcategories of extrinsic motivation: introjection, identification, and integration. These three were not used in our study.

Introjected regulation means to follow a regulation, rule, or expectation without fully accepting it as one’s own. In introjected regulation, activities are done to avoid guilt, or anxiety, or to preserve self esteem either by demonstrating one’s ability or by avoiding failure (Ryan and Deci 2000). Just Enough computer users could have introjected regulation, but in this study we had no way to measure introjected extrinsic motivation separately. The idea of avoiding guilt and anxiety does fit with our idea of a Just Enough user.

Identified regulation is somewhat internal and is a “conscious valuing of activity” and “self endorsement of goals” (Ryan and Deci 2000). We did find a way to measure identified regulation but the results were positively correlated with intrinsic motivation. This matches Deci and Ryan’s definitions, Fig 1, showing how identified regulation is shifting towards internal regulation. Therefore we did not use the identified regulation results because they were not representative of extrinsic motivation.

Integrated regulation is almost intrinsic motivation but also could describe Just Enough users because these users still are working to get some outcome, not for inherent enjoyment (Ryan and Deci 2000). Integrated regulation has increased internalization which improves one’s effectiveness, persistence, and well-being. Integrated regulation is really beginning to blur into intrinsic motivation.

For our study, we needed a valid way to measure and identify participants as external or internal in their motivations. Our goal was to clearly differentiate external and internal motivation into two discrete groups, so external regulation was the subcategory we used to measure extrinsic motivation.

Extrinsic motivation means doing something for results. In other words, wanting to get something from the activity as opposed to intrinsic motivation which is doing something just because it is interesting to you. (Ryan and Deci 2000) For example, one user might wonder what html, the internet computer language, is and want to teach themselves or create a webpage just to see if it works. They are intrinsically motivated and interested and choosing to do that work. But another user who also needs to learn html to write a website might be extrinsically motivated by needing a website for their business or being paid to produce a website for someone else.

These definitions are very important in understanding JE users because we define a JE user as a predominantly extrinsically motivated daily computer user. The JE user knows “just enough” to get the productivity they want or need. They are not an exploring, intrinsically motivated user. Deci and Ryan explain that the more that users are externally motivated, the less interest, value and effort they will spend to achieve their goals. This includes denying responsibility for their failures (Ryan and Deci 2000), which is similar to externalizing responsibility.

Extrinsic motivation may not be associated with well being and competence the way intrinsic motivation is, but it is still more positive than no motivation. Extrinsically motivated behaviors can eventually transform into intrinsic if regulations are internalized and assimilated. One can leap from any of the subcategories of extrinsic motivation directly into intrinsic motivation (Ryan and Deci 2000).

Seeing examples, having capability, and enjoying some autonomy can all help extrinsic motivation shift towards internal regulation. When significant others model their own value for the behavior then the learner might feel some connection which is central for internalization. Perceived capabilities support adoption of new activities. Autonomy, defined by Deci and Ryan as self volition, rather than individualism, is critical for absorbing values as one’s own. Pushing someone will not make them become internally regulated. (Ryan and Deci 2000).

What computer user motivation studies have already been done? Our research indicates that most studies have focused on increasing proficiency or training users in the most efficient manner. Efficiency has a direct link to increasing productivity, which is a reasonable goal for stakeholders like industry, government, and education that want to promote effective computer use. We could not find any studies isolating computer users by motivation style and studying their performance, although there are many in the fields of sports science, education, and other fields that use the power of identifying motivation style as a means to understanding performance.

### **3.3 Competence**

Competence is defined as being well qualified, having ability, or being “functionally adequate” (Merriam-Websters online dictionary).

Computer competence is not always well defined depending on the computer area and “competence” can cover a wide range of user expectations for performance. Three ways of measuring competence include self-reports, perceptions of ability, and performance measurements (Downey and Smith 2011). These separate characterizations of competence are not directly comparable.

Because competence can be relative, we will interchangeably use the word “proficiency” in this study. Proficiency is defined by Merriam-Webster’s online dictionary as the state of being proficient, “well advanced in an art, occupation, or branch of knowledge” which is very similar to being “well qualified” as mentioned above (Merriam-Websters online dictionary).

Our study is interested in daily users with the expectation that daily users will have some routine proficiency. We focus our study on email because it is so common, often done everyday, and can be done at a wide variety of proficiencies. Some people are expert users of email, creating mailing lists, using folders, creating incoming mail filters. Others could be considered proficient novices with a bookmark for their webmail, their password unknown because it is saved, and they have simple functionality. This wide range of skill in email is still a competency for that individual user. Their competency might be less than another users, but they are proficient/competent in their own way at getting email.

### **3.4 Satisficing Compared to Just Enough**

At some level, all computer users operate on a “just enough” basis. This is called “satisficing” and comes from a 1950’s economic decision theory combining the words satisfying and sufficing. Suffice means that something is enough, “to meet or satisfy a need” (Merriam-Websters online dictionary). Activities are satisficing when they do just enough to get acceptable results instead of aiming for optimum results. Satisficing is practical and a perfectly acceptable way to make decisions on choices when using computers.

Because satisficing is a reasonable decision making model for any computer user whether they are a power user or a novice, we will ignore satisficing in our study. Satisficing is an assumed and expected behavior. Both intrinsic and JE users can be expected to do some satisficing. We will not look for, or measure, satisficing in this study.

### **3.5 Skill Transfer**

Skill transfer is a large and well researched area of psychology which can generally be thought of as “learning transfer”. As Singley and Anderson say, “The study of transfer is the study of how knowledge acquired in one situation applies (or fails to apply) in other situations” (Singley and Anderson 1989). There is a separate business term, “knowledge transfer” which refers to moving knowledge within an organization (Argote and Ingram 2000).

Using a generalized definition of “transfer” and of “skill”, our goal is to test if the user can do the same routine and familiar task in an unfamiliar software and system. We are focused on accomplishment, not on “how” and “why”. Other studies analyze the how and why of skill transfer with cognitive models, processes, and methods. Human Computer Interactions uses some cognitive modeling. Olson and Olson claim, “cognitive modeling is a method that is useful in both initial design... evaluation, and training. But it does not extend to broader aspects of the context in which people use computers” (Olson and Olson 1990). Our interest is in people using computers, so cognitive modeling is not relevant.

The context of the skill transfer does matter in this study. How unfamiliar is the new situation? There are many skill transfer taxonomies, but this study focuses on near transfer, a widely used term that means the situation and/or the task are mostly similar. Our skill transfer was from familiar and routine webmail tasks to the same routine tasks in unfamiliar webmail or alternately from one word processor to another. A complete review of the similarities between the tasks can be found in 4.6.6 Familiar and Unfamiliar Software in the Method section.

## 3.6 Unfamiliar and Familiar Tasks

In this study, “unfamiliar” is defined as something that is outside the participants experience. “Tasks” are defined as any number of specific things one might do on a computer, for example, send an email. Unfamiliar tasks are actions taken on a computer that the participant has not tried before.

To accomplish an unfamiliar computer task without any teacher might require factors such as exploring, understanding the patterns of user interface design, an ability to generalize existing knowledge of using the computer, luck, coincidence, ability to use self-help tools such as the internet or help systems, or other factors.

We are not studying skill acquisition or learning directly, which both imply a level of remembering the procedure to accomplish the task. We did not direct the participants to show repeatability of the tasks over time for example. We are interested in how smoothly a computer user adapts to unfamiliar tasks. We’re looking at accomplishing the task, or \*did\* the participant find the solution, rather than \*how\* did they find the solution.

## 3.7 Stumble

Stumble is defined as “to speak or act in a hesitant or faltering manner” (Merriam-Websters online dictionary). It can also be defined as “to come unexpectedly or by chance <stumble onto the truth>”.

This is the term that we will be using to describe the actions of the participants as they seek to accomplish unfamiliar tasks or to transfer skills from familiar to unfamiliar systems. Stumbling is used here to mean hesitating, unproductive, inefficient, having difficulty, or lucking into the solution to an unknown task. The stumbling could be from any number of sources such as inexperience, motivation style, attitude, emotion or other.

Stumbling can mean to come upon the answer “unexpectedly or by chance” (above) as well as describing the actions taken to accomplish the task. So the participant might “stumble” upon the

answer to doing an unfamiliar task. They still accomplished the task. Qualitatively we can observe the difference between a participant stumbling on an answer, or stumbling around looking for the answer as opposed to a participant moving directly toward accomplishing an unfamiliar task.

So the opposite to stumbling is when a participant takes a relatively straight path to accomplishing a task. An example of moving directly to the answer would mean maybe one or two hover hints and then finding the correct button which would take a total of maybe three seconds. An example of stumbling could be checking out most buttons and links on the page, maybe multiple times, trying things and coming back, and can potentially take many minutes. Please see 4.6.3 Analyzing Observations in the Method section for more information about the rubric for stumbling.

## 3.8 Ethnographic Methods

Computer science has been diversifying for many years. It is not just the study of all things binary. As computer science has pursued studies relating to humans interacting with computers, for example Human Computer Interaction (HCI) and Human Factors, they have incorporated methods from other fields that also deal with humans, such as psychology, humanities, and sociology (Sim 1999). Ethnography is a technique borrowed from anthropology and sociology that has a “well-defined theoretical foundation” (Sim 1999).

Ethnography is a data collection method that results in a case study. It usually includes history, climate, behavior and more observations that objectively describe a group. “Ethno” means people. (Merriam-Websters online dictionary).

In this study we are using ethnographic methods to do open ended observations of two groups of daily computer users. We gathered motivation data, environmental data, and some demographics on the participant and then observed and customized the directions for each participant. The computer activities were recorded by video and audio recorders.

As Sims explains, “Ethnography is an inductive, qualitative technique suitable for investigating complex human phenomena in an open-ended manner” and “can also provide guidance for considering equivocal, qualitative evidence” (Sim 1999).

It is recommended that the researcher using an ethnographic approach not have preconceived expectations but instead discover what they learn from the “natives”. Early in a study there might not be any clear issues that will be themes in the study, but as observations progress the importance emerges (Sim 1999). Because an ethnographic study begins as open ended questions, the results often diverge from what might be initially expected (Sim 1999).

It is recommended that ethnographic approaches be as transparent as possible to avoid criticisms of being unscientific and also so resulting conclusions are supported. Therefore the raw data objectively describes the facts, not interpreting until the analysis phase. The researcher’s experience should be acknowledged where it could impact the study (Sim 1999).

Regarding the role of the researcher, ethnography  
“acknowledges that by simply having the researcher in the field setting changes it. Rather than trying to remove her influence on the group being studied (an impossible task), the researcher’s presence itself becomes part of the study and sometimes is used to draw out aspects of the group or site.” (Sim 1999)

In this study, as soon as an observed participant appears to be stumbling, the researcher felt free to interact, question, and give hints to the participant. This drew out the participant's opinions, attitudes, and feelings. The researcher also encouraged and prompted a continuing think aloud protocol.

In ethnography, studies are not exactly repeated like experiments can be, but instead can be validated by "convergence" or "triangulation". With "convergence", another study on a different topic might come to the same conclusion. Using "triangulation", one studies other sources of data to support the same conclusion (Sim, 1999). This study did do triangulation by including three forms of data gathering: interview, observation, and inventory.

### **3.9 Think Aloud Protocol**

A think aloud protocol is a method to hear the internal process of the participant. Participants are encouraged to constantly verbalize their thoughts, actions and choices. Think aloud is used in usability testing, psychology, and a range of social sciences. This protocol can include the researcher interrupting to ask questions or delve deeper into something the participant is doing or saying (van Someren et al. 1994). Think aloud can be summarized as, "the subject is asked to talk aloud, while solving a problem and this request is repeated if necessary during the problem-solving process thus encouraging the subject to tell what he or she is thinking" (van Someren et al. 1994).

Think aloud protocols have been used in HCI for years and come from the data gathering techniques and analysis from the work of psychologists Ericsson and Simon (Ericsson and Simon 1980). By having the participant say aloud what they are thinking, doing, seeing, feeling, the researcher can see into the participant's process instead of just the finished accomplishment. Capturing and recording the think aloud of the participant is very important. Please see 4.6.2 Documenting Observations in the Method section for more information.

Talk aloud protocol is similar and sometimes blurred together with think aloud, but just talking skips the self analysis of "what am I thinking" that think aloud includes. Therefore, talk aloud requires less processing or interpreting by the participant as they perform the task and therefore is thought to be more objective by not interfering with the participant's behavior (Ericsson and Simon 1980).

## 4 Method

The procedure we used to understand JE users included both quantitative and qualitative data gathering. The prescreening inventory assessed motivation style qualitatively, and results were statistically analyzed. After selecting participants to observe from the prescreening inventory results, we gathered qualitative data from observations customized to the individual participant. The observations were coded based on a rubric, validated for inter rater reliability, then statistically analyzed.

Each participant went through three phases of one on one observation with the researcher. Phase one confirmed the participant's existing proficiency doing routine tasks using email and word processing in a familiar environment (system and software). Phase two directed participants to accomplish unfamiliar tasks in a familiar environment. Phase three tested near skill transfer. We took participants out of their familiar environment and we directed them to repeat their proficient routine tasks in unfamiliar software.

We completed the procedure to gain approval for our study from the Internal Review Board (IRB) at Michigan Technological University. Our IRB number is 333101-2, approved on 5/22/2012 and expiring on 5/21/2013. We followed all recommended procedures for working ethically with human subjects, including clear consent procedures, explanation of the questionnaires, confidentiality, and proper storage and disposal of data.

Data collectors were trained by the Collaborative Institutional Training Initiative (CITI) Basic Course and Responsible Conduct of Research (RCR) course. Observers were also prepared to use ethnographic techniques and to explain think aloud protocol to the participants.

We began identifying motivation style by asking people to complete a consent form, take a pre-questionnaire, then do the motivation inventory. These can be found in the Appendix C - Consent to Participate in Research, Appendix D - Preliminary Questionnaire, Appendix E - Motivation Inventory. After inventories were scored, we selected and scheduled participants to observe. Observation sessions began with an interview and demographics questionnaire, then each observation was tailored to the experience of the participants. The observations were audio and video recorded and securely archived. Participants completed a post questionnaire after the observations and extrinsics completed a last questionnaire weeks later by email asking about their attitudes towards the term "Just Enough" user.

The Method section describes procedure details for conducting the motivation inventory, identifying and selecting observation participants, conducting observations, and analyzing quantitative and qualitative results.

### 4.1 Participant Selection

To carry out this research, we approached people everywhere in our small rural northern Michigan engineering college town asking them to participate by taking the pre-questionnaire and motivation inventory. We eventually had 66 inventory respondents in person and another 40 people through internet social media from China, India, South Africa, Australia, France, Turkey, Sweden, and the U.K.. We are limiting our study to the 66 respondents from age 13 to 87 that were daily users and for whom we have printed and signed consent forms. This includes international students from Turkey, China, and India. This sample method constitutes a sample of convenience and not a random sample.

### **4.1.1 Participant Population**

Participants were selected from all ages and experience levels, but they had to be daily computer users. The youngest respondent to the inventory was 13, but we chose adult participants for observation. The youngest observed participant was 23 and the oldest was 87. Sixteen participants were selected for observations, plus 3 outlier participants whose observations were unusable due to low proficiency, high amotivation, or narrow proficiency. Seven of the 16 observed were predominantly intrinsically motivated. The seven intrinsics have 3 digital non-natives and 4 digital natives. Nine participants of the 16 observed were predominantly extrinsically motivated and two of those nine were digital natives.

The original intent was to find 15 daily computer users to observe: five that have intrinsic motivation and 10 with extrinsic motivation. Of the ten extrinsically motivated, five would be digital natives who used computers before age 18. It proved difficult to find digital native users who grew up on computers and also had extrinsic motivation. Please see 5.2.3 Separating Into Groups in the Results section for more detail.

### **4.1.2 Method for Selecting Participants**

We pre-screened users using an adaptation of the Intrinsic Motivation Inventory (Ryan and Deci 2012) with additional questions from Guay, Vallerand, and Blanchard (Guay et al. 2000), as well as other questionnaires and interview questions (Appendix E - Motivation Inventory, Appendix F - Demographic Questionnaire, Appendix G - Interview Questions) to find participant's proficiency, experience with computers, and motivation style when using computers.

### **4.1.3 The Need for a Specific Population**

The point of the study is to identify and understand the effects of motivation style on computer proficiency. We need a participant population of daily computer users whose motivation style is predominantly extrinsic or predominantly intrinsic. We also compared digital natives and non-natives. Digital natives are defined as people who "grew up using computers" (Prensky 2001), which we defined as using computers before age 18.

### **4.1.4 Procedures for Assuring Participation Is Voluntary**

All participation was voluntary. We recruited participants from the local community via written and oral invitation flyers. No participant was coerced.

### **4.1.5 Compensation**

Participant input was very important, so as a token of our appreciation for their participation, we offered a choice of a 30 minute one-on-one help session in using computers or \$10 cash for participating. One participant accepted the cash, and six accepted the tutoring session to be sched-

uled at their convenience. Participants who did not complete any part of a research session were not eligible for any compensation.

### **4.1.6 Deception**

There was no deception in this research plan. Participants were not deceived.

### **4.1.7 Privacy and Confidentiality**

Any information that was obtained in connection with this study and that can be identified with a participant remains confidential and will be disclosed only with the participant's permission or as required by law. We made audio and video recordings of the study, with participant's permission, but our research (including published results) will only use written transcripts of those recordings with personally identifying information removed. After transcribing the recordings, we destroyed them. Code names were assigned to the 16 observed participants.

### **4.1.8 Potential Risks**

Disclosure of personally identifying information was a potential risk. The audio and video recordings we took may contain information that reveals the identity of subjects, so the possibility arises for embarrassing information to be released to the public. To mitigate this risk, we only used transcripts of these recordings which use code names. The publicly available material from the study includes only edited transcript material that does not include personally identifying information. Furthermore, we can show study participants the edited version of their transcripts, so that they can determine whether all identifying information has been removed satisfactorily.

We used a digital video camera for recording. This camera was locked in the office of Principal Investigator (PI) Wallace or Harriet King when not in use. The video recordings were downloaded to the desktop computers in the offices of the PIs, both of which are secured with ISO password protection. Only the PIs had access to the video recordings.

Feelings of frustration or inadequacy were a potential risk. The computer activities that the participants performed may have presented difficulties that annoy them or make them feel unskilled or unintelligent. To mitigate this risk, we included text in the consent letter that identifies the potential for difficulties and assured the reader that the tests are not evaluating intelligence or skill, but rather the effects of motivation on computer proficiency. Furthermore, since we were present during the subjects' computer activities, we monitored their comfort level and offered to stop the exercise if they wanted.

### **4.1.9 Informed Consent**

We used an informed consent form to inform all participants of these issues as required and approved by Michigan Technological University's Internal Review Board (IRB). Our IRB number is 333101-2, approved on 5/22/2012 and expiring on 5/21/2013. (Appendix B - IRB Protocol and Approval)

## 4.1.10 Conflict of Interest

There is no conflict of interest to disclose.

## 4.2 Pre-Questionnaire

The pre-questionnaire (Appendix D - Preliminary Questionnaire) was used to discover if the respondent was a daily user, how they use computers, and whether they used computers before age 18 (digital native). This questionnaire gave us background information for selecting participants and analyzing the results of our observations. The questions included:

- I want to use computers even when I have no purpose. (true, false)
- I mostly use computers only to get results, for example, see pictures, hear news, do work. (true, false)
- I enjoy exploring on computers. (true, false)
- I use computers just to get what I need. (true, false)
- How often do you use computers? (circle only one: daily, weekly, monthly, rarely, never, no answer)
- Did you “grow up” (before age 18) using computers at all? (yes, no)
- How long have you used computers? (circle only one: less than one year, one to 5 years, 6 to 15 years, 16 to 25 years, more than 25 years)
- What would you say your main reasons are for using a computer now, or wanting to learn how? (open answer)

## 4.3 Motivation Inventory

The motivation inventory is the single biggest element of the prescreen in identifying intrinsic and extrinsic users for observation and study.

### 4.3.1 Inventory Source

We used a quantitative inventory of motivation style adapted from Deci and Ryan’s “Intrinsic Motivation Inventory” (IMI) (Ryan and Deci 2012) and from Guay, Vallerand, and Blanchard for extrinsic motivation and amotivation (Guay et al. 2000). Both of their original inventories have been peer validated in research and are often cited. Having a professionally validated inventory for assessing motivation style was crucial to confirm that potential JE users had predominantly extrinsic motivation style or to find intrinsically motivated users for contrast.

All of the questions originally had the vague wording “this activity” depending on the grammar of the sentence. This vagueness was replaced with “using computers” or the grammatical equivalent. This followed the adaptation instructions by Deci and Ryan accompanying the IMI. There are other precedents for adapting the wording “this activity” from the IMI, including the work of Shroff and Vogel (Shroff and Vogel 2009) who adapted Deci and Ryan’s questions for perceived choice, interest, and perceived competence. These are the same three factors that our study used.

Questions for three factors are from Deci and Ryan's Intrinsic Motivation Inventory (IMI) (Ryan and Deci 2012) and include interest/enjoyment, perceived choice, and perceived competence. As Deci and Ryan explain, the two factors necessary to measure intrinsic motivation are a correlation of interest/enjoyment, which is one factor, and perceived choice. If both are high, then there is high intrinsic motivation style. If both are low, then there is low intrinsic motivation, with a score of four being neutral and the dividing line between high and low (Ryan and Deci 2012).

Deci and Ryan explain that "The interest/enjoyment subscale is considered the self-report measure of intrinsic motivation; thus, although the overall questionnaire is called the Intrinsic Motivation Inventory, it is only the one subscale that assesses intrinsic motivation, *per se*" (Ryan and Deci 2012), but also that "to be confident in one's assessment of intrinsic motivation, one needs to find that the free-choice behavior and the self-reports of interest/enjoyment are significantly correlated" (Ryan and Deci 2012).

Therefore we used both interest/enjoyment and perceived choice in our inventory to measure intrinsic motivation. Interest/enjoyment alone can tell about intrinsic motivation and certainly if interest/enjoyment are below neutral than that is low intrinsic motivation.

The third factor from Deci and Ryan's IMI that we used is perceived competence. This was very helpful in having an objective way to gauge the participant's self report of competence and can be used in comparing the participants.

The questions for the other three factors are from Guay, Vallerand, and Blanchard (Guay et al. 2000) and include identified regulation and external regulation which are two of the four forms of extrinsic motivation, and amotivation. External regulation is the most externally controlled form of extrinsic motivation and often characterized by compliance or reluctance (Ryan and Deci 2000). Identified regulation includes "conscious valuing" and "self endorsement of goals" (Ryan and Deci 2000). Because identified regulation was found to be positively correlated with intrinsic motivation, we did not use the identified regulation scores in our study. See Inventory Results for more information.

### **4.3.2 Inventory Questions**

The motivation inventory had between four and seven questions for each factor. The questions were randomly distributed on the inventory by using a random number generator and then sorting for that random number. There were a total of 32 questions on the motivation inventory.

The following lists the 32 total motivation inventory questions sorted by factor. The randomly sorted inventory that was given to respondents can be seen in Appendix E - Motivation Inventory.

#### Amotivation Factor (Apathy)

(Guay et al. 2000)

1. Why do you use computers? I don't know; I don't see what using computers brings me.
2. Why do you use computers? I use computers but I am not sure if it is worth it.
3. Why do you use computers? I use computers, but I am not sure it is a good thing to pursue it.
4. Why do you use computers? There may be good reasons to use computers, but personally I don't see any.

#### Identified Regulation Factor (Extrinsic Motivation that is internalized like intrinsic)

(Guay et al. 2000)

1. Why do you use computers? Because I think that this activity is good for me.
2. Why do you use computers? Because I'm doing it for my own good.
3. Why do you use computers? By personal decision.
4. Why do you use computers? Because I believe that this activity is important for me.

#### External Regulation Factor (Extrinsic Motivation)

(Guay et al. 2000)

1. Why do you use computers? Because I am supposed to use computers.
2. Why do you use computers? Because I don't have any choice about using computers.
3. Why do you use computers? Because I feel that I have to use computers.
4. Why do you use computers? Because using computers is something that I have to do.

#### Interest/Enjoyment Factor (Main Intrinsic Motivation Factor)

(Ryan and Deci 2012)

1. I enjoy using computers very much.
2. I think using computers is quite enjoyable.
3. I think using computers is a boring activity. (reverse score)
4. I would describe using computers as very interesting.
5. Using computers does not hold my attention at all. (reverse score)
6. Using computers is fun to do.
7. While I am using computers, I am thinking about how much I enjoy it.

#### Perceived Choice Factor (Correlating Intrinsic Motivation Factor)

(Ryan and Deci 2012)

1. I believe I have some choice about using computers.
2. I don't really have a choice about using computers. (reverse score)
3. I feel like I have to use computers. (reverse score)
4. I feel like it is not my own choice to use computers. (reverse score)
5. I use computers because I have no choice. (reverse score)
6. I use computers because I have to. (reverse score)
7. I use computers because I want to.

#### Perceived Competence Factor

(Ryan and Deci 2012)

1. After working on computers for awhile, I feel pretty competent.
2. I am pretty skilled at using computers.
3. I am satisfied with my performance at using computers.
4. I think I am pretty good at using computers.
5. I think I do pretty well at using computers, compared to other people.
6. Using computers is an activity that I can't do very well. (reverse score)

### 4.3.3 Scoring Inventory

Questions for all six factors were answered by the respondent selecting one choice from a seven point Likert not true to true scale. A score of one is the minimum score of “not at all true”. A score of four is neutral or “somewhat true”. A score of seven is the maximum of “very true”. For example, “I would describe using computers as very interesting” assesses interest/enjoyment and derives from Deci and Ryan’s Intrinsic Motivation Inventory (Ryan and Deci 2012).

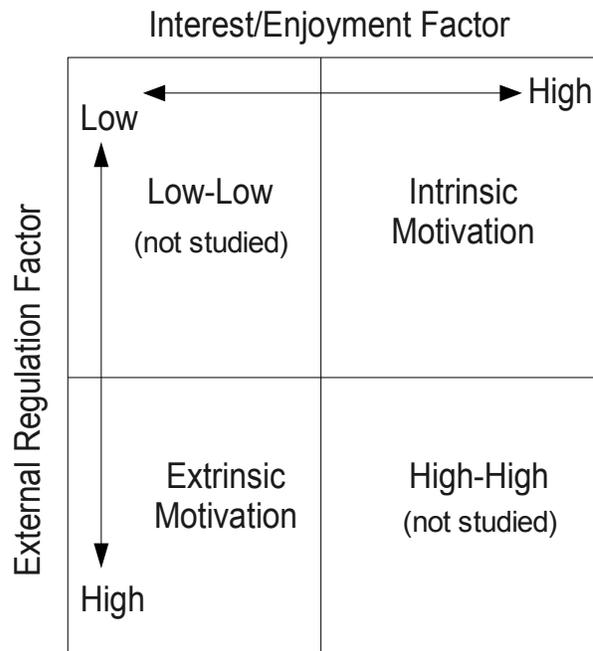
A Likert scale is an ordinal measure of ranking (Sirkin 2006) but it is acceptable to use averages and statistics on ordinal data in the fields of psychology and social sciences. As Sirkin explains, “we did violate some mathematical assumptions in creating an interval level of measurement index out of ordinal components, but as previously indicated, this is common practice in the social and behavioral sciences.” (Sirkin 2006)

Results were logged into a spreadsheet that matched the random order of the survey and then the spreadsheet was sorted by the six factors. Eight of the questions were reverse scoring questions so the participant’s answer was subtracted from 8, per the instructions in Deci and Ryan’s IMI (Ryan and Deci 2012).

The corrected results were averaged within each factor with the minimum score possible of 1, maximum score of 7, and neutral score of 4. This was per the instructions from Deci and Ryan and there are many precedents for using means to score the IMI including Shroff (Shroff and Vogel 2009) and McAuley, Duncan, and Tammen (McAuley et al. 1989) who used means for IMI data. There are precedents for scoring Guay, Vallerand, and Blanchard using means also in Pavlas, Jentsch, Salas, Fiore, and Sims (Pavlas et al. 2012) . Detailed results from scoring the motivation inventory are included in Appendix J - Inventory Results.

Because this survey was a prescreening tool to find participants with the required motivation style among many daily computer users, we used a grouping variable to identify predominantly intrinsic or extrinsic motivation style. First we needed to confirm the correlation between interest/enjoyment factor and perceived choice factor. If they were positively correlated, then just interest/enjoyment could be used for the grouping variable. For extrinsic motivation, the external regulation factor is the best measure of extrinsic motivation, see more in 3.2.3 Extrinsic Motivation in the Background section.

A score greater than neutral, 4.0, for external regulation and less than or equal to neutral, 4.0, for interest/enjoyment identifies a predominantly extrinsically motivated computer user. The exact opposite scores are the predominantly intrinsic users, thus the intrinsic and extrinsic groups are separate by definition, as shown in Figure 2. We logically chose 4.0, the neutral point, as the cut-off for the neutral and low group with anything above 4.0 as the high group.



**Figure 2: Extrinsic, Intrinsic, and Other based on high and low external regulation and high and low interest/enjoyment factors.**

Respondents who scored in the High-High or Low-Low groups were not suitable candidates for the study. Participants were selected to represent the clearest delineation between extrinsic and intrinsic for the two groups of observed participants.

Administering and scoring motivation inventories and observations were not discrete processes, but instead were ongoing in parallel. Motivation inventories continued to be administered right up until the end of the observations in the hope of finding more digital natives that were extrinsically motivated participants.

While administering the inventory, we did not answer any questions from people taking the questionnaire. They might want to know what the questions or a particular word meant, but we wanted them to use their own idea of what it meant. In this way, their attitudes were measured, not our explanation of what the question might mean.

We followed the precedent of Rose, Shneiderman, and Plaisant (Rose et al. 1995) in refining the process and interpreting the inventory data as we proceeded. Some participants were assumed to be suitable for observation but were given the motivation inventory, which was scored just before observing and it was found that their results did not fit requirements to be observed. In one case, an observation was done before scoring that participant's motivation inventory. This case taught us to score the inventories first. We only wanted the clearly extrinsic or intrinsic respondents.

### 4.3.4 Statistical Analysis Method

The scores of the motivation inventory were calculated as means for each of the six factors for each of the 66 respondent. These results were data screened by calculating descriptive statistics including mean, variance, standard deviation, kurtosis and skewness for all 66 respondents, the 16 observed participants, and the 16 separated into intrinsic and extrinsic groups.

Because we have a sample of convenience, we need to show that the three assumptions for parametric analysis hold so we can confirm we have a normal distribution. The three assumptions are normality, homogeneity, and independence (Sirkin 2006).

Because the grouping variable defined separate groups as explained above, the intrinsic and extrinsic groups are clearly separate populations and did not need a t-test to show their difference. However, t-tests were run to discover any similarities or differences in the intrinsic and extrinsic groups for age, digital native, perceived competence, amotivation, and perceived choice, and interest/enjoyment and external regulation were confirmed for their distinctness.

### 4.3.5 Pilot Study of Inventory

Two pilot studies were done to confirm the effectiveness of the adapted motivation inventory. They were run one after the other with the first pilot study completed and analyzed before the second pilot study was designed and run. We used the first pilot study results to adjust the questionnaire and the second pilot study confirmed that the questionnaire was ready to use in the main study.

In the first pilot study, questions for the effort/importance factor were included from Deci and Ryan. Effort/Importance questions were confusing to users and the results did not correlate with intrinsic motivation. With further research, effort/importance was found to not be required by Deci and Ryan for their Intrinsic Motivation Inventory. "Effort is a separate variable that is relevant to some motivation questions, so is used if its relevant" (Ryan and Deci 2012). The main category for intrinsic motivation from Deci and Ryan is interest/enjoyment.

JE users were correctly identified using the questionnaire as having high extrinsic motivation, low amotivation, and low intrinsic motivation. Power users, later re-named "intrinsic", were correctly identified using the questionnaire as having high intrinsic motivation, low amotivation and low extrinsic motivation.

The questionnaire was adjusted to remove effort/importance and then was given to six participants for the second pilot study. We did find that the questionnaire is helpful in defining which users fit the JE and power user categories that are prerequisites for this study.

We also learned some presentation tips. Survey responders noticed the title of the survey as "Just Enough" Users, and at least one indicated some anxiety about being judged as "just enough". This possibly influenced their answers so the title was generalized to "Computer User Study" for the final survey.

Questions for the extrinsic and amotivation factors were all related to the context question: "Why do you use computers?". We had randomly ordered all the 32 questions together and prefaced extrinsic and amotivation questions with the context question each time. This was annoyingly redundant to survey respondents, so we randomly ordered the 12 extrinsic and amotivation questions on one page with the context question just once at the top for the final version. That left the

20 intrinsic and proficiency questions randomly ordered on the first two pages of the three page questionnaire.

The two pilot studies helped to finalize the adapted motivation inventory and gave valuable feedback on how to present the inventory to respondents.

## 4.4 Demographic Questionnaire

Once a participant was pre-screened with the motivation inventory and first questionnaire to check that they are daily users, then if they were selected and agreed to be observed, we gave them a demographic questionnaire. This data is mostly not being used except for age, which we consider of interest in this study.

The questionnaire asked: name, age, gender, nationality, highest level of education you have completed, highest level of education your parents completed, and race (optional).

## 4.5 Participant Interview

Before observing a participant, we briefly interviewed them to find out their experience with computers and their self report of proficiency (Appendix G - Interview Questions). These conversations were recorded in audio form. Answers to the interview helped in guiding the customized directions of each observation.

Interview questions included:

- What would you say your main reasons are for using a computer, or wanting to learn how?
- Please list some things you do regularly on the computer (e.g. email? Facebook? entertainment?)
- Do you use word processing or email? Webmail? What kind?
- How would you rate yourself from 1 to 10, 10 being expert and 1 being novice, in computer skills?
- Part of the study is to observe computer activities that are already comfortable for you. Can we observe you doing word processing or webmail?

## 4.6 Observation Method

After identifying motivation style, we did three phases of observations resulting in qualitative data that were recorded, quantified, and analyzed. Participants were observed one on one with the researcher. Remember, phase one confirmed the participant's existing proficiency doing routine tasks using email and word processing in their comfortable system and software. Phase two directed participants to accomplish unfamiliar tasks in their comfortable system and software environment. Phase three tested near skill transfer. The third phase required both an unfamiliar system and unfamiliar software. Systems were selected based on the participants experience and software was provided that was unfamiliar to all participants.

## 4.6.1 Directing Observations

A generalized observation script was used, see Appendix L - Observation Script and Worksheet. Directions included explaining think aloud protocol, giving participant's a task, continuing encouragement to use think aloud protocol, and asking the participant questions to gain deeper insight into their attitudes and feelings. Each observation was customized to the participant's existing knowledge, experience, and current state so we could be sensitive to the participants needs. For example, an elderly participant might get too tired, or a persevering participant might spend 10 minutes on a 15 second task. Then that observation would not have as many tasks attempted as another observation.

Customization was required to confirm the participant's existing proficiency and to test for unfamiliar task accomplishment in their familiar domain. Adjusting the test to fit the participant also allowed us to include a wide variety of ages, skills, and experience levels. By including a variety of daily users who fit the JE profile, we could test if JE users exist in all ages and experience levels of computer users.

Participants were observed and directed without any teaching in order to simulate a daily user's normal situation when faced with new tasks or unfamiliar software. The researcher refused to teach with words like, "I'm not telling anything. Sorry" (14:14 Familiar Appendix O - Observation Notes: Alice); or in response to their comment that they don't know how, "I know you don't, that's the point." (11:50 Familiar Appendix S - Observation Notes: Lucy).

But after 20 seconds, the task was considered a "stumble" and the researcher might begin giving prompts or hints depending on the situation. Examples include:

1. researcher says, "I can see it" (16:16 Familiar Appendix U - Observation Notes: Mary Ann)
2. researcher reassures novice intrinsic Wilma that the computer is turned on (1:20 Unfamiliar Appendix DD - Observation Notes: Wilma)
3. researcher says, "cold"... "cold"... "cold" ... "really cold".. "so cold" (25:34 Familiar Appendix V - Observation Notes: Mike).

More extensive examples are found in Appendix M - Example Directive Wording.

Directions and tasks were not the same in each observation, but there were similarities. For confirming proficiency, all were asked to demonstrate routine email tasks. For unfamiliar tasks, there were many participants who were directed to do webmail contacts, create a new email group, add people to the group, and send email to the group. Some participants were directed to show proficiency in word processing. The skills used to confirm proficiency in the familiar system and software were repeated in the unfamiliar system and software for the near skill transfer.

Tasks were considered to be one step in a process. For example, sending email to a new group email list is actually many tasks: 1) find contacts; 2) make list; 3) add people to list; 4) find email; 5) compose email; 6) address email; and 5) send email.

Phases two and three tested two kinds of task accomplishment: unknown task in familiar software and known task in unfamiliar software. This design intended to study the participant's flexibility. If we just tested unfamiliar task accomplishment or near skill transfer, we would not capture the full extent of the user's ability to adapt proficiency.

The researcher also directed participants to express their feelings, attitude, and opinions. If there were signs of quitting, resisting, or stumbling, the researcher would ask questions to find out more. The researcher used indicators such as great lengths of time without progress or com-

ments, moaning, sighing, cursing, and other forms of distress as occasion to prompt the participant for more information. Sometimes participants were asked to rate their feelings on a one to ten scale, with ten being extreme emotion and one being no emotion.

## 4.6.2 Documenting Observations

The observations were audio and video recorded. This guaranteed that the observer was able to attend to hearing the think aloud protocol of the participant, notice their actions, and also to review the observation later.

The video recordings were done with the camera facing the participant's screen in order to capture the actions and choices of the participant. Photos were taken of the participant in the setting, intentionally avoiding identifying features of the participant like their face.

Ethnographic techniques and think aloud protocol were used as a way to capture the participants actions, attitudes, and thoughts. Direct observation and the ability to "see inside" the participant's head with think aloud protocol gave direct experiential evidence of participants' flexibility. We used a variation of think aloud protocol that encouraged unstructured verbal reports of thinking. The researcher gave prompts to the user to continue sharing what they were thinking, seeing, or doing. There were no restrictions placed on the conversation of the participant. They were not limited to "thoughts" but were allowed to laugh, sigh, complain, explain, and more as they wanted.

This blend of think aloud and talk aloud protocols allowed us to hear what the user was thinking, trying to do, or trying to decide, as well as get their impressions of the tasks or software and any emotions they felt. The intention was to gather as much qualitative information as possible about the user's efforts to do the directed tasks. This study is not intended to objectively measure internal cognitive processes. This variation of think aloud and talk aloud protocol increased our observational insight.

The recordings of the think aloud protocol were later reviewed and transcribed. The transcriptions summarize phases two and three of the observations and focus on details of task failure as well as attitudes and feelings expressed. As Sim states, "results from these [ethnographic] studies tend to be descriptive and prosaic". (Sim 1999). The transcriptions are not word for word but do included many descriptive quotes and actions that capture stumbling, resistance, quitting, persistence, design comments, feelings, and many other interesting tidbits of usability and attitude. See Table of Appendices for the transcriptions.

## 4.6.3 Analyzing Observations

Observations and transcripts were reviewed for major themes that emerged and coded to measure levels of failure to accomplish unfamiliar tasks or near skill transfer. A scoring rubric was created to convert participant's actions and attitudes into quantitative data. Rating results were tested for reliability using a second and third rater.

Remember, each observation was unique. Both time spent on a task and the number of tasks varied based on the user's experience, actions, and state. The participant's distractions and the researcher's directions, hints, and interruptions to discuss attitudes and feelings all contribute to a unique experience in each observation.

Therefore, to quantify the observed behavior, we allow for variability in these factors. An expert might complete an unfamiliar task in 2 seconds, and someone else in 16 seconds, or maybe 10 minutes. We found that 20 seconds allowed enough time for individual variability in successful task completion. When a task took 20 seconds or longer, it is not a success. It is rated as a “stumble”.

Stumble correctly measures faltering in completing a task. We rate one minute or longer of not accomplishing a task as a “fall”. This indicates the participant has fallen down in performing the task but they can get back up. They might persevere and complete the task still. Efforts to complete a task that passed 3 minutes are rated as a “persist”, and each instance was marked for how long past 3 minutes the participant persisted.

Stumble, fall, and persist are all time related and allow for individual variation. Only one stumble, fall, or persist are counted for each task. In addition, there are two more codes, “quit” and “resist”. These are also rated one per task. Quit and resist are based on the participant’s words and might not include matching action. For example, they might say, “I am done with this” but keep looking to complete the task. This counts as a quit. Please see Table 1 for more detail.

**Table 1: Rubric for Coding Observation Transcripts**

CODE	Application	Example
Stumble	[action] >= 20 seconds	Task takes 20 seconds or longer, at most one per task
Fall	[action] >= 1 minute	Task takes one minute or longer, at most one per task, must be preceded by a stumble
Persist	[action] >= 3 minutes	Task takes 3 minutes or longer, at most one per task, must be preceded by a stumble and fall
Quit	attitude towards a task	Could be words/attitude without taking action, at most one per task, e.g. give up, quit, leave, stop, done, or finished
Resist	attitude towards a task	Could be words/attitude without taking action, at most one per task, e.g. deny, refuse, contradict, reject, refuse

Results of coding were statistically analyzed for differences using Mann-Whitney U tests and Spearman’s rho correlation tests, both non parametric, because the code results do not pass the parametric assumption for independence.

## 4.6.4 Setting

Observing users in their own comfortable setting, system, and software served not only to confirm the user’s proficiency but also to put the participant at ease during the observation so that factors like test anxiety would have the least impact on user’s ability to learn new skills on their own.

Every effort was made to provide a distraction free environment for the study. The familiar environment of the first part of the observation was of the participant’s choosing. The unfamiliar envi-

ronment was a quiet computer lab where the observer and participant were often the only people in the room. This was to alleviate the effects of distraction.

## 4.6.5 Familiar and Unfamiliar System

The choice of familiar and unfamiliar system was dictated by the experience of the participant. We did most of the unfamiliar observations on a Linux operating system since most participants were unfamiliar with it. A few of the intrinsically motivated participants who had expert proficiency already knew Linux well, so we used either Mac or Windows for their least familiar system depending on their experience.

Linux Fedora is similar to Windows or Mac but it has some noticeable differences such as the menu being on the top of the desktop (unlike Windows, similar to Mac) and the specific desktop used in the tests did not have icons to start the programs they needed (unlike Windows and Mac). Also the “my computer” icon did not access programs as users seemed to expect. The users all hesitated to click on the menus at the top, thinking they were buttons instead of realizing they were menus with more options underneath.

## 4.6.6 Familiar and Unfamiliar Software

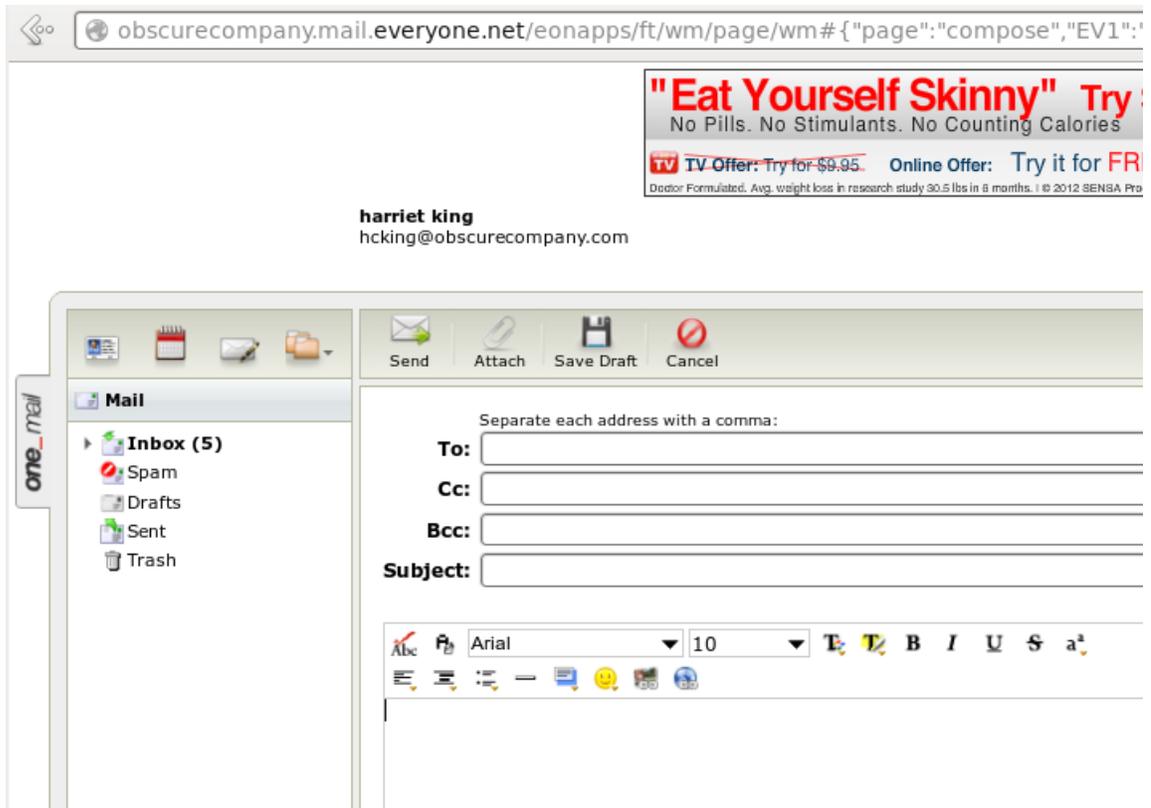
For familiar software, we focused primarily on email and word processing because they are very commonly used tools by daily users. This would allow us to confirm existing competencies and also facilitated drawing general observations across the JE and intrinsic user groups.

The unfamiliar tasks in familiar software for phase 2 were customized based on the participant's experience, but often were things like: find your email contacts, create a group email list, send email to that list, insert a table in word processing, and more. These were done in the participant's own software and system.

Beyond testing unfamiliar task accomplishment, we also wanted to test how transferable routine tasks are to unfamiliar systems and software. Phase 3 required unfamiliar software to test near skill transfer. The software we used needed to be unfamiliar to all participants but also require similar routine tasks and be reasonably well designed. We also require the unfamiliar interface to not intentionally limit the user choices or have very directive interactions.

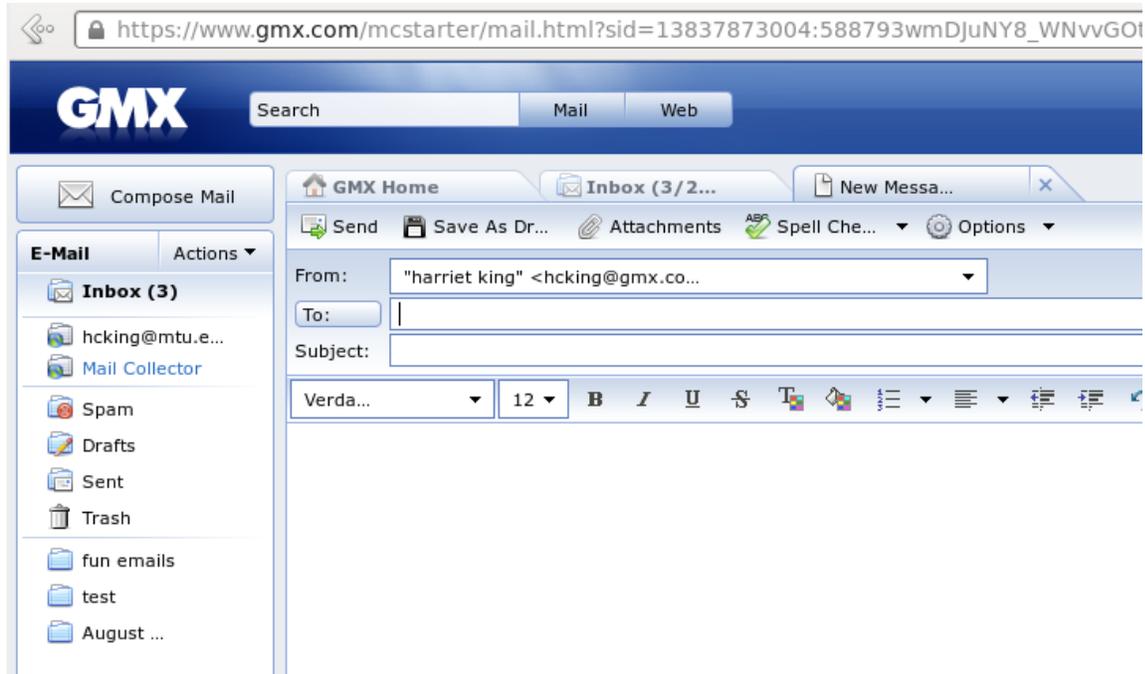
Directed interaction eliminates opportunities for users to make choices, explore, and demonstrate they are engaging in complex problem solving. If the software interaction is only one path, then the user has no choice in their actions and any proficiency can be credited to the directive software.

Likewise, intentionally awkward or obfuscating user interface design would give confused results. If the user had trouble with skill transfer, it might be just confirming that bad design makes for failed work flow instead of testing the user's competence transfer. Some basic good design criteria for user interfaces include function visibility and predictability, helpful and timely feedback to the user, user choice and control, and consistency for similar actions. (adapted and expanded from Norman 2002).



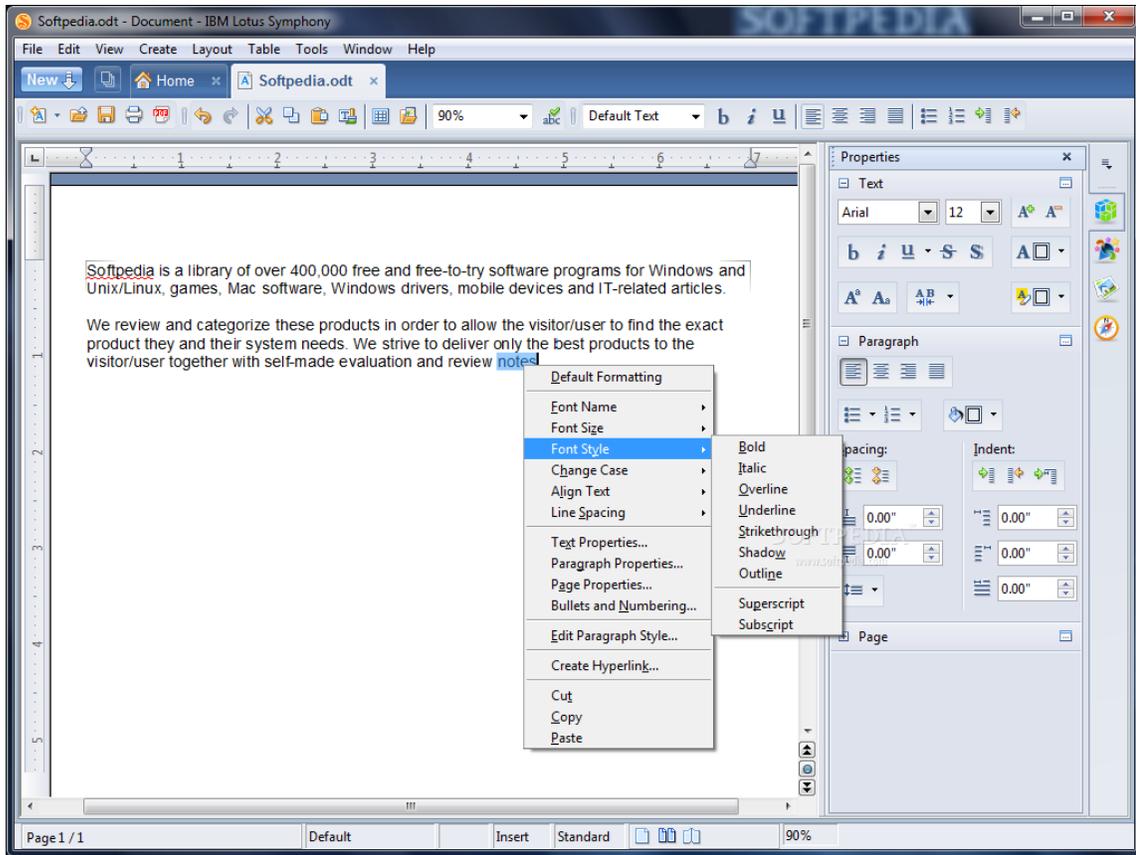
**Figure 3: Screenshot of Obscure Company Webmail, an unfamiliar software for participants. (Fair use of copyrighted material: see Appendix A.)**

We also needed the software to have the same routine tasks that participants already demonstrated in confirming their proficiency. For example, if the user demonstrated proficiency in reading, replying, forwarding, attaching, and deleting email then those same routine tasks need to be in the unfamiliar software. These same routine tasks in unfamiliar software require near skill transfer.



**Figure 4: Screenshot of GMX Webmail, an unfamiliar software for participants. (Fair use of copyrighted material: see Appendix A.)**

For webmail, we used “Obscure Company” (Fig. 3) and “GMX” (Fig. 4) webmails and for word processing, we used “IBM Lotus Symphony” (Fig. 5) on Linux. The two webmails and the word processing all fit into generally accepted good design principles of providing the user with feedback, clear affordance, expected menu and button placement, consistency, mouse hover hints, and more. Interestingly, a few Gmail using participants commented that they preferred the unfamiliar webmail to their current Gmail software.



**Figure 5: Screenshot of IBM Lotus Symphony, the word processor that was unfamiliar software for participants. (Fair use of copyrighted material: see Appendix A.)**

We have analyzed the work flow of a few routine tasks in Table 2. We used Gmail webmail as our typical familiar email and most of the 16 participants used Gmail. For example, the user starts composing an email by clicking a button which is found on the upper left in Gmail, Obscure Company, and GMX. But in Obscure Company there is no color difference or word label on the compose button (Fig. 6). In GMX and Gmail there is a clear indication that “Compose” is a button and it is labeled with a word. So the work flow is a near skill transfer: all have buttons in the same left top of the screen, but Obscure Company’s “Compose” button is less obvious with only a picture and no indication it is actually a button.



**Figure 6: Side by side comparison of webmail "compose" button: Obscure, GMX, and Gmail. (Fair use of copyrighted material: see Appendix A.)**

Table 2 notes if there are differences in the work flows for compose, open inbox, read, reply, and forward an email, all routine tasks. The first column tells what task, the second column tells how Gmail handles the task, since Gmail is our example of a familiar software. Column 3 notes the differences, if any, in the work flow for that task between Gmail, Obscure Company, and GMX. Column 4 describes how Obscure Company handles the task and column 5 tells how GMX handles the same task. So column 2 is familiar software compared to columns 4 and 5 for unfamiliar software.

**Table 2: Detail of Near Skill Transfer: work flow comparison of unfamiliar webmail software.**

Task	Webmail	Workflow
<b>compose mail (Fig. 6)</b>	Familiar Gmail	click "compose" button, top left, contrasting color
	Unfamiliar Obscure Company	click pencil/paper icon, top left between other icons, same color, no words
	Unfamiliar GMX	click "compose mail" button, top left, same color
	Difference in Work Flow	harder to see compose in obscure company but all compose buttons are in same area of screen
<b>open inbox</b>	Familiar Gmail	click "inbox" word on left top, same color
	Unfamiliar Obscure Company	click "inbox" word on left top, same color
	Unfamiliar GMX	click "inbox" word on left top, same color
	Difference in Work Flow	NO DIFFERENCE
<b>read mail</b>	Familiar Gmail	click "[name of sender or participant]" of mail in center large panel, same color, opens by replacing same center window

<b>Task</b>	<b>Webmail</b>	<b>Workflow</b>
	Unfamiliar Obscure Company	click “[name of sender or participant]” of mail in center top half panel, same color, opens in bottom half of center panel
	Unfamiliar GMX	click “[name of sender or participant]” of mail in left half of center panel, same color, opens in right half of center panel
	Difference in Work Flow	Gmail replaces center panel with reading pane, others open reading pane side by side with inbox list (either below or to the right)
<b>reply to mail</b>	Familiar Gmail	click “arrow” icon button on right at top of what reading, same color, no word, OR gray “reply” word link at bottom, same color in separate white box. NOTE: if email is medium to large, “arrow” icon button disappears into the header and the second choice disappears into the footer
	Unfamiliar Obscure Company	click “reply” button with picture and word, top icon bar, first of 9 buttons with words, same color
	Unfamiliar GMX	click “reply” button with picture and word, top icon bar, 2nd of 7 buttons with words, same color
	Difference in Work Flow	Gmail has two reply buttons, both same color as background, one is a word, one is an icon, one or both can disappear with medium and bigger emails by floating off the top of the mail view. Both gmx and obscure have one step: a button with word and icon, always visible
<b>forward mail</b>	Familiar Gmail	click “drop down” arrow on “arrow” for reply to see more options, same color, then select “forward in drop down menu”, all on center right at top of email reading, or click gray on white words in white box at bottom (often not visible if reading anything other than shortest email) NOTE: same as for reply
	Unfamiliar Obscure Company	click “forward” button with picture and word, top icon bar, 3rd of 9 buttons with words, same color
	Unfamiliar GMX	click “forward” button with picture and word, top icon bar, 3rd of 7 buttons with words, same color
	Difference in Work Flow	Gmail has two buttons, one requires two steps (select from drop down), both buttons are same color as background, one is a word, one is an icon, one or both can disappear with medium and bigger emails by floating off the top of mail view. Both gmx and obscure have one step, button with word and icon, always visible, both at top center area

The main comments from participants were about how much easier it was to read and to compose email in Obscure Company and GMX instead of Gmail because Gmail has smaller text boxes to type in or read from with no control for resizing but both Obscure Company and GMX had a fairly large and simple view of both reading and composing.

## 4.7 Post Questionnaire

After the observations, the participant was asked to complete a questionnaire designed to capture the participant's overall experience and allow them a chance to provide written feedback (Appendix H - Post Observation Questionnaire). The five questions were:

1. On a scale of 1 to 10, with 10 being very stressed and 1 being no stress, what was the most stress you experienced DURING the test?
2. What were you trying to do when you had your maximum stress level DURING the test?
3. On a scale of 1 to 10, with 10 being very stressed and 1 being no stress, how do you feel right now?
4. Please give any feedback that would help in our study of the effects of motivation on computer competency.
5. Please give any further comments here.

In addition, all extrinsic participants were asked follow up questions about their attitude to the term "Just Enough" users by email weeks later. This was to get direct information about the term from the people who fit it. The email explained our definition of "Just Enough" as "someone who only learns/knows enough to get what they need/want from a computer. A "Just Enough" user does not have high interest/enjoyment in using computers. Instead they use them to get what they need/want." (Appendix I - JE User Questionnaire and Results (weeks later)). The 3 questions were:

1. A. Would you consider yourself a "Just Enough" computer user? (yes/no)
2. B. If you consider yourself a "Just Enough" user, what feelings do you have about that?
3. What do you think about the term "Just Enough" user?
4. Do you have suggestions regarding "Just Enough" users?

# 5 Results

The Results include both quantitative and qualitative data. Quantitative results include motivation inventory results with appropriate analysis and data reporting. The inventory results were used to select participants to observe. Observation results are also quantified by coding the transcripts, establishing inter rater reliability, and statistically analyzing the coded results.

Qualitative observation results provide deeper understanding of JE users through observed nuances of the participants' attitudes and behaviors. The qualitative section begins by introducing participants with their basic information and an illustrative quote from the observations that gives a hint to their personality. Then more results for each participant and a two examples of how and where a participant failed at a task. Extensive qualitative results follow that detailing the themes and data supporting our hypothesis. Our design study of customized directions, ethnographic techniques, and using a think aloud protocol, allowed us to gather rich data and deep understanding about the participant.

We also include the questionnaire results for the pre and post questionnaires and the special questionnaire only to JE users asking what they thought of the term "Just Enough" user.

## 5.1 Pre-Questionnaire Results

The main point of the pre-questionnaire was to find daily computer users and to discover if they were exploring computer users or not, see 4.2 Pre-Questionnaire in the Method section. Remember, we only wanted to observe participants who were proficient daily users that fit the extrinsic or intrinsic motivation style. Our questions for identifying "explorers" were also intended to identify potential JE users.

For example: "I mostly use computers only to get results, for example, see pictures, hear news, do work" and "I use computers just to get what I need" both give us a JE user with a "true" answer and probably an explorer with a "false" answer. The questions "I want to use computers even when I have no purpose" and "I enjoy exploring on computers" should identify explorers with a "true" answer and maybe a JE user with a "false" answer.

All answers to the pre-questionnaire are direct self reporting. The results are interesting because it does not exactly match the results found from the validated motivation inventory (Table 3). Some of the extrinsics answer true to being an explorer; for example, Alice answers true to the first explorer question and false to the last JE question and Walter answers true to the second explorer question. Intrinsic like Mike, Peter, Rebecca, and Wilma answered one or more of these questions as if they were extrinsic. This is more evidence of the value of the professional psychological instrument that was adapted to create our motivation inventory because the self report answers from the pre-questionnaire do not give reliable motivation style results.

**Table 3: Summary of Pre-Questionnaire self report answers for each observed participant ordered by motivation style.**

Name	Explorer I want to use computers even when I have no purpose	JE I mostly use computers only to get results	Explorer I enjoy exploring on computers	JE I use computers just to get what I need	Motivation Style
Alice	T	T	F	F	extrinsic

<b>Name</b>	<b>Explorer</b> I want to use computers even when I have no purpose	<b>JE</b> I mostly use computers only to get results	<b>Explorer</b> I enjoy exploring on computers	<b>JE</b> I use computers just to get what I need	<b>Motivation Style</b>
Lilly	F	T	F	T	extrinsic
Lucy	F	T	F	T	extrinsic
Marsha	F	T	F	T	extrinsic
Mary Ann	F	T	F	T	extrinsic
Miranda	F	T	F	T	extrinsic
Molly	F	T	F	T	extrinsic
Olivia	F	T	F	T	extrinsic
Walter	F	T	T	T	extrinsic
Beth	T	F	T	F	intrinsic
Jane	T	F	T	F	intrinsic
Mike	F	T	T	F	intrinsic
Peter	F	T	T	F	intrinsic
Rebecca	T	T	F	T	intrinsic
Roger	T	F	T	F	intrinsic
Wilma	F	T	T	F	intrinsic

The pre-questionnaire also was the first time we asked respondents to share their main reasons for using a computer, as shown in Table 4. In the table, the respondents are ordered alphabetically by code name because when you read what they use computers for on a daily basis, there is no clear difference between intrinsic and extrinsic users. Basically, both extrinsics and intrinsics report using computers for work, communication, information.

**Table 4: Results from Pre-Questionnaire: What would you say your main reasons are for using a computer now. Ordered alphabetically by code name.**

<b>Code Name</b>	<b>Pre-Questionnaire Main Reasons to Use Computers</b>	<b>Motivation Style</b>
Alice	manage volunteer work, accounting, email, Facebook	extrinsic
Beth	study, watch news and TV, "I use computer everyday even sometimes I don't have any specific purpose"	intrinsic
Jane	work, education, entertainment, exploring	intrinsic
Lilly	work, correspondence, shopping, communicating w/family	extrinsic
Lucy	work, email	extrinsic
Marsha	finances, minutes, keep in touch, volunteer, email family, government forms	extrinsic
Mary Ann	work, email, data base work	extrinsic
Mike	getting general info, email, Facebook, contact with others	intrinsic
Miranda	to help my business grow	extrinsic
Molly	work, keep up with my profession	extrinsic
Olivia	work, communication	extrinsic
Peter	"get access to information from other sources or own calculations faster than I ordinarily would be able to"	intrinsic
Rebecca	keep in touch, pay bills, create documents, archive photos	intrinsic
Roger	everything	intrinsic
Walter	email, research, music (singing and learning)	extrinsic
Wilma	email	intrinsic

## 5.2 Inventory Results

The goal of giving and scoring the motivation inventory was to find possible candidates for observation. Because we only gave the inventory to daily computer users, each individual score identified predominantly extrinsic, intrinsic, or “Other” motivated daily computer users. The inventory results were statistically analyzed with two goals: to validate the data and to describe the intrinsic and extrinsic users. Details of the questionnaire, scoring, and statistical analysis are in 4.3 Motivation Inventory in the “Method” section.

The motivation inventory gave us quantitative results from 32 questions. The questionnaire has a seven point Likert scale which is scored by first correcting for any reverse scored questions, and then averaging responses to each of the six factors. This yielded a single average score per factor for each respondent as recommended by Deci and Ryan (Ryan and Deci 2012). A minimum score is 1, neutral is 4, and maximum is 7. We used less than or equal to neutral, which is 4, as a low score and above neutral as a high score.

The six factors include one factor for amotivation, also known as apathy. Two factors cover two forms of extrinsic motivation: external regulation and identified regulation (Guay et al. 2000). Two factors measure intrinsic motivation: interest/enjoyment and perceived choice (Ryan and Deci 2012), which must be positively correlated. The sixth factor measures perceived competence.

We administered 66 inventories over two months in our effort to understand motivation style and find candidates to observe. Respondents were culled from every possible source including community groups, classmates, faculty, and family. Notices were posted at a popular grocery store but no respondents came forward from that. This constitutes a sample of convenience. Please see 4.1 Participant Selection in the “Method” section for more information. All respondents to the inventory are n=66 and the observed participants are n=16. Both respondents and participants were statistically analyzed.

### 5.2.1 Parametric or Non Parametric Statistics

Because we have a sample of convenience, we need to demonstrate the three assumptions required to assume evenly distributed data so we can perform parametric statistical analysis. The 3 assumptions are normality, homogeneity, and independence (Sirkin 2006). For factors that fail the assumptions for parametric analysis, we use non parametric statistics. Before we can test for valid data that has a significant correlation between interest/enjoyment and perceived choice, we have to discover which factors can be tested parametrically and which must be non parametric.

The parametric assumption of independence tells if one score is independent from another. Because each score represents a different human, the scores are independent. The independence assumption holds for all six factors for 66 respondents and for 16 participants.

The assumption of normality can be shown by kurtosis and skewness calculations both being less than the absolute value of 1.95 (Table 5). All six factors in the inventory scores for the 16 observed participants and the 66 respondents show skewness and kurtosis below absolute value of 1.95 except amotivation. Amotivation for n=66 fails the test of normality with kurtosis score of 1.986. Therefore amotivation needs non parametric analysis.

**Table 5: Inventory Skewness and Kurtosis by Factor**

	Respondents n=66		Observed Participants n=16	
	Skewness	Kurtosis	Skewness	Kurtosis
Amotivation	1.486	1.986	1.004	-0.557
Identified Regulation	-0.063	-1.048	-0.527	-1.157
External Regulation	0.038	-0.781	-0.273	-0.870
Interest/Enjoyment	-.0513	-0.050	0.165	-1.358
Perceived Choice	-0.213	-0.708	-0.050	-1.565
Perceived Competence	-0.246	-0.609	-0.533	-0.988

Homogeneity is the equality of variances and can be shown with Levene’s test for Equality of Variances (Table 6). Among the 16 observed participants, all six factors passed Levene’s test and have equality of variances but both amotivation and perceived competence fail to have equal variances for n=66. Amotivation already failed the normality assumption for n=66 and now amotivation and perceived competence have failed homogeneity for 66 participants. Therefore amotivation and perceived competence both need non-parametric analysis.

**Table 6: Homogeneity of Inventory Factors**

	Levene’s Test for Equality of Variances n = 16 Observed. Significance	Levene’s Test for Equality of Variances n = 66 Respondents. Significance
Amotivation	0.053	0.002
Identified Regulation	0.802	0.546
External Regulation	0.572	0.822
Interest/Enjoyment	0.989	0.842
Perceived Choice	0.492	0.218
Perceived Competence	0.152	0.010

Thus normality, independence, and homogeneity are demonstrated for external regulation, interest/enjoyment, perceived choice, and identified regulation. Then our sample of convenience for those factors can be assumed to be evenly distributed and can be parametrically analyzed.

In addition to amotivation and perceived competence needing non-parametric analysis, we also have information for age and whether a participant is a digital native (used computers before 18) or digital non-native from the demographics questionnaire given before each observation. Age fails the assumption for homogeneity with a Levene’s Test for Equality of Variances significance of p=0.003. Digital native is a categorical variable so it also requires non-parametric analysis. Digital native is categorical because it only has two values: the larger value of 2 is equal to digital native and the smaller value of 1 is equal to digital non-native. Therefore a relationship of “more”

digital native will be the state of 2 equals being a digital native, and “less” digital native is 1, which equals digital non-native.

**Table 7: Summarizing Parametric or Non Parametric Analysis**

Parametric or Non Parametric for Analysis	Inventory Factors
Passes 3 assumptions for parametric analysis	<ol style="list-style-type: none"> <li>1. external regulation</li> <li>2. interest/enjoyment</li> <li>3. perceived choice</li> <li>4. identified regulation</li> </ol>
Must be non-parametrically analyzed	<ol style="list-style-type: none"> <li>1. amotivation</li> <li>2. perceived competence</li> <li>3. age</li> <li>4. digital native</li> </ol>

Now that we know which type of tests to apply (Table 7), we can begin to validate the data based on the requirements by Deci and Ryan (Ryan and Deci 2012).

## 5.2.2 Required Correlation

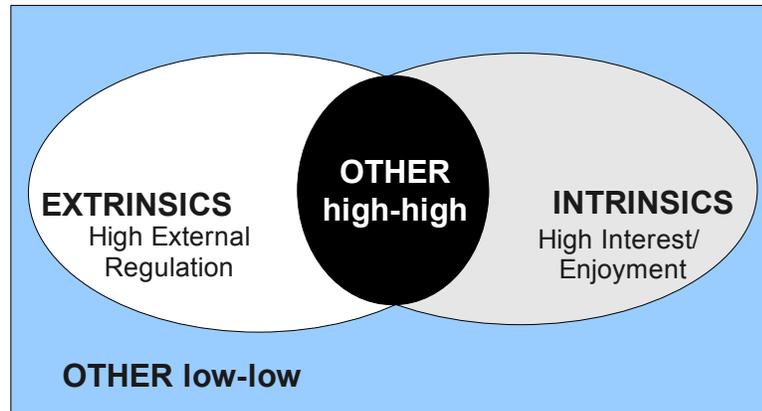
The requirement from Deci and Ryan (Ryan and Deci 2012) for valid data was to demonstrate a correlation between perceived choice and interest/enjoyment factors. Since both interest/enjoyment and perceived choice meet the assumptions for parametric analysis, we ran a Pearson correlation test. Interest/enjoyment is significantly positively correlated with perceived choice for both 66 respondents and 16 participants. See Table 8: Pearson Correlation of Interest/Enjoyment & Perceived Choice. Therefore the inventory data for n=66 and n=16 are both valid to use.

**Table 8: Pearson Correlation of Interest/Enjoyment & Perceived Choice**

Correlation of Interest/Enjoyment & Perceived Choice Factors		
	n = 66	n = 16
Correlation	0.602	0.815
Significance (2-tailed)	p < 0.01	p < 0.01

## 5.2.3 Separating Into Groups

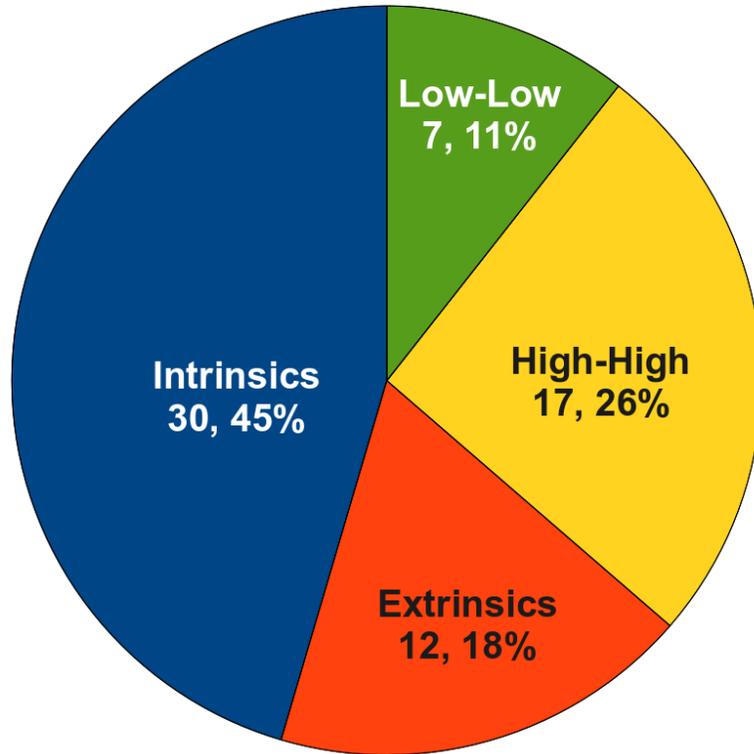
The next step is to define a grouping variable to separate the 66 respondents into intrinsic, extrinsic and other categories. We wanted to observe the most obviously extrinsically motivated or intrinsically motivated users. For this reason we define the grouping variable on high external regulation and low interest/choice or the reverse, as discussed in 4.3.3 Scoring Inventory in the “Method” section.



The Venn diagram shows how the intersection of high external regulation and high interest/enjoyment factors is not in either intrinsic or extrinsic groups (Fig. 7). Perceived choice has been demonstrated to have a significant positive correlation with interest/enjoyment so we define the grouping variable based on interest/enjoyment only. External regulation is the primary factor for extrinsic motivation (Guay et al. 2000) and interest/enjoyment is the primary factor for intrinsic motivation (Ryan and Deci 2012).

Perceived competence, perceived choice, and amotivation can be descriptive but are not identifying factors, per Deci and Ryan (Ryan and Deci 2012) and Guay, Vallerand, and Blanchard (Guay et al. 2000). Identified regulation is a form of internalized extrinsic motivation and was not correlated with external regulation in our 66 respondent's scores, so we are using only external regulation to define extrinsic motivation. Identified regulation is not used further in this study.

Intrinsic and extrinsic groups are separate and disjoint by definition. The grouping variable separates extrinsics by high external regulation and low interest/enjoyment, see Scoring Inventory in the Method section. The intrinsics are the opposite (Fig. 2 or Fig. 7).



**Figure 8: Extrinsic, Intrinsic, High-High, & Low-Low of all Inventory Respondents. Key to “XX, XX%”: total count, percent of all 66 respondents.**

In addition, there is the “Other” category which includes the “High-High”, which is high external regulation with high interest/enjoyment, and also the “Low-Low”, which is low external regulation with low interest/enjoyment. 37% of the 66 respondents are Other and were not qualified for observation (Fig. 8).

**Table 9: All 66 Respondents by Motivation Style**

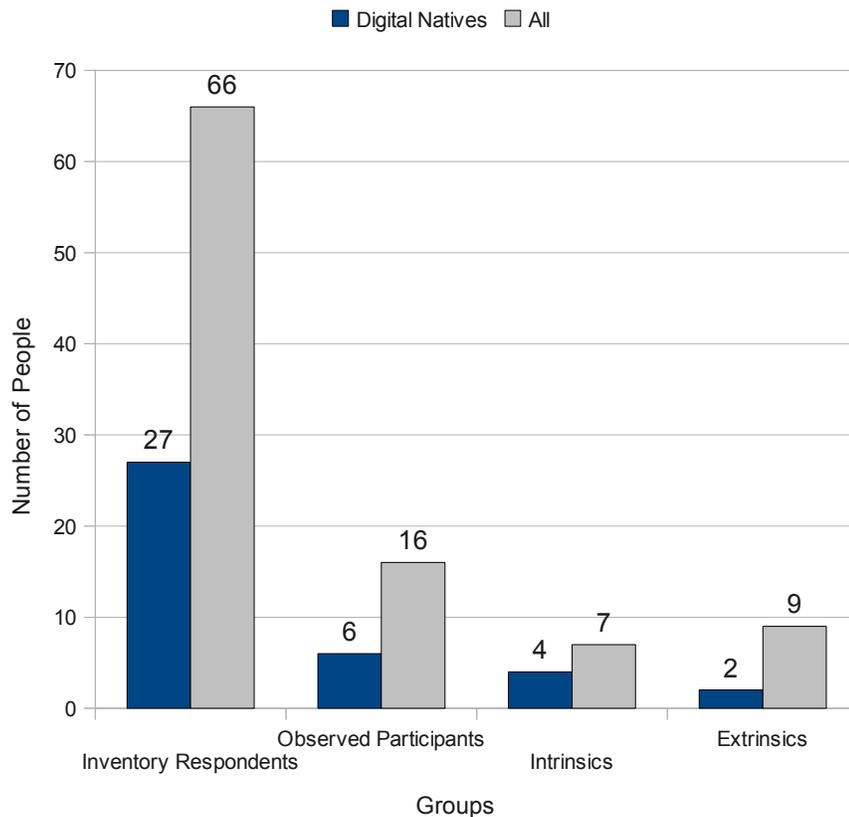
All Respondents By Motivation Style		
<b>Motivation Style</b>	<b>Number</b>	<b>Percent</b>
Intrinsic	30	45%
Extrinsic	12	18%
High-High	17	26%
Low-Low	7	11%
Total	66	100.00%

Twelve respondents, 18%, are predominantly extrinsically motivated and only 9 were willing to be observed (Table 9). The goal had been to observe 10 extrinsics with half of them being digital natives. We had difficulty finding extrinsically motivated digital natives and of the nine extrinsics

observed, only 2 were digital natives, or 22% (Fig. 9). Future work could study the ratio of extrinsics in digital natives and non natives.

There were 30 respondents that were predominantly intrinsic, representing 45% of the 66 total respondents. Initially we intended to observe 5 expert intrinsics as a contrast group to the JE users and expected that intrinsically motivated users in general would have high perceived competence due to their increased interest/enjoyment.

Surprisingly, we also found intrinsic users with lower perceived competence and realized that it would be helpful to test how an intrinsic user with low perceived competence would accomplish unfamiliar tasks or near skill transfer. So we studied 3 non-expert intrinsics and 4 expert intrinsics. The 4 expert intrinsics were also digital natives, so digital natives were 57% of all intrinsics (Fig. 9).



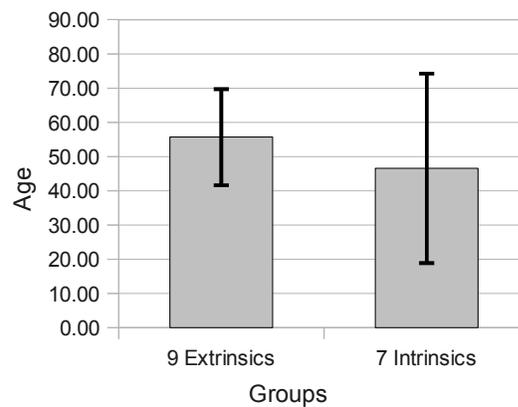
**Figure 9: Digital Natives Compared to Total of Each Group**

Overall, 41% of the 66 respondents were digital natives and among the 16 observed, 6 were digital natives, or 38% (Fig. 9)

## 5.2.4 Differences Between Extrinsic and Intrinsic

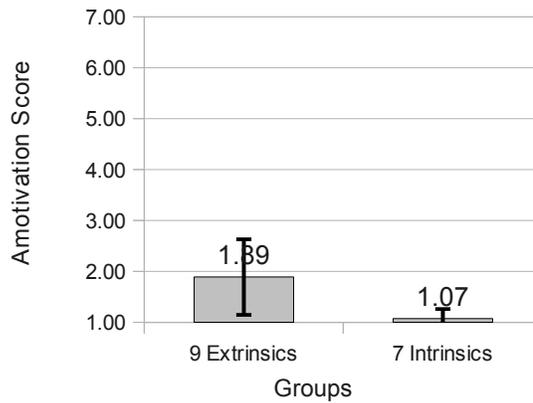
This section describes the inventory results and age and digital native analysis for the two groups of 9 observed extrinsics and 7 intrinsics. We tested for statistically significant differences between the extrinsics and intrinsics for age, digital native, and five relevant factors from the inventory: amotivation, external regulation, interest/enjoyment, perceived choice, and perceived competence.

A non parametric Mann-Whitney U test was conducted to compare the age and digital native factors between intrinsics and extrinsics. A plot of the mean age for intrinsics and extrinsics demonstrates the overlapping standard deviations (Fig. 10). There was no significant difference for either age ( $p=0.396$ ) or digital native ( $p=0.166$ ).



**Figure 10: Mean Age by Extrinsic and Intrinsic. Error bars represent standard deviation.**

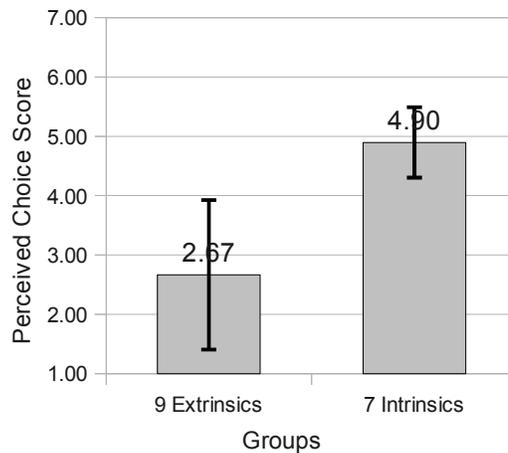
Amotivation failed the parametric assumptions so we ran a non parametric Mann-Whitney U test which showed significant difference between intrinsics and extrinsics for amotivation ( $U = 9.50$ ,  $p = 0.012$ ). Plotting the mean with standard deviation error bars for extrinsics and intrinsics demonstrates the U test results (Fig. 11). Extrinsics and intrinsics have different levels of amotivation.



**Figure 11: Mean Amotivation by Extrinsic and Intrinsic. Error bars indicated standard deviation.**

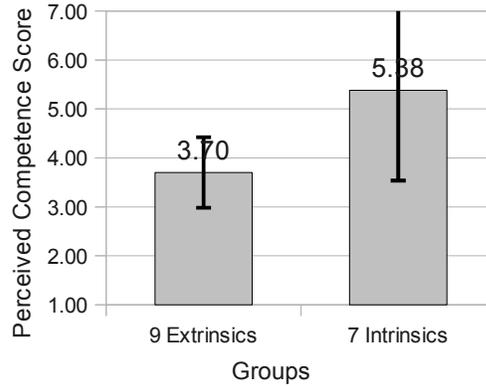
Extrinsic and intrinsic are defined by the grouping variable to be different for external regulation and interest/enjoyment. No tests are necessary to show the groups are different.

Perceived choice is evenly distributed based on passing the three assumptions for parametric statistics, including equal variances. An independent samples t-test was conducted to test perceived choice for differences between intrinsic and extrinsic. There was a significant difference in the scores for extrinsic (M=2.7, SD=1.3) and intrinsic (M=4.9, SD=0.6);  $t(14)=4.306$ ,  $p=0.001$ . Since perceived choice is positively correlated with interest/enjoyment, it is not a surprise that the two groups are significantly different. Plotting the perceived choice mean with standard deviation error bars for extrinsic and intrinsic demonstrates the t-test results (Fig. 12).



**Figure 12: Mean Perceived Choice by Extrinsic and Intrinsic. Error bars represent standard deviation.**

Perceived competence failed the parametric assumptions so we ran a non parametric Mann-Whitney U test which did not show significant difference between extrinsics and intrinsics for perceived competence ( $U = 14.50$ ,  $p = 0.071$ ). Plotting the mean with standard deviation error bars for extrinsics and intrinsics visually demonstrates the U test results (Fig. 13).



**Figure 13: Mean Perceived Competence by Extrinsic and Intrinsic. Error bars represent standard deviation.**

In summary, extrinsics are statistically significantly different from intrinsics for amotivation and perceived choice, as well as the grouping variables of external regulation and interest/enjoyment (Table 10). Extrinsics and intrinsics are not statistically significantly different for age, being digital native, and perceived competence, which are important characteristics in analyzing the two groups' different performance in the observations.

**Table 10: Significant Differences in Inventory Scores, Age, & Digital Native**

Factor	Different	Significance
Age	<b>NOT</b> different	$p=0.396$
Digital Native	<b>NOT</b> different	$p=0.166$
Perceived Competence	<b>NOT</b> different	$p=0.071$
Amotivation	<b>Different</b>	$p=0.012$
External Regulation	<b>Different</b>	$p<0.001$
Interest/Enjoyment	<b>Different</b>	$p<0.001$
Perceived Choice	<b>Different</b>	$p=0.001$

Some things might not be significantly different statistically but are still interesting to notice. For example, we had difficulty finding enough digital native extrinsics for our study and ended up with only 2. Amotivation is significantly different between extrinsics and intrinsics, but all scores

are very low. The maximum score is only 2.75 for either group, which is still quite low (Table 11). Clearly, all the 16 observed participants are generally not amotivated.

**Table 11: Minimum & Maximum Scores for Extrinsic and Intrinsic**

	EXTRINSIC		INTRINSIC	
	Minimum	Maximum	Minimum	Maximum
Age	34	74	23	87
Amotivation	1.00	2.75	1.00	1.50
External Regulation	4.25	6.50	1.00	4.00
Interest/Enjoyment	1.57	4.00	4.14	6.71
Perceived Choice	1.57	5.57	4.14	5.86
Perceived Competence	2.50	4.33	2.67	7.00

Perceived competence is interesting because there is no significant difference between intrinsic and extrinsic. But there is a big difference in the maximum perceived competence for extrinsic of 4.33 and intrinsic having the highest possible score of 7.0 (Table 11). The intrinsic has a higher perceived competence mean of 5.38 compared to the extrinsic's below neutral mean of 3.70 (Table 12). The minimum perceived competence for extrinsic is 2.5 and 2.67 for intrinsic, which is very close. It is clear in the motivation research that intrinsic motivation leads to increased success (Ryan and Deci 2000), so the intrinsic's higher perceived competence fits with intrinsic's expected higher success.

Perceived choice was shown to be significantly different for extrinsic and intrinsic, but look at the maximum (Table 11). They almost match at 5.57 and 5.86. The minimum for extrinsic is 1.57 compared to 4.14 for intrinsic and the means are also quite different as one might expect based on the statistical analysis result. The perceived choice extrinsic mean is 2.67 compared to the intrinsic mean of 4.90 (Table 12).

### 5.2.5 Data Screening

Data screening identifies any missing data or outliers and can help describe the participant groups. We did data screening with descriptive statistics for the 66 inventory respondents, the 16 observed participants, and the 9 extrinsic and 7 intrinsic observed. For complete score listings per respondent and participant, see Appendix J - Inventory Results. There is no missing data. Here we report the mean and the standard deviation for age (from demographic questionnaire) and the five inventory factors (Table 12).

**Table 12: Mean & Standard Deviation for Each Group: n=66 Inventory Respondents, n=16 Observation Participants, n=9 Extrinsic Observed, n=7 Intrinsic Observed**

	Group	Age	Amotivation	External Regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence
<b>Mean</b>	n=66	NA	1.70	3.92	4.57	4.12	4.69
	n=16	51.69	1.53	4.19	4.07	3.64	4.44
	n=9	55.67	1.89	5.39	2.73	2.67	3.70
	n=7	46.57	1.07	2.64	5.80	4.90	5.38
<b>Std Dev</b>	n=66	NA	0.92	1.53	1.34	1.27	1.42
	n=16	20.82	0.69	1.68	1.80	1.51	1.54
	n=9	14.05	0.74	0.89	0.89	1.26	0.72
	n=7	27.68	0.19	1.02	0.95	0.59	1.84

There are two observed participants who are outliers. Intrinsic Mike is an outlier in amotivation and extrinsic Molly is an outlier in perceived choice.

Mike was 2.3 standard deviations above the intrinsic mean with a 1.5 amotivation score. But 1.5 is still very low on a scale of 1 to 7. The other intrinsic all have the minimum score of 1.0 in amotivation. Because amotivation is not a grouping variable and 1.5 is still very low amotivation, we can note and then ignore Mike's deviation.

Molly was 2.3 standard deviations above the extrinsic mean with a perceived choice score of 5.57. The extrinsic perceived choice mean is quite low at 2.67. This is not surprising since extrinsics score below neutral of 4.0 for interest/enjoyment, and choice and interest are positively correlated. Since extrinsics are externally regulated and our grouping variable cuts off their interest score at 4.0 or below, we could expect perceived choice to be low. In our study, there is no requirement that perceived choice be low for extrinsics, just that choice and interest be positively correlated as demonstrated.

So what is going on with Molly having such high perceived choice as indicated by her score of 5.57? We asked Molly about her attitudes and we know that she asserts that she *always* has a choice. We are reminded of the American value for "rugged individualism". Molly says she has a choice regarding computer use because she can quit her job so she would not have to use computers. It is a drastic choice, but Molly sees it as a distant possibility. Her attitude explains her high perceived choice.

There were three other outliers that could not be observed satisfactorily so they were dropped from the study. One was an extrinsic daily user with the minimum possible score for perceived competence of 1.0. Her proficiency proved too low to confirm with observation. Another dropped outlier was an intrinsic digital native whose only software use was social media and internet shopping. Testing unfamiliar tasks in phase 2 or unfamiliar software in phase 3 was too difficult.

The third dropped outlier was an intrinsic digital native with a very high amotivation of 5.0. The intrinsic standard deviation for amotivation is 0.19, so this participant is 20 standard deviations above the mean. We stopped her observation mid way through because she clearly is an expert user. So instead we interviewed her to find out her reasons for scoring so highly amotivated. The interview results are very interesting and we hope to use them for another study.

## 5.2.6 Other Characteristics of Inventory Respondents

There are some interesting results from the total group of 66 inventory respondents. For example 41% of the 66 are digital natives but only 7% of digital natives are extrinsic. The other 93% are all either intrinsic or “Other” motivation style (High-High or Low-Low). The 7% of digital natives that are extrinsic is only two people, Lucy and Molly, and they are both older than 30. Of the four intrinsic digital natives observed, they are all younger than 28.

There are 29 of the 66 inventory respondents with high perceived competence scores of 5.0 or greater. 21 of those 29 are digital natives, or 72%. We already showed that among the 16 observed, there is no statistically significant difference between extrinsics and intrinsics for perceived competence. It would be an interesting future study to see how digital natives and non-natives differ on perceived competence.

When looking at correlation, we can use a parametric Pearson test for correlation for external regulation, interest/enjoyment, and perceived choice, whereas amotivation, perceived competence, digital native, and age can be non parametrically analyzed with Spearman’s rho. Age data was not gathered for the 66 inventory respondents because it was part of the pre-observation questionnaire. We already demonstrated that interest/enjoyment and perceived choice are significantly positively correlated as required by Deci and Ryan (Ryan and Deci 2012). Correlations are summarized in Table 13.

**Table 13: Summary of Correlations: n=66 Inventory Respondents & n=16 Observed Participants**

Relationship	Correlation	Significance	n	R^2
External Regulation with Interest/Enjoyment	- 0.821	p=0.001	16	67.40%
	- 0.397	p=0.001	66	15.76%
External Regulation with Perceived Choice	- 0.879	p=0.001	16	77.26%
	- 0.785	p=0.001	66	61.62%
Amotivation with Perceived Competence	- 0.602	p=0.014	16	36.24%
	- 0.339	p=0.005	66	11.49%
Age with Perceived Competence	- 0.710	p=0.002	16	50.41%

One question is whether correlations hold for both the 66 inventory respondents and the 16 observation participants. Because our grouping variable is defined to be opposite ends of external regulation and interest/enjoyment, we can expect a strong negative correlation there, which was confirmed with a Pearson test ( $rs[66] = -0.397, p=0.001$  and  $rs[16] = -0.821, p=0.001$ ). Because interest/enjoyment and perceived choice are already positively correlated, we can expect external regulation and perceived choice to also be negatively correlated, and that is confirmed with a Pearson test for both all respondents and the 16 observed participants ( $rs[66] = -0.785, p=0.001$  and  $rs[16] = -0.879, p=0.001$ ).

Both inventory and observation participants show a statistically significant negative correlation between amotivation and perceived competence using a Spearman’s rho ( $rs[66] = -0.339, p=0.005$  and  $rs[16] = -0.602, p=0.014$ ). This makes complete sense because if you are more apa-

thetic then you will spend less effort/time to be competent, a relationship that the negative correlation confirms statistically.

Age and amotivation do not have any significant relationship through correlation ( $p=0.859$ ) for the 16 observed participants and there is no age data for the 66 respondents. Age and perceived competence have a significant negative correlation from the Spearman's rho ( $rs[16]=-0.710$ ,  $p=0.002$ ). There is a significant positive correlation between age and digital native ( $rs[16]=0.536$ ,  $p<0.001$ ) which would be expected due to the definition of digital native as someone who grew up on computers and computers are somewhat new (Table 14).

**Table 14: Digital Native Significant Correlations for Observed Participants**

Digital Native Relationship with...	Correlation	Significance	n	R <sup>2</sup>
...Age	0.536	$p<0.001$	16	28.73%
...Interest/Enjoyment	0.561	$p=0.024$	16	31.47%
...Perceived Choice	0.575	$p=0.020$	16	33.06%
...Perceived Competence	0.647	$p=0.007$	16	41.86%
...External Regulation	-0.534	$p=0.033$	16	28.52%

Among the 16 observed participants, being a digital native shows significant positive correlations (Table 14) with interest/enjoyment ( $rs[16]=0.561$ ,  $p=0.024$ ), perceived choice ( $rs[16]=0.575$ ,  $p=0.020$ ), and perceived competence ( $rs[16]=0.647$ ,  $p=0.007$ ), and a significant negative correlation with external regulation ( $rs[16]= -0.534$ ,  $p=0.033$ ). This means that digital natives can be expected to have more interest/enjoyment, perceived choice, and perceived competence, and less external regulation than digital non-natives.

The inventory data collected could be analyzed further in a future study but let's focus now on our main topic: the actions, attitudes, and feelings of JE uses as they attempt unfamiliar tasks and near skill transfer. Please see the Appendix J - Inventory Results for complete statistical data.

## 5.3 Quantitative Observation Results

Observation results include two parts, quantitative and qualitative results, which allow deeper understanding of the same observation data. The quantified coded results are based on rating observation transcripts that are statistically analyzed, see 4.6.3 Analyzing Observations in the Method section for more information. The second part are the qualitative results which include highlights of observed attitudes, behavior, and feelings, and a few select tasks are described regarding how and where the participant failed. The quantified results of the motivation inventory and observation coding create the skeleton of the results and the qualitative stories and quotes flesh out the participant’s attitudes, feelings, and ability to adapt their proficiency.

Often when participants showed emotion, we asked them to rate their feelings on a scale of one to ten with ten being strong and one being weak. These self ratings of feelings are not statistically analyzed.

This section will detail the coded results from the transcribed observations and what statistical analysis can tell us about Just Enough users compared to intrinsics. Do JE users stumble and fall more than intrinsics? Stumble, fall, and persist are all time related codes and quit and resist are attitude related codes. Please see 4.6.3 Analyzing Observations in Method section for more detail regarding codes and transcripts. Coding in this manner first requires high inter rater reliability.

Inter rater reliability was greater than 95% agreement with the researcher’s ratings for all five codes using two outside raters reviewing 30% of the transcripts (Inter Rater Reliability Results). Stumble, fall, and persist are time related so inter rater reliability is 100% because counts can be confirmed with a spreadsheet. Quit has inter rater reliability of 99.13% with rater 1 and 97.73% with rater 2. Resist has 96.52% (rater 1) and 97.73% (rater 2) agreement with researcher’s ratings.

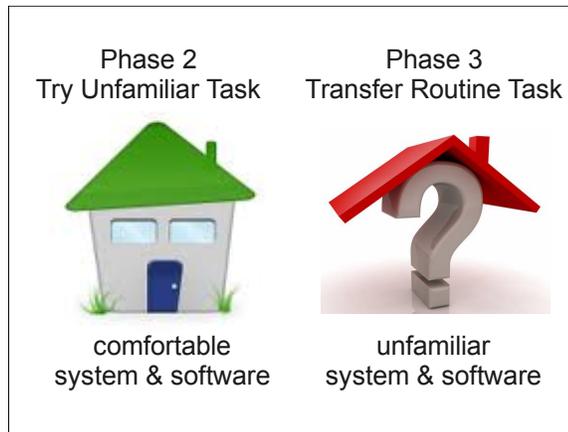
Extrinsics did most of the stumbling, falling, persisting and quitting. The total occurrences of each code are shown in Table 15. Extrinsics account for between 81% and 90% of each code. Remember, stumble is a 20 second delay, fall is a one minute delay, and persist is anything greater than 3 minutes trying to accomplish the task. So every fall is preceded by a stumble and every persist is preceded by a stumble and a fall. It is clear from the extrinsics’ 91 stumbles compared to 21 by intrinsics that extrinsics are having some difficulty in phases 2 and 3. But are the extrinsics and intrinsics statistically different in their performance?

**Table 15: Occurrences of Each Code for Extrinsic & Intrinsic in Phases 2 & 3**

Phase	Extrinsic	Intrinsic								
	Stumble		Fall		Persist		Quit		Resist	
2	50	11	32	5	9	2	7	1	7	2
3	41	10	24	6	6	0	2	0	6	0
Total	91	21	56	11	15	2	9	1	13	2
Percent	81%	19%	84%	16%	88%	12%	90%	10%	87%	13%

### 5.3.1 Differences Between Extrinsic and Intrinsic in Code Results

There is a statistically significant difference between intrinsic and extrinsic in stumbling, falling, persisting, and quitting using a Mann-Whitney U test. Because the coded results do not fit the parametric assumption for independence, we ran non parametric statistical analysis. Remember, phase 2 tests unfamiliar tasks in familiar system and software, and phase 3 tests near skill transfer in unfamiliar system and software ( Figure 15: Graphic Explanation of Phase 2 and Phase 3).



**Figure 15: Graphic Explanation of Phase 2 and Phase 3**

Mann-Whitney U tests show a significant difference between intrinsic and extrinsic for all codes except resist. We can see that extrinsic account for 87% of resisting in the observations but the two groups are not significantly different for phase 2 ( $p=0.246$ ), phase 3 ( $p=0.198$ ), or the total of the two phases ( $p=0.198$ ).

Stumbling and falling are both significantly different between extrinsic and intrinsic overall ( $U=5.0, p=0.004$  and  $U=5.5, p=0.005$  respectively) and also between phase 2 and phase 3 (Table 16). Mean rank indicates that extrinsic have more stumbles and falls, which can also be seen in Table 15 which details the coded results for extrinsic and intrinsic. Extrinsic account for 81% of stumbles and 84% of falls. This is good news for our hypothesis because it demonstrates that extrinsic stumble and fall on unfamiliar tasks in familiar software and on near skill transfer to unfamiliar software.

**Table 16: Extrinsic and Intrinsic Have Significant Differences in Phase 2, Phase 3, and total occurrences.**

Phase	Stumble	Fall	Persist	Quit
2	Different ( $U=3.5, p=0.003$ )	Different ( $U=4.0, p=0.003$ )	Not Significant ( $p=0.127$ )	Different ( $U=14.5, p=0.041$ )
3	Different ( $U=9.5, p=0.018$ )	Different ( $U=11.0, p=0.025$ )	Different ( $U=14.0, p=0.023$ )	Not Significant ( $p=0.470$ )

Phase	Stumble	Fall	Persist	Quit
Both Phases	Different (U=5.0, p=0.004)	Different (U=5.5, p=0.005)	Different (U=12.5, p=0.030)	Different (U=10.5, p=0.014)

Persist and quit are both significantly different between extrinsics and intrinsics overall (U=12.5, p=0.030 and U=10.5, p=0.014 respectively) as we might expect due to their functional connection to stumble and fall which also are significantly different. Mean rank indicates that extrinsics have more persists and quits than intrinsics in the total of both phases. Table 15 shows that 88% of persists are by extrinsics and 90% of quits are by extrinsics. It makes sense to find more occurrences of persists in extrinsics because they have more over 80% of stumbles and falls and persists must be preceded by stumble and fall. Likewise, if one succeeds at a task, then there is nothing to persist at or to quit.

**Table 17: Total Persist and Quit Occurrences for Extrinsic and Intrinsic**

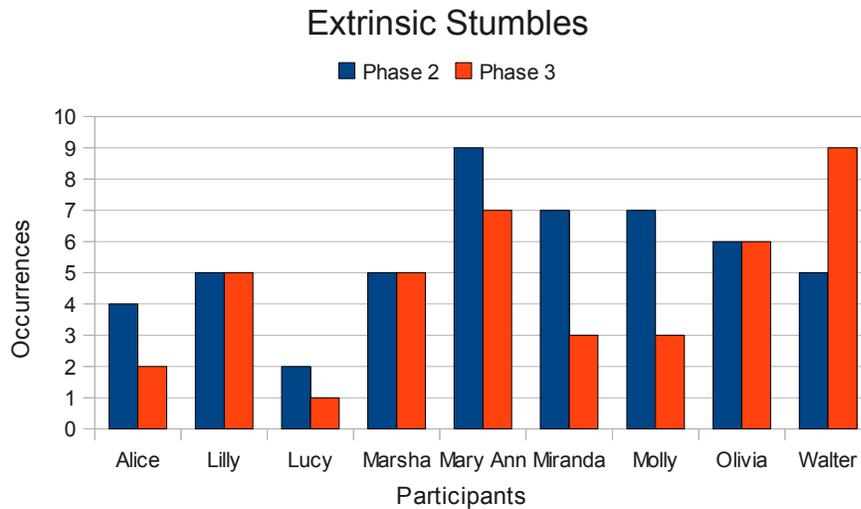
	Extrinsic	Intrinsic
<b>Persist</b>	15	2
<b>Quit</b>	9	1

When testing persist and quit in phase 2 and phase 3 separately, they are both not significant for one phase (Table 16). Persist has no significant difference in phase 2 and quit has no significant difference in phase 3. Is there anything about unfamiliar task that makes both extrinsics and intrinsics persist without significant difference? Is there something about near skill transfer that makes both extrinsics and intrinsics quit without a difference? Maybe the answer is that the counts for intrinsic are too small to really analyze (Table 17).

**Table 18: Comparing Phase 2 and Phase 3: No Significant Differences**

	Stumble	Fall	Persist	Quit	Resist
Extrinsic	NO Difference (p=0.370)	NO Difference (p=0.147)	NO Difference (p=0.738)	NO Difference (p=0.056)	NO Difference (p=0.494)
Intrinsic	NO Difference (p=0.784)	NO Difference (p=0.872)	NO Difference (p=0.317)	NO Difference (p=0.317)	NO Difference (p=0.317)

Another question is whether phase 2 and phase 3 had any significant difference. For example, did unfamiliar tasks in phase 2 incur more stumbles than near skill transfer in phase 3? A Mann-Whitney U test was run to discover if there is a difference between phases 2 and 3 for stumble, fall, persist, quit, and resist. The results indicate no significant difference in performance between phase 2 and 3 for either extrinsics or intrinsics (Table 18).



**Figure 16: Stumbles shown for phase 2 and phase 3 for each extrinsic participant.**

Initially it seemed like extrinsics did all the stumbling and mostly only on unfamiliar tasks, phase 2. Before the transcripts were coded and statistically analyzed, we would have said that near skill transfer, phase 3, was not a problem for JE users. But the statistics showed no significant difference between phases 2 and 3. Fig. 16 clarifies how individual performance did not improve in phase 2, it sometimes got worse.

Table 19 gives an idea of the effect size of the significant differences between extrinsic and intrinsic in coded observations for stumble, fall, persist, and quit. Resist is not significantly different between the two groups.

**Table 19: Occurrences of Each Code for Extrinsic & Intrinsic in Phases 2 & 3. Asterisk indicates statistically significant difference for this code between extrinsic and intrinsic.**

Total Observed Occurrences			
Code	Total	Percent	
Stumble*	91	81.00%	JE Users
	21	19.00%	Intrinsic
Fall*	56	84.00%	JE Users
	11	16.00%	Intrinsic
Persist*	15	88.00%	JE Users
	2	12.00%	Intrinsic
Quit*	9	90.00%	JE Users
	1	10.00%	Intrinsic
Resist	13	87.00%	JE Users
	2	13.00%	Intrinsic

### 5.3.2 Relationships Found in Extrinsic and Intrinsic

What relationships exist between the code results and also the inventory scores, age, and being digital native or non-native? When you test phases 2 and 3 for extrinsic and intrinsic separately the results are sparse. Extrinsic has no significant correlations and intrinsic has a positive correlation between stumble and fall in both phase 2 ( $r_s[7]=0.840$ ,  $p=0.018$ ) and phase 3 ( $r_s[7]=0.872$ ,  $p=0.010$ ).

When we separately focus on extrinsics or intrinsics and their relationships with the codes and inventory factors, we find interesting ways to describe the two groups. We use the total occurrences of each code for extrinsic and for intrinsic to do this analysis (Table 20).

**Table 20: Total Occurrences of Each Code for Extrinsic and Intrinsic**

	<b>Extrinsic</b>	<b>Intrinsic</b>
<b>Stumble</b>	91	21
<b>Fall</b>	56	11
<b>Persist</b>	15	2
<b>Quit</b>	9	1
<b>Resist</b>	13	2

Running Spearman’s rho tests reveals some significant correlations for the intrinsic and extrinsic group. When looking for relationships among all 12 variables, intrinsic had more correlations with 15 compared to extrinsic’s 4 relationships. The 12 variables are: choice, competence, external regulation, interest/enjoyment, age, digital native, stumble, fall, persist, quit, and resist. Correlations between the inventory scores, age, and digital native have already been discussed in 5.2 Inventory Results. But those results did not separate extrinsic and intrinsic, which we will do now.

The extrinsic group has 3 significant correlations for age: age is positively correlated with persist ( $r_s[9]=0.667$ ,  $p=0.050$ ); age is negatively correlated with digital native ( $r_s[9]= -0.728$ ,  $p=0.026$ ); and age is negatively correlated with amotivation ( $r_s[9]= -0.713$ ,  $p=0.031$ ). Extrinsic are also significantly negatively correlated with perceived choice ( $r_s[9]= -0.699$ ,  $p=0.036$ ). For a summary, see Table 21.

**Table 21: Extrinsic Group Significant Relationships**

<b>Relationship</b>	<b>To</b>	<b>Correlation</b>	<b>Significance</b>	<b>n</b>	<b>R^2</b>
Age	Persist	0.667	0.050	9	44.49%
	Digital Native	-0.728	0.026	9	53.00%
	Amotivation	-0.713	0.031	9	50.84%
External Regulation	Perceived Choice	-0.699	0.036	9	48.86%

Interestingly, this extrinsic group result means that there are no correlations between stumble, fall, quit, resist, or persist. But the older the extrinsic, the more likely they are to be persistent, not amotivated, and probably not a digital native. Digital native results are expected because computers are too new for someone over 55 to be a digital native. The more externally regulated the extrinsic, the less perceived choice they have. We saw this same significant relationship for all 16 observed participants and the 66 inventory respondents previously in the inventory results, see Table 16.

Because there are 15 significant correlations for the intrinsic group, we will summarize them in Table 22 and just briefly mention them here with a plus or minus sign to indicate the relationship. Stumble is significantly correlated with five things: fall (+), age (+), digital native (-), interest/enjoyment (-), and perceived competence (-). Besides stumble which was just mentioned, digital native is significantly correlated with five more things: age (-), external regulation (-), interest/enjoyment (+), perceived choice (+), and perceived competence (+). Age has already been listed as significantly correlated with stumble and digital native, and additionally with external regulation (+) and perceived competence (-). There are only 3 more significant correlations for the intrinsic group: perceived competence with falling (-) and also with interest/enjoyment (+), and external regulation with perceived choice (-).

**Table 22: Intrinsic Group Significant Relationships**

Relationship	To	Correlation	Significance	n	R <sup>2</sup>
Stumble	Fall	0.898	.006	7	80.64%
	Age	0.823	.023	7	67.73%
	Digital Native	-0.832	.020	7	69.22%
	Interest	-0.861	.013	7	74.13%
	Perceived Competence	-0.917	.004	7	84.09%
Digital Native	Age	-0.866	.012	7	75.00%
	External Regulation	-0.874	.010	7	76.39%
	Interest/Enjoyment	0.866	.012	7	75.00%
	Perceived Choice	0.866	.012	7	75.00%
	Perceived Competence	0.866	.012	7	75.00%
Age	External Regulation	0.757	.049	7	57.30%
	Perceived Competence	-0.929	.003	7	86.30%
Perceived Competence	Fall	-0.768	.044	7	58.98%
	Interest/Enjoyment	0.786	.036	7	61.78%
External Regulation	Perceived Choice	-0.883	.008	7	77.97%

Based on these statistical results for intrinsics we can describe the expectations for an intrinsic as shown in this study. The older the intrinsic, the more he/she will stumble, be externally regulated, and have less perceived competence. If the intrinsic is a digital native they can be expected to not stumble, be younger, have less external regulation and more interest/enjoyment, perceived choice, and perceived competence. If you happen to stumble or to fall your perceived competence can be expected to be lower.

**Table 23: Mean Number of Code Occurrences for Extrinsic and Intrinsic**

	Extrinsic	Intrinsic
stumble	10.11	3.00

	Extrinsics	Intrinsics
fall	6.11	1.57
quit	1.00	.29
resist	1.11	.29
persist	1.67	.29

In summary we have shown that extrinsics do stumble, fall, persist, and quit significantly more than intrinsics in both phase 2 and phase 3. Here are the mean number of occurrences for each code in Table 23. We demonstrated that phase 2 and 3 have no significant difference between them and there is no significant difference between extrinsics and intrinsics in age, digital native, or perceived competence scores on the inventory. Extrinsic and intrinsic are significantly different in stumbling and falling as we are graphically reminded in Fig. 17.

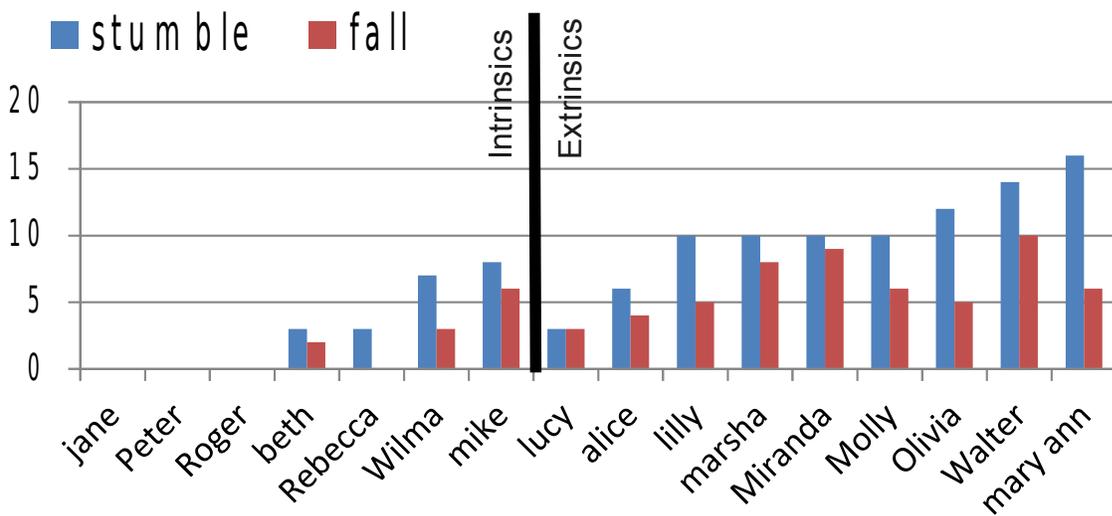


Figure 17: Comparing 9 Extrinsics and 7 Intrinsics for Stumble and Fall Performance. Intrinsics are on the left and extrinsics are on the right.

## 5.4 Qualitative Observation Results

Let's look next at each observed participant. They have been identified by motivation style and separated into the intrinsic or extrinsic group. All are proficient daily users. We have demonstrated how different the two groups are statistically. What are the individuals like?

The qualitative observations in this study are designed to gather a richness of data to give us a comprehensive understanding of JE users. The study design is not a sterile experiment with no researcher in the room with the participant, directions given only on paper, with no hints, help, or soliciting of attitudes or feelings. In our design, we required the researcher to monitor progress and adjust both the tasks, timing, directions, and questions to fit the participants apparent state and experience. This included drawing out participant's attitudes and feelings, and once the participant started to stumble, around 20 seconds, to give hints depending on the situation, please see Appendix M - Example Directive Wording for examples.

We want to understand JE user's attitudes, feelings, and ability to adapt their proficiency. For brevity we will focus on information related to our hypothesis. There are plenty of interesting things to point out in the 32 hours of recorded observations, which could be analyzed for computer literacy, impacts of age, communication patterns, interface design issues, and more. Future work could revisit the data with other emphases. Ethnographic studies like this one usually include the details of the setting, weather, distractions, lighting, time of day and those details are included in the Table of Appendices as a table for each participant, for example: Table 85: Wilma Detail Summary.

These qualitative observation results are presented journalistically starting with big picture style general descriptions and moving into deeper, more detailed examples. First we introduce the participants with their basic information including a descriptive quote, separated into their extrinsic or intrinsic groups. Next we give more detail by discussing their individual performance and characteristics, still split into extrinsics and intrinsics. Details of performance stumbling and falling follow with two case studies.

Then we delve into the nuances of participant's attitudes and feelings to illustrate the major themes of this study. We detail two pairs of similar proficient daily users who perform differently; one is intrinsic and one is extrinsic. Then we demonstrate participant's resistance, persistence, and quitting. Details exploring why participants do not use help systems are explored next. Then we answer the question whether the lowest interest/enjoyment and perceived choice extrinsics have any similarities. The last details example the effects from the test itself, including: changes in feeling, distraction, evidence of learning, and age and tiredness.

### 5.4.1 Introducing Observed Participants

There were seven intrinsic and nine extrinsic participants in the observations. In this section we will describe them for you. All names have been changed to protect privacy. Scores are the average of answers for each factor on the 7 point scale Likert scale, so the range of scores is minimum of one to maximum of seven with four being neutral. Self rating for competency and any self rating for feeling is on a ten point scale with one being minimum and 10 being maximum.

## Extrinsic Participants

The nine extrinsics include Alice, Lilly, Lucy, Marsha, Mary Ann, Miranda, Molly, Olivia, and Walter. Yes, too many females but remember, we observed every extrinsic we found that agreed to be a participant.

Alice is a digital non-native, 71 year old, with 16 to 25 years computer experience. She rates herself a 3 on competence out of a max of 10, but her inventory score for perceived competence is 4.17, just above neutral. Alice is not amotivated about using computers based on her inventory score of the minimum 1.0. Her extrinsic/intrinsic quality is close to neutral with external regulation at a mere 4.75 score but interest/enjoyment at 4.0, which is the highest interest score to still make the cutoff for extrinsic. Her perceived choice fits her qualifying for extrinsic at a lowly 3.29 score. Alice tells us, "I don't do ANYTHING that I'm not taught. And that is a big drawback in my learning." (1:18 Familiar Appendix O - Observation Notes: Alice) Weeks later Alice was asked by questionnaire if she considered herself a "Just Enough" user:

"Yes, though I've never heard the term before. ...As the definition says, I know enough to get what I want, most of the time. And it definitely is not a pleasure for me to try to figure out things on my own. N-O-T AT A-L-L....It's pretty spot on for my abilities. I'll never achieve "knows too much" status, that's for sure. I suspect that it covers a wide range of people's skill levels though. Maybe everyone thinks they are a "Just Enough" user. Would that be a hoot!"

Lilly is a digital non-native, 48 years old with 6 to 15 years computer experience. She rates herself a 7 on competence out of a max of 10 but her perceived competence score is a very neutral 4.33. Based on her inventory, Lilly is very externally regulated with a 6.5 score and a tiny bit amotivated with 1.5. Her interest/enjoyment is very low at 1.57 and her perceived choice is also 1.57. Lilly's inventory scores tell us she is a very extrinsically motivated user who does not have much interest in computers. When asked during the test about her feelings, Lilly shares, "Ohhh, you know, that kind of feeling like, ohhh, why am I so stupid? How can I not know how to do this? I dread asking one of my kids because they have no patience." (9:41 Familiar Appendix R - Observation Notes: Lilly) Responding to a questionnaire weeks later asking if Lilly considered herself a "Just Enough" user, she replied, "Yes. I am okay with that, I really want computers to be as unobtrusive in my daily life as can be. Just Enough term sounds a bit lazy."

Lucy is one of our two digital native extrinsics, a 34 year old with a 2 year old daughter at the observation. She has a lifetime of computer experience and rates herself a 6 on competence out of a max of 10, but her inventory score for perceived competence is a neutral 4.33. Lucy has a lot of amotivation based on her inventory score of 2.75 and a strong external regulation at 6.0. Her interest/enjoyment are low at 3.0 and perceived choice very low at 1.57. Lucy explains during the observation that,

"I have no desire whatsoever to read about something that I use rarely, and I don't really care to know. I don't read instruction manuals, generally. And why would I Google it? I wouldn't, because it's a bunch of teenagers who can't spell right, who don't use punctuation, all lower case." (18:51 Familiar Appendix S - Observation Notes: Lucy)

In a followup questionnaire weeks later we asked if Lucy considered herself a "Just Enough" user and she replied, "YES. I am fine using the computer only for what I need. I think they are ruining the world quite frankly, and am slightly proud I find them somewhat repulsive machines."

Marsha is a digital non-native, 68 years old with more than 25 years computer experience. She rates herself a 3 on competence out of a max of 10 but compared to her peers she rates herself a 6. Her perceived competence score is a very neutral 4.33. She has low interest (2.57), choice (2.43), and amotivation (1.0) and her external regulation is just 4.5, so above but close to neu-

tral. Marsha says, "I like to sign out, because then they, THEORETICALLY, aren't watching me, but you know they are because advertisements for something I just looked at turn up on the \*weirdest\* pages." (27:31 Familiar Appendix T - Observation Notes: Marsha) Marsha was not too happy to consider herself a "Just Enough" user when asked by questionnaire weeks later. She responded to the question with, "I guess so. My feelings are that I would like to be more than that. I would consider a "just enough" user to be one who uses only email, or only cruises the web for news, or only uses one application."

Mary Ann is a digital non-native, 60 years old with 16 to 25 years computer experience and she rates herself a 4 on competence out of a max of 10 and scores a neutral 4.0 for perceived competence on the inventory. Mary Ann has high external regulation based on her inventory score of 6.5 and low choice (2.57) and interest (3.71). Her amotivation score is only 1.25. Mary Ann often asked, "Is that OK?" when doing the test and she expressed this clear reason why she doesn't explore:

"What I realized when we were sitting together and I learned so much from your asking me to look for things, that I can do more than I think I can, but that, there are two reasons why I don't. One is it's, you know, a little bit more scary to do things on your own and you were sitting there so I knew if I screwed something up you would help me fix it, but more importantly, when I'm at work, I'm so busy, that I don't have time to play around... I always have to do things in the fastest way possible, which doesn't allow exploration." (1:06 Unfamiliar Appendix U - Observation Notes: Mary Ann)

When asked weeks later by questionnaire if Mary Ann considered herself a "Just Enough" user she replied, "Yes. My feelings are that I would like to be more than that. I do not want to be a "dinosaur. I sometimes can do a little more than just enough if I get up my courage to try."

Miranda is a digital non-native, 58 years old with 6 to 15 years computer experience and she rates herself a 4 on competence out of a max of 10 and scored below neutral at 3.33 on perceived competence and a 2.0 on amotivation (higher than most). Miranda scored very low on interest/enjoyment at 2.0 and 3.14 for perceived choice, and just above neutral for external regulation at 4.5. Miranda says, "It seems stupid and why should I waste my time staring at the computer." (15:10 Familiar Appendix W - Observation Notes: Miranda) In a follow up questionnaire weeks later we asked Miranda if she considered herself a "Just Enough" user and she said, "Yes. My feelings are, why would I spend any more time at the computer? I'd rather read a book or take a walk. Just enough is a perfect name."

Molly is one of our two digital native extrinsics, a 40 year old with a 6 year old daughter at the test. Molly has a lifetime of computer experience and self rates her competence at a 6 but compared to her peers, only a 3 out of a max of 10. On the inventory, Molly scores a below neutral 3.67 for perceived competence. She has high amotivation based on her inventory score of 2.75 and is more than 2 standard deviations higher in perceived choice at 5.57 due to her attitude that everything in life is a choice. As she says, she can quit her job if she wants to choose to not use computers. Molly's interest/enjoyment score is 3.43 and her external regulation score is 4.25 which is close to neutral. Molly shares this,

"This all is stupid. This is ridiculous. I don't know why anyone uses computers. This is exactly how I feel. And I feel stupid. I don't really care. I can basically do anything I need to do and I have [IT worker] and if I can't do anything I just call [IT worker] and cry. He sets me up for success. I'm so lucky." (31:00 Familiar Appendix X - Observation Notes: Molly)

Weeks later Molly was asked in a questionnaire if she considered herself a "Just Enough" user and she replied, "Yes. The term "Just Enough" is kind. I don't feel judged or "less than" (stupid)."

Olivia is a digital non-native, 48 years old with 16 to 25 years computer experience and she rates herself a 4 on competence out of a max of 10. Olivia also scored high on amotivation at 2.75 and very low on interest (1.57) and choice (2.14). Olivia has high extrinsic motivation based on her

external regulation inventory score of 5.75. Olivia is the poster child for resistance, but claims she is calm. She insists, “[it] is really annoying not to be able to find these things that you’re CLAIMING it’s on here. [doubting researcher tone] And it’s like, how are you supposed to know where it is.....[I’m] irritated. I don’t get angry at computers. I’m a calm zen person.” (21:04 Familiar Appendix Y - Observation Notes: Olivia)

Our last extrinsic is Walter, a digital non-native, 74 years old with 6 to 15 years computer experience and he rates herself a 2 on competence out of a max of 10 and scored a low 2.67 on perceived competence. Walter has relatively high amotivation based on his inventory score of 2.0, very low choice at 1.71 and low interest at 2.71. He has high extrinsic motivation based on his external regulation inventory score of 5.75. Walter shares his revelation after a long attempt to sign in to Gmail in a university Linux lab [talking about himself],

“You are not IN an unfamiliar building, confronting an unbelievably unfamiliar system, with all the scariness of being surrounded by REAL fully paid, fully trained, card carrying life member geeks, and all their systems. It’s JUST GMAIL. Of course, I should have known that, but for some reason I got spooked by the surroundings. I got intimidated by my high level of geekitude surroundings.” (14:38 Unfamiliar Appendix CC - Observation Notes: Walter)

Walter had interesting answers to the later questionnaire asking if he considered himself a “Just Enough” user. “Mostly, yes. I guess most people want to improve in every way. But then, after all, people do get on without a computer at all, so perhaps ‘No Computer’ (or ‘The Computer They Make You Use At Work’) is the true ‘Just Enough Computer’.”

## **Intrinsic Participants**

The seven intrinsics we observed were Beth, Jane, Mike, Peter, Rebecca, Roger, and Wilma.

Beth is a 26 year old digital native who self rates her competence at 8 out of 10 and scored 6.33 on perceived competence on the inventory. Beth scored the minimum of 1.0 on external regulation compared to her 6.43 on interest/enjoyment and 5.86 on perceived choice. Her amotivation is also the minimum of 1.0. Beth is an international graduate student in computer science.

Jane is a 27 year old digital native who self rates her competence at 9.5 out of 10 and scored 6.67 on perceived competence. Jane scored the minimum of 1.0 on amotivation and a low 2.5 on external regulation. Her interest/enjoyment are very high at 6.71 and choice of 5.14. Jane is also an international graduate student in computer science.

Mike is a 74 year old digital non-native with 16 to 25 years experience and he self rates his competence at 4 out of 10, but among his peers at 6, while his perceived competence score was a low 3.0. Mike scored a 1.5 for amotivation and a low 2.75 for external regulation. His interest/enjoyment is just above neutral at 4.14 and his perceived choice is also 4.14. Mike says,

“There’s a lot of things I used to hate when I got started, I kind of like Vista for example and a lot of people hate it. I’m used to it now, sooo... I’m sure there’s a lot of things that are a lot better that I could use for lots of things that I don’t want to do, you know, like the new paint [Microsoft Paint], I’m so happy with the old paint.” (27:30 Unfamiliar Appendix V - Observation Notes: Mike)

Peter is a 24 year old digital native who self rates his competence at 10 out of 10 and scored the maximum 7.0 on perceived competence. His amotivation is the minimum score of 1.0 and his external regulation is a low 2.5. Peter scored very high at 6.57 for interest/enjoyment and 4.86 for perceived choice. Peter is also an international graduate student in computer science.

Rebecca is a 65 year old digital non-native with more than 25 years computer experience. She self rated her competence as a 5 out of 10 and a 9 compared to her peers and her perceived competence score was relatively high at 5.17. Rebecca's external regulation score of 4.0 was the maximum she could score and still be grouped as an intrinsic. Her interest/enjoyment score was 5.57 with perceived choice at 4.29. Rebecca is retired from years of office work on computers but she also used to be an avid Facebook gamer.

Roger is a 23 year old digital native who self rated himself an 11 on competence out of a ten point scale. His score for perceived competence was 6.83 and the minimum 1.0 for amotivation. Roger's external motivation is a very low based on his inventory score of 2.0 and his interest/enjoyment score is 6.14 with perceived choice at 5.29. Roger is a graduate student in computer science.

Wilma is an 87 year old digital non-native who scored a quite low 2.67 for perceived competence and self rates as 3 out of ten for competence. She has 16 to 25 years experience mostly acting as secretary to her husband. Wilma scored the minimum of 1.0 for amotivation and 5.0 for interest/enjoyment with 4.71 for perceived choice. Her external regulation was 3.75. Wilma offers a special opportunity to study a novice intrinsic but sadly her age impacted the observation. We conducted a special extra interview with Wilma weeks after the test and she shared this,

"I'm motivated to explore more," (3:32 Interview Appendix DD - Observation Notes: Wilma) and "I don't use it [computer] as much as I ought to probably... it's sitting there and I'm sure there are much, many learning experiences on that computer, that I could be getting... but it's just too frustrating." (14:30 Interview Appendix DD - Observation Notes: Wilma.

## 5.4.2 Individual Performance and Characteristics

In this section we will begin to point out highlights from the code results for individuals separated into extrinsic and intrinsic groups.

### Extrinsic Participants

There are 9 extrinsics, 2 of whom are digital natives. They range in age from 34 to 74 with perceived competence scores ranging from 2.50 to 4.33. Digital natives Lucy and Molly are both over 30, working mothers with small children. One works as a nurse and the other is a realtor and waitress.

**Table 24: Extrinsic Participant Code Occurrences for Phases 2, 3, and total. Asterisk denotes digital native (Molly and Lucy). “Time Persisting” is how long the coded persists each took.**

Code	Phase	Alice	Lilly	Lucy*	Marsha	Mary Ann	Miranda	Molly*	Olivia	Walter
Stumble	2	4	5	2	5	9	7	7	6	5
	3	2	5	1	5	7	3	3	6	9
	<b>total</b>	<b>6</b>	<b>10</b>	<b>3</b>	<b>10</b>	<b>16</b>	<b>10</b>	<b>10</b>	<b>12</b>	<b>14</b>
Fall	2	3	2	2	4	3	6	4	4	4
	3	1	3	1	4	3	3	2	1	6
	<b>total</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>8</b>	<b>6</b>	<b>9</b>	<b>6</b>	<b>5</b>	<b>10</b>
Persist	2	3	0	1	1	0	0	1	0	3
	3	1	0	0	1	1	0	0	1	2
	<b>total</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>5</b>
Time Persisting		8,4,6,7		3	6,3	5		3	4	4,10,6,5,3
Quit	2	0	1	1	1	0	0	2	1	1
	3	0	0	0	0	0	1	0	0	1
	<b>total</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>
Resist	2	0	0	1	1	0	2	0	3	0
	3	0	0	0	2	0	0	0	4	0
	<b>total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>7</b>	<b>0</b>

Notice the detail for the extrinsics in Table 24. There are many instances of stumbling, falling, persisting, quitting and resisting. Every extrinsic had at least 3 stumbles. Lucy had the least stumbles with 3 exactly but every stumble turned into a fall for Lucy. All other extrinsics had fewer falls than stumbles.

Lilly and Miranda are the only extrinsics with no persists, but since both Lilly and Miranda had one quit, maybe they quit before their trouble turned into persisting. The cutoff for persist is 3 minutes or more spent on the same task. All other extrinsics had at least one persist.

Alice and Mary Ann are the only extrinsics to not do any quitting or resisting. Were they very compliant with the directions? Did they not have such long troubles that they felt compelled to quit? Alice had four persists ranging in time from 4 minutes to 8 minutes, which is very long. So clearly she is persisting, but she didn't quit. Mary Ann only had one persist for 5 minutes and also did not quit. Based on observations they did seem willing to follow directions and not resist.

Lucy (1), Marsha (3), Miranda (2), and Olivia (7) were the resisters. More than half of the extrinsics did not resist at all (5 out of 9). Resist counts only once per task and only regarding a task. For example, Marsha demonstrated plenty of resisting in her attitudes to computer design, but that was not related to a task so it does not count as a coded resist. Marsha still has 3 coded resists to tasks. The most resistant extrinsic from the coding is clearly Olivia with 7 resists, which is more than double the highest of the other resisters.

Is there anything about resisters Lucy, Marsha, Miranda, and Olivia that is a pattern to help explain their resisting other than their personality? Three of them have higher amotivation but still well below neutral and one is at the minimum amotivation of 1.0. Their perceived choice ranges from 1.57 to 3.14 and their perceived competence ranges from 2.5 to 4.33. These ranges indi-

cate that they are not all of one mind about amotivation, choice, or all low competence. Maybe they are just “question authority” type people. Based on the attitudes they expressed in observations, each one did express a value for questioning.

What is the difference with Alice, Lilly, Mary Ann, Molly, and Walter that they did not resist any task?

Walter was particularly persevering and he has 5 persists, the longest one being for ten minutes. That is an impressive amount of time spent on a task that for an expert intrinsic might take less than 10 seconds. We will be talking about Walter later.

## Intrinsic Participants

Now we will focus on the intrinsic individual performance, as shown in Table 25. It is a dramatic difference from the extrinsics, as we would expect since intrinsic account for only 10% to 19% of all code occurrences. There are 7 intrinsic and 4 of them are digital natives. We will see there is a big difference between the digital native intrinsic and the digital non-natives that we studied.

**Table 25: Intrinsic Participant Codes for Phases 2 & 3. Asterisk denotes digital native (Beth, Jane, Peter, and Roger). “Time Persisting” is how long the coded persists each took.**

Code	Phase	Beth*	Jane*	Mike	Peter*	Rebecca	Roger*	Wilma
Stumble	2	3	0	4	0	2	0	2
	3	0	0	4	0	1	0	5
	<b>total</b>	<b>3</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>7</b>
Fall	2	2	0	3	0	0	0	0
	3	0	0	3	0	0	0	3
	<b>total</b>	<b>2</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
Persist	2	0	0	2	0	0	0	0
	3	0	0	0	0	0	0	0
	<b>total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Time Persisting			14,4					
Quit	2	0	0	1	0	0	0	0
	3	0	0	0	0	0	0	0
	<b>total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Resist	2	0	0	2	0	0	0	0
	3	0	0	0	0	0	0	0
	<b>total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

There are four digital native intrinsic, Beth, Jane, Peter, and Roger. Three of the digital native intrinsic, admittedly self rating as expert, all have zero stumbles, falls, persists, quits, or resists. Jane, Peter, and Roger’s tests were characterized by breezing through both the unfamiliar tasks and the near skill transfer as they gave highly analytical design and programming comments. Peter pointed out how one could hack the unfamiliar email and Roger offered to program a serv-

er email list instead of a simple Gmail contact group. Jane’s commentary might be re-used to teach teachers how to analyze the heuristics of using software.

A great example of the difference in intrinsic experts is their sense of how much time is a delay. In this example, at 11:16, Peter is asked to write an email in unfamiliar email software and at 11:18 Peter hesitates with, “Hmm...[pause] OH there's the compose email button.” (11:21 Unfamiliar Appendix Z - Observation Notes: Peter) Peter considers 2 seconds a delay and comments with a “Hmm” but finds the correct solution in a total of 5 seconds. This is one reason the rubric for the coding allows 20 seconds before a stumble, so there is room for novices to figure things out.

Beth is also a digital native intrinsic and she had 3 stumbles that turned into two falls, all with unfamiliar tasks in phase 2. She had no stumbles in near skill transfer. Her stumbles were qualitatively different from the other extrinsic or intrinsic stumbles. Beth was looking up the answer for Gmail in Google help. Her first stumble was because “contacts” is hidden behind the “mail” button in Gmail. That took her 2:02 to figure out, which she did by using Google. The next two unfamiliar tasks she continued with google so they took 0:32 and 1:24 respectively.

**Table 26: Comparing Intrinsic Digital Native Inventory Scores Ordered from Lowest Perceived Competence to Highest**

	Experience	Age	Amotivation	External Regulation	Interest/ Enjoyment	Perceived Choice	Perceived Competence
Beth	16-25 years	26	1.00	1.00	6.43	5.86	6.33
Jane	16-25 years	27	1.00	2.50	6.71	5.14	6.67
Roger	16-25 years	23	1.00	2.00	6.14	5.29	6.83
Peter	16-25 years	24	1.00	2.50	6.57	4.86	7.00

There are some clear distinctions in the intrinsic group between the digital natives and the digital non-natives. It might be due to the sample of convenience that all the digital natives happen to be graduate students in computer science. Future work could look at the composition of intrinsics and digital natives.

For this study the intrinsic digital natives are all in their mid 20’s, life long users with the minimum amotivation score and perceived competence almost or at the maximum of 7.0, see Table 26. Although all four of the digital native intrinsics grew to adulthood in different countries, Turkey, U.S.A., China, and India, they all have parents with higher degrees. And all four are computer science graduate students seeking PhDs. When asked to rate their competence on a one to ten scale, Beth gave herself an 8, Jane and Peter each gave themselves the maximum of 10 and Roger gave himself an off the scale 11. Roger also suggested future tests should give harder tasks, which is a good idea.

In contrast, there are three digital non-natives in the intrinsic group, Wilma, Mike, and Rebecca, see Table 27. When sorting them from low to high perceived competence, we can easily see that younger is higher competence in this case. All three of them had a higher self rating when asked to compare to just their peers. Wilma self rated a 3 on a 10 point scale with an 8 compared to peers. Mike gave himself a 4, with a 6 compared to peers, and Rebecca gave herself a 5, and 9

out of 10 compared to her peers. So their experience leads them to consider themselves not so strong on computers except their peers are even worse than them.

**Table 27: Comparing Intrinsic Digital Non-Native Inventory Scores Ordered from Lowest Perceived Competence to Highest**

	Experience	Age	Amotivation	External Regulation	Interest/ Enjoyment	Perceived Choice	
Wilma	16 - 25 years	87	1.00	3.75	5.00	4.71	2.67
Mike	16 - 25 years	74	1.50	2.75	4.14	4.14	3.00
Rebecca	25+ years	65	1.00	4.00	5.57	4.29	5.17

Rebecca, at 65 years old and the highest perceived competence (5.17) of the digital non-native intrinsics, had 3 stumbles and no falls, persists, quits, or resists. Interestingly, Rebecca has the maximum external regulation to still fit as an intrinsic (Table 27).

Wilma, at 87 years old, was an intrepid participant suffering some blindness from macular de-generation as well as numerous instances in the observation that indicate age related tiredness or ineffectiveness. Please note that she had only 2 stumbles and no falls in phase 2 but later in phase 3 she had 5 stumbles and 2 falls. This could be attributed to tiredness. The researcher re-spected Wilma’s frailty and did not push her in the observation. Wilma had no persists, no quits, and no resists.

We did an extra interview with Wilma a few weeks later to discover more about her high interest in using computers. When asked how she felt about lifelong learning, Wilma shared, “Well I think that it’s very important. VERY. Why stop just because you get older. You should start learning more. There’s so much out there you don’t know. You can’t just give up. Besides, it keeps your mind youthful, more youthful let’s say. I think.” (5:10 Interview Appendix DD - Observation Notes: Wilma)

Mike is our intrinsic 74 year old, scoring just over neutral (4.14) on interest/enjoyment and quite low external regulation of 2.75 to be grouped as an intrinsic. His amotivation is a bit high at 1.5. Mike wins the prize for the longest persisting at 14 minutes on one task. He had 8 stumbles divided evenly between phases 2 and 3, 6 falls, 2 persists (14 and 4 minutes long), one quit and two resists. More on Mike later.

### 5.4.3 Examples of Performance Difficulties

This section will detail a few example tasks to notice how and where the participant met difficulty or took a wrong turn.

#### Example One: Alice

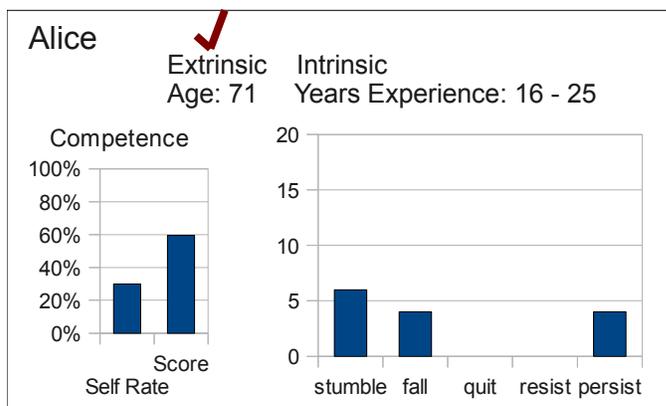


Figure 18: Alice Basics

This is the case of Alice, an extrinsic, 71 year old, with middle of the road perceived competence (4.17) and ranked number 8 out of 16 observed when all are ordered low to high competence, see Fig. 18. A note on the “Competence” graph found in Fig. 18. This is the percent of self rating out of max 10 and percent of perceived competence score out of max 7 on the motivation inventory. The stumble, fall graph is the total occurrences for this participant. We will be seeing more summary figures like this.

Alice explained at the beginning of the observation that she has never done anything on the computer that she hasn't been taught, see Extrinsic Participants in Individual Performance and Characteristics. Alice is a self proclaimed non-explorer. All times are in parentheses and time and quotes are from Appendix O - Observation Notes: Alice, Familiar.

At 10:53 in Alice's familiar system and software, the researcher directs Alice to add people to the new email group she just created. Alice is looking for way to add people to the new group, tried enter key, tried drag. At 11:41 the researcher hints, “I can see it.”

By 12:30 Alice is trying the button that selects all. Alice says, “Oh I clicked on them all... but I've wondered about how to do that” (14:56).

By 14:57 Alice shares, “Now I'm getting into scary territory because it's [the computer] doing things I didn't ask it to do” (15:00).

The researcher replies, “You can't hurt anything, and remember you have a back arrow up here [point to browser] just to give you a little more confidence. What would you say your stress level it right now?”

“Well I’m kind of annoyed, at myself, uh... I’m not extremely stressed. I would give myself a 5. I’m not happy. And I’m not relaxed. And I’m very frustrated because I can’t get it to go beyond XXX and I know there’s a way. Come on you guys, play fair,” she says to the computer (15:56).

As Alice explores, she seems surprised at the choices she finds. She asks, “Should I ask for help? I don’t know what to ask” (17:14). She clicks on Gmail’s help in upper right and quickly found the page “add a contact” on a contact group page. Alice reads aloud, “That sounds possible.”

She tried to remember from the instructions but didn’t do exactly what the instructions said. Alice complains, “That’s not fair,” when it doesn’t work.

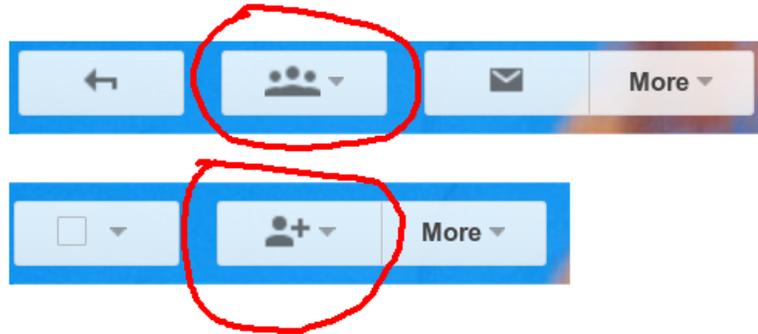
The researcher points out that she didn’t do the instructions exactly, so Alice goes back to them, and reads them again. She figured out what she had missed, went and did it like the instructions, and it worked.

“Look at that,” whispers Alice. Then, “Ahhhh,” she gives a happy scream (19:02) and a big hug to the researcher.

So where did Alice have difficulties? Alice starts to look for a way to add people to her email group at 10:53. She drags, she clicks the enter key. She is not necessarily experienced enough to scan the top and left sides for buttons, hover hints, hidden menus, and other affordances to find the command she needs. It appeared that she was unfamiliar with the idea of hover hints or the possibility of more menus available “behind” the small triangle symbol.

After about a minute, the researcher prompts her at 11:41 that the button she needs is visible. Alice eventually gets more daring at trying things without any idea what they will do. She isn’t reasoning it out or using heuristic patterns, she is just randomly clicking things. The computer begins to follow her randomly clicked commands, leading Alice to be nervous that she doesn’t understand why the computer is doing things at 15:00. A minute later Alice comments on how the computer is unfairly stopping her from finding what she needs. She still hasn’t looked for help online or in the software.

It is true that the software is designed so the buttons available change depending on which selections are made on the left side. The button she needs is a picture only icon button that looks like a rising sun with three heads sticking out of it (Fig. 19). When you hover over it, this buttons says, “groups”. In the three months since the observation of Alice, something has changed so now there is the same “groups” button but adding to a group is another button with a single head with a plus sign (Fig. 19). This is a great example of the pros and cons of online applications with their power to change things whenever they want.



**Figure 19: Screenshots of Old and New “Groups” and “Add” Contact To Group buttons. (Fair use of copyrighted material: see Appendix A.)**

When asked to rate her feelings at 15:40, she rates her frustration only a 5 out of ten, but says, “I’m very frustrated” (15:50), which sounds pretty unhappy.

At 17:14 she finally suggests looking for help, but comments, “I don’t know what to ask”, but right away finds something helpful. It seems that she hasn’t done any searching for answers before which would be accurate if she only does things she is taught instead of teaching herself.

She doesn’t try to write down the instructions or set her screen so she can see both at once. She “remembers” the instructions and makes some errors in the process. Maybe she did not read them carefully the first time either. She isn’t sure why it didn’t work and needs the researcher to tell her she did not follow the instructions exactly.

At 19:02 when she follows the instructions exactly, Alice is very excited to have figured it out by herself! It took her about 8 minutes. She persisted. She complained that the computer was being unfair and blocking her. She called the computer, “you guys”, which anthropomorphized the computer machine into some men who have power to block her.

In summary, Alice had never explored before and her lack of experience is clear because she appears to not know any patterns for finding her own way, such as where to look for commands, to use hover hints, or that extra commands are “hidden” behind triangle icons. She delayed searching for answers, seeming to think that would be drastic and very unfamiliar. Her random drifting and clicking things probably took her further from her goal since the buttons available are context sensitive to other selected choices. She misread, misunderstood, or just forgot the instructions and didn’t refer back to them until she was told she did it wrong.

## Example Two: Molly

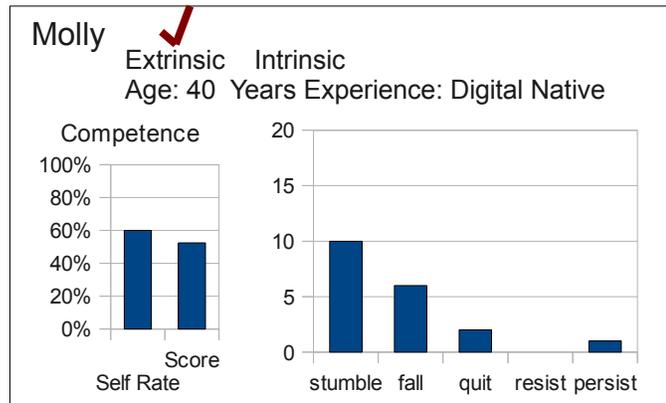


Figure 20: Molly Basics

Molly is a digital native extrinsic, 40 years old, with a distracting 5 year old daughter in the observation with us. Molly self rates as a 6 out of 10 for competence and has relatively high apathy (2.75) and high perceived choice (5.57), see Fig. 20. Her attitude is that she has to use computers for work and basic social connection but she has a choice because she could quit her job. All times are in parentheses and time and quotes are from Appendix X - Observation Notes: Molly, Familiar.

At 8:12 the researcher directed Molly to find her address book. The researcher said, "What do you think it's called?"

Molly answered, "Addresses."

"Yeah, it's not, that's what's confusing... silly Gmail," replied the researcher (8:47). Meanwhile Molly is hovering over all the buttons and choices on the left and top of the application.

At 9:33 Molly still can't find contacts. The researcher asks, "How do you feel? [pause] Do you feel frustrated, annoyed, happy?"

Molly answers, "I feel, I feel like, indifferent. I'm a little put out that I can't find my contacts."

Researcher asks, "So how put out are you, one to ten with one being none and ten is a lot"

"Not too much."

"What's that number, one to ten?"

Molly answers, "One..." But then Molly asked questions to confirm what one and ten mean, and adds, "Maybe like a three" (9:56).

Molly begins searching for “contacts”. She says, “Then I’ll just go like that, ‘contacts’, oh, it’s just going to search the web, but maybe not, we’ll do a little search here” (10:07). Molly uses the search at the top of Gmail by typing in “contacts”.

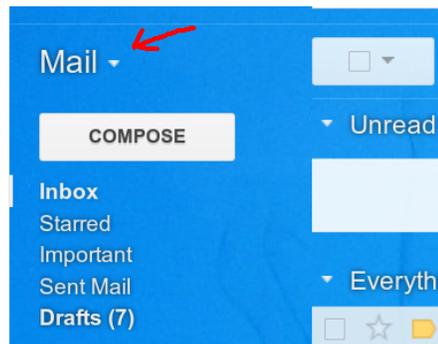
The researcher says, “That was smart, I’ve never seen anyone do that. That was a good idea.”

Molly reads out loud, “No... more... no... and then I would give up. I would give up and I would call the person and say ‘I’ve lost your email would you give it to me again’ and they’d give it to me, and I would send them what I needed to send them. That’s how I would do it.” (10:33).

But Molly hasn’t stopped looking and four seconds later at 10:37 she found the “contacts”. “Contacts,” Molly exclaims. “And then I’d find it, once I gave up. That’s how it works.”

So the first problem is vocabulary. Is it called “address book” or “contacts”? When looking at buttons, the word to look for is “contacts”. Molly was relatively systematic looking through the buttons and choices on the left and top and thought for herself to try searching, although she was unclear if it would search inside her application or on the entire internet.

Molly quickly scans the results and rejects them and then declares that she gives up. She has a backup plan or workaround that will get what she needs without looking for “contacts” anymore. But she doesn’t actually stop looking and only four seconds later finds “contacts”, which are in a “hidden” menu accessed by a triangle icon on the word “Gmail” which is the same color as the background and has no indicator that it is a button or link (Fig. 21).

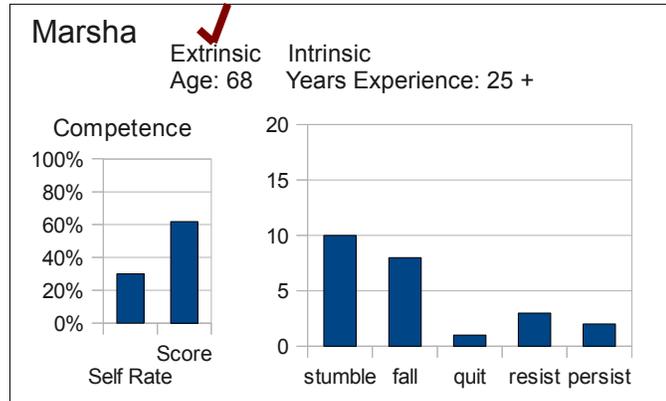


**Figure 21: Screenshot of "Contacts" button behind "Mail" in Gmail. Doesn't look like a button with no rectangle or color change. (Fair use of copyrighted material: see Appendix A.)**

It took Molly over two minutes to find contacts, which is a stumble and a fall, but not a persist. It is also a quit and admittedly she quit quickly and then found it anyway. Finding contacts or address book is a task that might be on the verge of extinction as email and webmail take more of the work out of addressing an email with suggestions and other aids. Molly clearly is comfortable that she has support people to help her, but she did try to find out on her own also.

## 5.4.4 JE User vs. Intrinsic: Marsha and Rebecca

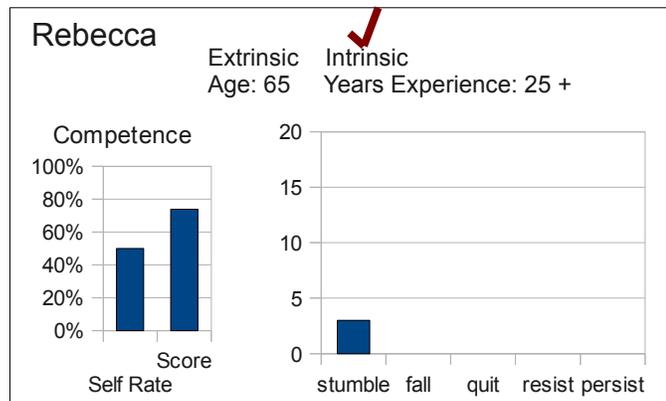
A primary question for this study is: why do some proficient daily computer users stumble and fall over unfamiliar tasks and others adapt easily?



**Figure 22: Marsha Basics**

Let's look at two very similar participants except one is extrinsic and one is intrinsic. Marsha and Rebecca are both in their mid 60's with more than 25 years experience, digital non-natives who scored the minimum of 1.0 on amotivation (Table 28). They are in the same area for competence with Marsha self rating as a 3 out of 10, Rebecca a 5 out of 10. Marsha scored 4.33 for perceived competence on the inventory, Rebecca a 5.17. They are in the upper group when ordering all 16 observed participants by perceived competence, Marsha is number 11 and Rebecca is number 12.

Marsha is extrinsic with low interest/enjoyment well below neutral at 2.57 and perceived choice at 2.43 (Fig. 22). Rebecca is intrinsic with interest/enjoyment high at 5.57 and perceived choice above neutral at 4.29 (Fig. 23).



**Figure 23: Rebecca Basics**

Can you guess what their stumbling scores are like? Marsha has 10 occurrences of stumbling, 8 falls, 2 persists, 1 quit, and 3 resists (Table 28). Compared to Rebecca with 3 stumbles, zero falls, persists, quits, or resists. Rebecca was our first observation and Marsha was our last. We

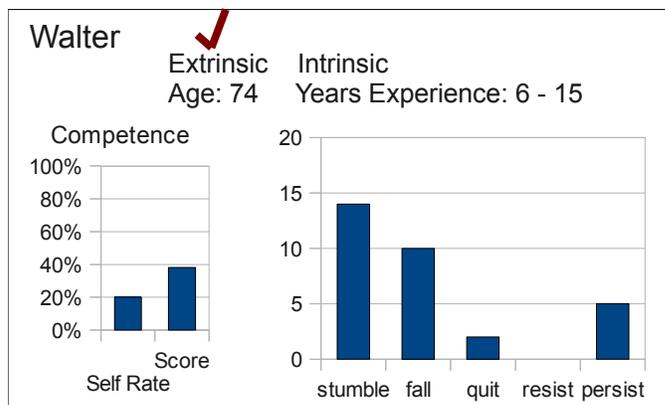
expected Rebecca to be extrinsic. We didn't even score her inventory before observing her. She did not stumble. She could do everything. It was very concerning. Perhaps the thesis study was wrong, until we scored her motivation inventory and found that she is INTRINSIC!

**Table 28: Comparing Marsha & Rebecca**

Name													
Marsha	10	8	1	3	2	68	3	25+	1.00	4.50	2.57	2.43	4.33
Rebecca	3	0	0	0	0	65	5	25+	1.00	4.00	5.57	4.29	5.17

The statistics demonstrated that extrinsics are different from intrinsics in coded observation performance. Marsha and Rebecca demonstrate that difference. They are similar in so many ways and in person, they are pretty similar style: both efficient, opinionated, practical, and helpful women who are famous at being responsible and reliable. They have both been leaders in work and community. Before coding the observations, we would have said it seemed Marsha knew how to do everything and barely stumbled, but the codes help show the true picture. She actually had a lot of stumbling.

### 5.4.5 JE User vs. Intrinsic: Walter and Mike



**Figure 24: Walter Basics**



Figure 25: Mike Basics

Another very close comparison is Walter and Mike, two 74 year old men, both retired professors, both similar perceived competence, one is intrinsic and the other extrinsic, but both were noticeably persevering. Both Walter (Fig. 24) and Mike (Fig. 25) have slightly elevated amotivation relatively at 2.0 and 1.5 (Table 29). Their perceived competence is very close at 2.67 and 3.0 although they self rated as a 2 versus Mike's 4 out of ten, probably a sign of Walter's self deprecating style. In the perceived competence rating, they are both at the bottom of the 16 observed participants with Walter number 3 and Mike number 4. Walter does have less years experience than Mike at 6 to 15 years experience.

Table 29: Comparing Walter & Mike

name	Stumble	Fall	Quit	Resist	Persist	Age	Experience self-rate	Experience	Amotivation	External Regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence
Walter	14	10	2	0	5	74	2	6-15	2.00	5.75	2.71	1.71	2.67
Mike	8	6	1	2	2	74	4	16-25	1.50	2.75	4.14	4.14	3.00

Walter was remarkably persevering, with 5 persists at 3, 4, 5, 6, and ten minutes each. The researcher because exhausted by the length of the test as Walter persevered on and on. Mike also was very persistent with 2 persists, which seems like less until you know that Mike persisted for 14 minutes on a task that took an intrinsic digital native 10 seconds. Because Mike was so persistent, the test had fewer tasks so less chances to find out if he would persist more.

Both men have quits also, Walter has 2 and Mike has one, so at some point they will give up. On resisting they are different. Mike has 2 resists and quite a lot of resistant attitude about computer design, but Walter had zero resists and his attitude was of curiosity but resigned to his low competence, not questioning authority or designers. At times, Walter and Mike both seemed agitated but both said their feelings were lessened to zero because they were just in a test so it did-

n't really matter. They appeared more upset than they admitted to, with both of them employing a few swear words.

Let's look at the transcripts:

Mike: “[I feel] fine... None of this is real... It doesn't really matter to me if I did it or not, but there are times when I want to do something and I get REALLY FURIOUS.” (37:16 Familiar Appendix V - Observation Notes: Mike)

Walter: [asked about his stress] “No problem. Zero...I mean it's not something I HAVE to do right now.” (32:52 Familiar Appendix CC - Observation Notes: Walter)

When Walter spent five minutes trying to login to Gmail with the password, “guest”, midway through he says, “Oh s\*\*\*... I'm frustrated because it doesn't accept “guest” as a password.” (10:41 Unfamiliar Appendix CC - Observation Notes: Walter) When prompted to rate his frustration he gives it only a three.

Similarly, in the middle of Mike's 14 minutes trying to send an email to a group, he answers the researcher's question with, “If I REALLY needed to do it, I would be very frustrated, like 8, I'm not that frustrated now because the world won't end if I don't get it done. So it's about a 3 right now.” (14:49 Familiar Appendix V - Observation Notes: Mike)

### 5.4.6 More on Resist

Of the 16 observed participants, only 5 have any occurrences of resist. Remember that resist has to be towards a given task, not just in attitude. There are examples of resistant attitudes to computers, but only 5 resisted the tasks. Four of those were extrinsics, Lucy, Marsha, Miranda, and Olivia, and intrinsic Mike also has 2 resists. We will look at Olivia, with 7 resists, and then at Mike.

One extrinsic participant that was observed, Olivia (Fig. 26), was noticeably most resistant and dismissive. She usually greeted a direction with, “That can't be done”, before even looking. She also passed multiple times over the exact command wording on a button or menu that she was looking for.

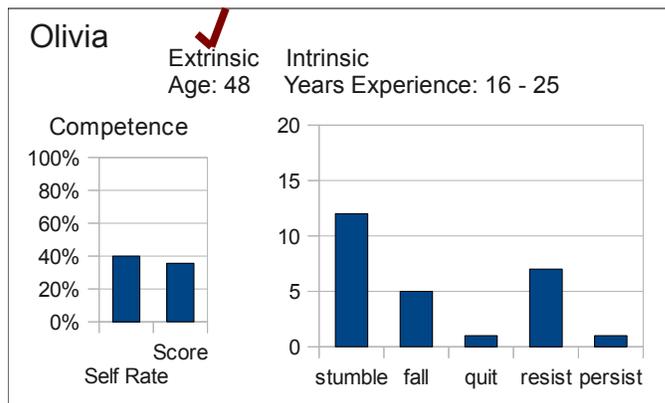


Figure 26: Olivia Basics

Interestingly, Olivia also has the second lowest score for perceived competence and the second lowest scores for both interest and choice among the extrinsics that were observed; so no interest, no choice, no perceived competence. Maybe she almost is trying to apply what some people call “planned inadequacy”. This is where you do something very badly on purpose so you don’t have to do it again, someone else takes over that chore for you, because you were so “bad” at it (on purpose). But Olivia is a white collar professional, who would do her computer chores? Maybe a secretary?

Olivia is proud to be a “Just Enough” user. Olivia’s response to the later questionnaire asking if she considered herself a “Just Enough” user was, “Sure. Very proud that I can do it enuf [sic]. People should make more things easy for us.”

In this example, Olivia denies the existence of a way to empty email trash, when actually there are multiple ways to empty email trash. All times are in parentheses and time and quotes are from Appendix Y - Observation Notes: Olivia, Familiar.

At 7:58, while looking for spam, Olivia stumbles across trash and offers, “I’ll empty the trash instead.” The researcher agrees, but Olivia adds, “I have no idea how to do that. It’s already IN the trash.”

The researcher encourages her with, “Look around. ...you can empty the trash.” (8:10)

Olivia counters with, “It’s already IN trash. Where do you empty trash to? I’m thinking that I never empty my trash because there’s no way to empty trash because it’s already trash.” (8:25)

Researcher, “No, there *is* a way to empty trash.”

Olivia insists, “There’s no trash emptying.”

At this point, Olivia sounds passionate, so the researcher asks about her agitation. Olivia answer, “I’m not agitated at all. You’re just wrong. There’s no trash emptying.”

The researcher asks her the share what she’s feeling. “I think it’s dumb that the trash doesn’t have an empty,” shares Olivia. (8:40)

Researcher, “It does actually.”

“I don’t see it. If I click on something in my trash, all I can do is trash something in my trash, which is silly because it’s already in my trash,” Olivia persists. (9:08)

The researcher decides to give up on this task, “OK, we’ll come back to this. Let’s look at your spam,” but of course they never return to the trash and it doesn’t get empty.

Another example, this time from Appendix Y - Observation Notes: Olivia, Unfamiliar, illustrates Olivia’s certainty regarding the function of the computer without even checking it out. The researcher asks Olivia if the email she just sent to herself in unfamiliar email is here yet and the researcher knows it is not here until you click on the “check mail” button.

Olivia suggests, “Sometimes you can reload it.” (5:18)

“Un hunh, do you think there might be a check mail button?” the researcher prompts.

“There is a thing called “check mail” button. It doesn’t work though,” says Olivia with certainty, then she clicks it. (5:22)

The researcher hints, “Well, you know what? I see it [the email] now.”

Olivia asks, “You do? It should be this newest one.” (5:33)

The researcher asks, “Do you have it sorted newest on top?”

“Yeah, I do,” but she doesn’t. “Look at this, oh, ok, now it’s here,” as she clicked the sort again. (5:40)

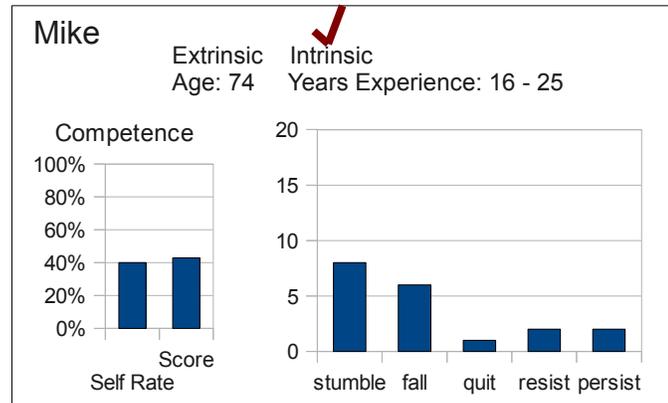
Notice in the first example that Olivia is directing the observation by changing from the assigned task of spam to a task that grabs her attention. This is not a problem, but possibly demonstrates her style. Then Olivia does not look for a way to empty the trash, of which there are a few, but instead explains that there is no such thing as empty trash. She maintains that point of view even when told by the researcher that there is trash emptying.

In the second example, Olivia assumes the computer doesn’t work, even though she has not tried the relevant button, which actually does work. She has her email sorted upside down and cannot see that the button works.

Olivia questions everything, including an advertisement she becomes distracted by. This is not related to a task so it doesn’t count as a resist, but it is a good illustration of her general attitude. “I wonder why I have these weird pictures here?” asks Olivia while considering an advertisement in the middle of her screen in Obscure Company webmail. She continues, “[an ad] But for what? A policeman? Who would ever care about looking at a policeman checking ID? Who would ever buy him?” (13:54 Unfamiliar Appendix Y - Observation Notes: Olivia)

In contrast to Olivia’s resistance, here is an example of intrinsic digital native, Beth. She is questioning but not in a militant way. Beth’s questioning is more just “wondering”. Beth says, “It’s not in settings,” as she searched online on google. “Do I have that?” Then she clicks on it. “That’s weird. I never noticed that. I don’t [sic] even know that I can click on that.” (6:49 Familiar Appendix P - Observation Notes: Beth)

Sometimes participants find work arounds which approximate resisting, but generally are more practical because they are still accomplishing the task in an indirect way. For example, extrinsic digital non-native Lilly says, “I don’t like to do that...That’s the kind of thing that if I had sat here, alone, long enough I might have, uh, done that, unchecked that box, cuz, if I was really, I would have to really, really want to get rid of it, like, oh shoot, I really goofed on that. You know? But I would \*probably\* just discard the whole thing.” (9:17 Familiar Appendix R - Observation Notes: Lilly)



**Figure 27: Mike Basics**

And sometimes participants blur together resisting and work arounds. In this example, Mike has been directed to make a table with rows and columns and he just will not comply. He insists that using tabs and line returns is good enough, but it is not the assigned task. It is a work around. Mike refused to even look for a way to do the table. So he is resisting trying to make the table at the same time he declares a work around would be good enough. This is resisting the task set by the researcher. See Fig. 27 for a refresher on Mike's basics. All times are in parentheses and time and quotes are from Appendix V - Observation Notes: Mike, Unfamiliar.

At 30:51, the researcher asks Mike to do a table and Mike does "insert table" from "borders" menu at 31:26, but it has no rows or columns. The researcher explains that is not what we're looking for.

At 31:37, the researcher ask Mike to do a table with rows and columns. At 33:40, Mike wants to do tabs for table and will do anything to do a work around instead of a table. Mike apparently does not want to figure out table with rows and columns. Instead he just keeps making tabs and returns and saying it is columns and rows.

"I can MAKE a thing with four columns and two rows," Mike insists. (34:00) What he means is that he can make rows with line returns and columns with tabs, which is not a table. There is some gentle arguing between Mike and the researcher.

The researcher laughingly says, "This is very entertaining... not that I would ever laugh at a test subject or anything" (34:50)

But Mike would NOT do a table, so the researcher stopped the task (35:17) and offered to show Mike how to make a table. He refused the offer but the researcher was adamant, because it is only ONE command.

Then the researcher asked, "How do you feel?"

"Fine," replied Mike.

"You feel fine, really?" asked the researcher incredulously because Mike had seemed very irate about the table.

Mike is laughing. The researcher repeats, "all right?"

“Why not?” Mike replies. “None of this is real.... It doesn't really matter to me if I did it or not, but there are times when I want to do something and I get REALLY FURIOUS” (37:16)

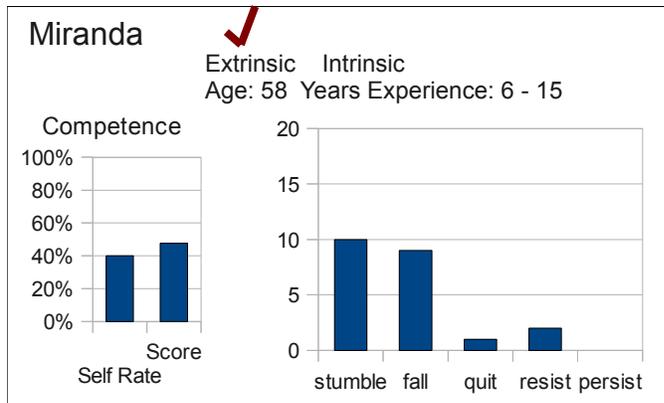
The researcher asks, “What if you had to do this?”

“It would be very, very frustrating, way up there,” says Mike holding his hand high in the air.

“Would you have thrown your computer out the window yet?” asks the researcher with a smile.

“I haven't done that yet,” Mike answers, “but sometimes I beat on the desk or something.”

Is 74 year old Mike just sick of working on the computer? Is he being a joker by not bothering to make a table? Or is he really annoyed and refusing to try? Or something else? As Mike explained from earlier in the observation, “If I'm in a game, it doesn't matter. I mean it matters a little bit, but not like most people who needed to do it. There's not the same kind of pressure. You annoy me sitting here and interrupting but it's not frustrating. I don't feel under pressure. I'm 74, I don't give a sh\*\*.” (10:56)

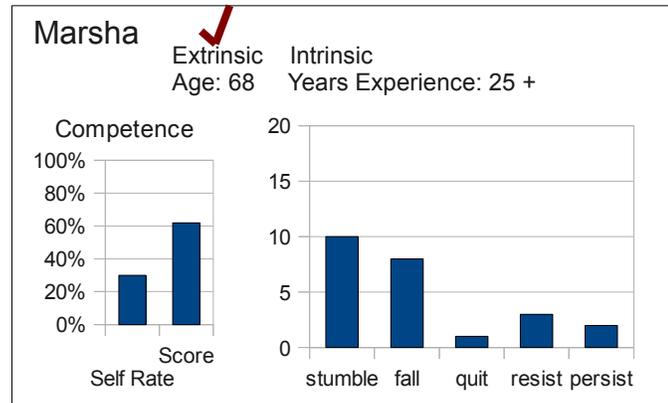


**Figure 28: Miranda Basics**

Here is a short resist example of someone who resists but keeps trying the task anyway and does succeed. Extrinsic digital non-native Miranda (Fig. 28) has been asked to put email into folders at 13:00.

“I don't know what I'm doing. This is why I don't put anything in there because it seems stupid and why should I waste my time staring at the computer, when I could just leave it there [inbox] and let it build up to 1200,” she says while pointing to the email message count at top right. (13:54 Familiar Appendix W - Observation Notes: Miranda)

But she kept trying to do it and at 15:10 she succeeded in putting email into a folder. She did not quit. She didn't want to do the task and she expressed her resistance but complied with the test.



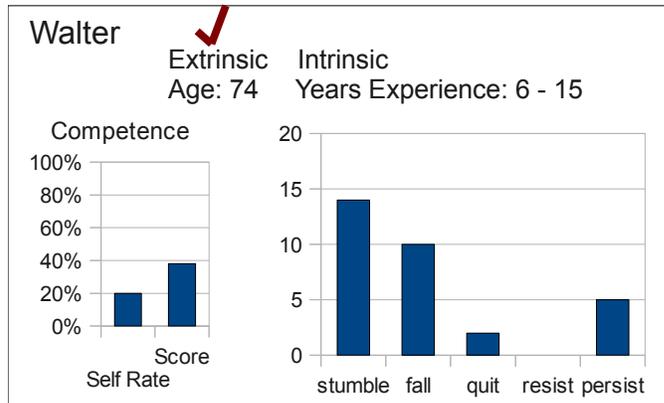
**Figure 29: Marsha Basics**

There is also the passionate resistance of Marsha (Fig. 29) that is directed more at “them” controlling “us” than at any specific task. She does have 3 resists to tasks, but more interesting are her opinions resisting “the Man” and defending “Everyman”. For example, Marsha shares, “I never use the google calendar. I’m not telling them what I’m doing every day. Forget that!” (26:50 Familiar Appendix T - Observation Notes: Marsha) And this example: “Passionate?...I am. I’m not MAD at them [MS Word], I’m frustrated with them. I’m sure they’re putting features into it that people in offices or high pressure marketing firms use, but they’re leaving out the average person. And maybe that’s what open office is for. I don’t know.” (34:12 Familiar Appendix T - Observation Notes: Marsha)

### 5.4.7 More on Persist

One thing that became clear when observing the variability of humans in the study was that persevering can be a strong trait. Persisting alone might not lead to a solution if the problem solving is too narrowly focused. Some participants have just a kernel of information and a lot of perseverance which leads them to go a long way down the wrong path without trying any other paths to solving a problem.

This kind of narrow perseverance is like watching someone in the kitchen who knows only that eggs are associated with the refrigerator, the kernel of knowledge. When you ask this person to boil an egg, a process which requires a pot, a stove, water, and an egg, they use their kernel of knowledge, that eggs are related to refrigerators, and spend 30 minutes trying to boil the egg by using the refrigerator in wildly inventive ways: put the egg in door of the fridge, put it in the cheese drawer, put the egg on top of the fridge, shut the egg in the door hinge. They try many things but only on the path related to the little bit of knowledge they started with: eggs are associated with refrigerators. They don’t try any other path, like look for a pot, look for water, find a stove.



**Figure 30: Walter Basics**

Walter did this kind of narrow problem solving multiple times (Fig. 30). This example is only a five minute persist while trying to login to Gmail, but the researcher really gave him assistance after four minutes. Walter was confused about what his password should be and thinks it should be “guest” based probably on some outdated 1990’s experience. He is so used to being on his own home system with saved password in desktop mail application, that logging in to Gmail is not very familiar. All times are in parentheses and time and quotes are from Appendix CC - Observation Notes: Walter, Unfamiliar.

At 7:40 Walter entered username and password in Gmail to login and the login failed. Then he changed one letter to lower case in his username, which wouldn’t matter because username is case insensitive. Walter says, “I’m trying all the passwords I have, or know, realizing this is probably stupid because, um, because, why would this system know any of my passwords, or know my name at all because I’ve never been here before in my life. So that is silly, so I’m gonna try “guest” because I’ve heard that that sometimes works.” (8:55)

At 9:05 Walter put “guest” into password, but still has a typo in his username. Gmail gives him a “prove you’re a human” graphic scramble to read and quote and he tries it. He keeps trying through three “scrambles”, saying them aloud: 2nd as Italian accent, 3rd as Russian accent. Doesn’t work to log him in. Walter says, “Oh sh\*\*.” (10:41) The researcher prompts him to tell what he’s feeling. “I’m frustrated,” Walter shares, “because it doesn’t accept “guest” as a password.” (10:45) Prompt him to tell how frustrated on 1 to 10. “Three.”

Tried a 4th time, again saying the scramble out loud. Researcher offered to help, but Walter says, “No, I’m going to try one more thing here.” (11:45)

Walter clicks on the question mark button which took him to a reset password page. Researcher told him he’s using the wrong username, then teach him that he’s in a new browser tab, which explains why he can’t use the back button. Walter finds his previous tab, sees his name and seemed to forget what his username should be. The researcher prompts Walter to pretend he is at a store telling the clerk his email address.

“Oh yeah! Gmail! Of course,” Walter realizes. (12:48) Then he corrects his username typo, but wanted to still use “guest” as password. “Let’s try “guest” again,” Walter says. (13:05)

“No!” says researcher in an annoyed voice, “You have a password. You’ve been using it, remember? The [help guys] helped you.... Good!” (13:10) Walter has succeeded in logging in to Gmail.

The researcher asks if Walter understands better now and Walter shares, “It’s not whether this system knows my password, I realize that now, it’s whether I’m actually at Gmail and they know my password and my everything.” (13:32)

“So tell me, was that a revelation? Did you just learn something?” asks the researcher. (13:36)

“Oh yeah!” Walter replies. “I just learned that wherever you are, wherever you go, there you are.... [laughing] You are not IN an unfamiliar building [university computer lab], confronting an unbelievably unfamiliar system [Linux Fedora], with all the scariness of being surrounded by REAL fully paid, fully trained, card carrying life member geeks [students], and all their systems. It’s JUST GMAIL. Of course, I should have known that, but for some reason I got spooked by the surroundings. I got intimidated by my high level of geekitude surroundings.” (14:38)

Walter spent about 5 minutes on this task and he repeated the same behavior while expecting different results, for example using his incorrect username with a typo in it, and using “guest” for the password, which he tried more than five times and probably would have continued trying if the researcher hadn’t stopped him.

Walter made wonderfully entertaining theater out of speaking aloud the “scrambles” that Gmail gave him to prove he is a human but Walter didn’t seem to question why he was being given scrambles in the first place. This implies that reasons for login procedures are so mysterious to Walter that any new behavior required does not alarm him. It is just the computer doing it’s strange thing again.

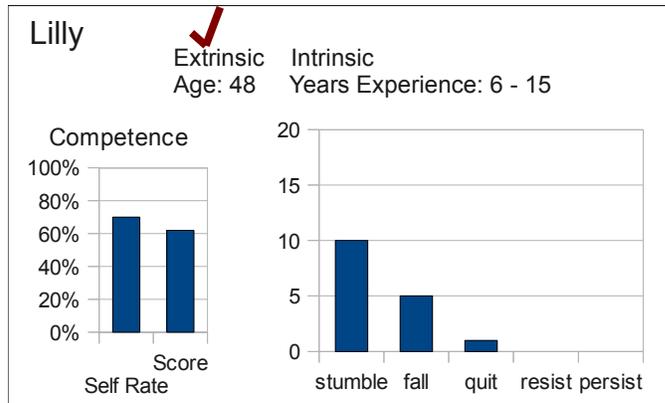
When offered help, Walter wants to continue persisting on his own, at 11:45 he wants to try one more thing, which is the question mark button. This takes him to password reset but the researcher stops him. If Walter resets his password, his desktop application at home will not be logged in still and the researcher already heard a 10 minute story about how Walter paid \$100 to have a service in India set his password in his application for him after Walter reset his password previously. It’s great that Walter is supporting entrepreneurs, but we did not want to give Walter more trouble at home.

Even when Walter is frustrated to the point of swearing, he only rates it a three out of ten, possibly part of the test effect of “this doesn’t matter”. Walter is clearly confused about username and password and their role in the webmail login process. His explanation that the surroundings of a computer lab on campus made him confused seems pretty reasonable. Basically, Walter did not transfer the skill of logging in, which admittedly was not very familiar for him. And although he did try the question mark button for help, he did not question why he was being given “extra” hoops to jump through with scrambles or look to confirm that he had spelled his username correctly. He just repeatedly tried the same thing.

## 5.4.8 More on Quit

Exactly half of the 16 observed participants had at least one occurrence of quitting. Only one of them is an intrinsic, Mike. The others are all extrinsics, Lilly, Lucy, Marsha, Miranda, Molly,

Olivia, and Walter. Some of those are also resisters, with only Lilly, Molly, and Mike being quitters but not resisters. Let's look at Lilly first (Fig. 31). All times are in parentheses and time and quotes are from Appendix R - Observation Notes: Lilly, Familiar.

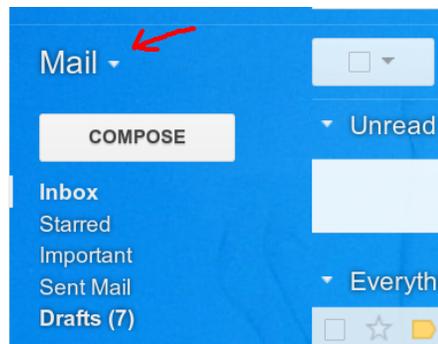


**Figure 31: Lilly Basics**

At 18:50, the researcher asks Lilly to go to her contacts.

"I never use it," says Lilly. "I don't know where the address book is. I never use it. Because I don't need it. Because when I type in the first letter of the email then these things pop up for me." (18:55)

At 19:40, the researcher hints that it might be called "contacts" and Lilly is looking down the left side and across the top, but not in the left corner where "contacts" is behind "mail" (Fig. 32).



**Figure 32: Screenshot of "Contacts" button behind "Mail" in Gmail. Doesn't look like a button with no rectangle or color change. (Fair use of copyrighted material: see Appendix A.)**

"I do not know. I give up," declares Lilly. (20:35)

When prompted for her feelings and asked by the researcher if she feels annoyed, Lilly answers, "Umm, no because I know that, I know you asked me to do something, I'm sorry if I disappointed you. But,"

The researcher interrupts Lilly with, "I'm not disappointed."

Lilly continues, "I don't use the address book." (21:00) "In fact I feel, like, um, I'm a little bit, smart not to get all worked up about something that I don't ever use," Lilly continues. (21:25)

First, this study is on the cusp of change from using address book to not, as emails suggest addresses so fluidly. Secondly, Lilly has such a clear attitude of wanting to please, to not disappoint, but even with that she is willing to "give up" and feels proud of herself for it. This probably is demonstrating boundary setting as opposed to being oppositional. Lilly barely makes it two minutes before giving up, but she does check in the sensible places, along the left and across the top, and she has a reasonable alternate way of working, just type in the address and use the software's suggested email address.

This is the exact same topic that Lucy takes issue with (Fig. 33). Lucy does not want to bother with an email address list because she can just use the suggestions from the email "to" field. All times are in parentheses and time and quotes are from Appendix S - Observation Notes: Lucy, Familiar.

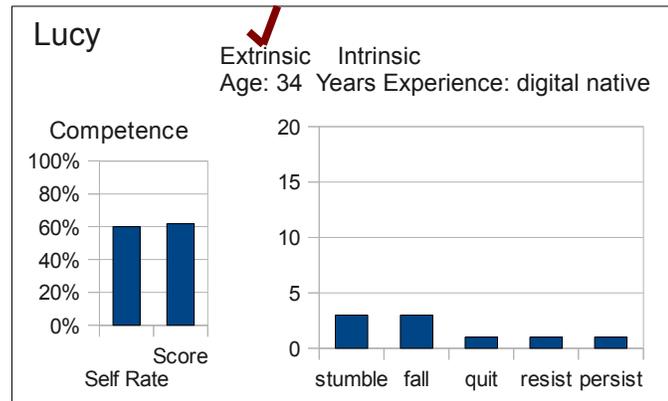


Figure 33: Lucy Basics

At 10:15, the researcher prompts Lucy to put somebody in the new email list she just created. Lucy reads out loud, "It says you can drag and drop. Manage your lists using the buttons above. [reading] import contacts. [reading more, then] So there's no way I can import contacts. I'm getting frustrated now. I'm DONE with my computer now. I would never do this." (10:43)

"So you would quit at this point?" the researcher asks.

Lucy answers, "I would just send the email [use the "to" field suggestions]. Actually I would just call someone. I would just pick up my phone and talk to them [instead of emailing]... if it's anything important, I'm going to call them." (11:23)

The researcher directs Lucy to add her one contact to her list. Lucy looks around for a way to do that. "I do not know how to take [friend's name] into my list," Lucy says.

The researcher adds, "I know you don't, that's the point." (11:50) Then the researcher asks Lucy how high her frustration level is.

"I never become very annoyed with it, but I'm thinking it's stupid," she answers. "Why would I do this? I guess if I was 16 years old with 50 friends and I wanted to invite everybody over to my house I would have a little party list I could just send out. If I didn't have Facebook, see?" (12:34)

At 13:25 Lucy adds her friend to her list. The researcher asks her to rate her stress. "I'm not stressed," Lucy replies. "I would say annoyance. Probably about a 4. I'm thinking it's stupid. ... I'm not like losing it or anything. I'm still in a good mood, but I think it's stupid." (13:47)

### 5.4.9 Use Help or Not

Searching for help online or in the software's help system was a hot topic. Some users seem to have no experience using it, or their experience is from the early 2000's when it still was notoriously bad quality.

Intrinsic digital native Beth is the only expert who had any stumbles and she went right away to search for answers, then continued to use search for the next two unfamiliar tasks. This took more time maybe then just looking around the screen, but she still got the answers without drifting into the persist territory (Fig. 34). So her stumbling was qualitatively different from the example of Alice randomly scanning the screen for possible buttons. Exploration is great, but Beth wasn't lost, she was just using a slightly slower method of looking up the answer.

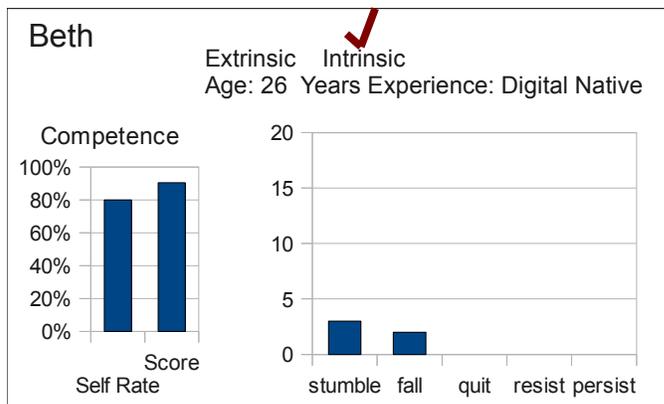


Figure 34: Beth Basics

Alice had never used help much but was almost a convert by her experience during the observation. She shares, "I almost never go to help, because I almost never find it helpful. But it was helpful today." (36:26 Unfamiliar Appendix O - Observation Notes: Alice) Other attitudes regarding search for help were expressed by Lucy, Marsha, and Mike, and they were all pretty negative. Here is what Lucy says about searching for help when asked.

The researcher asks Lucy, "... you didn't go Google it either, or look at the help."

“Why would I do that?” Lucy asks.

“Tell me, why would you not do that?” the researcher asks back.

“Because it’s going to have 50 pages of text that I have no desire whatsoever to read about something that I use rarely, and I don’t really care to know. I don’t read instruction manuals, generally. And why would I Google it? I wouldn’t, because it’s a bunch of teenagers who can’t spell right, who don’t use punctuation, all lower case,” answers Lucy. (18:51 Familiar Appendix S - Observation Notes: Lucy)

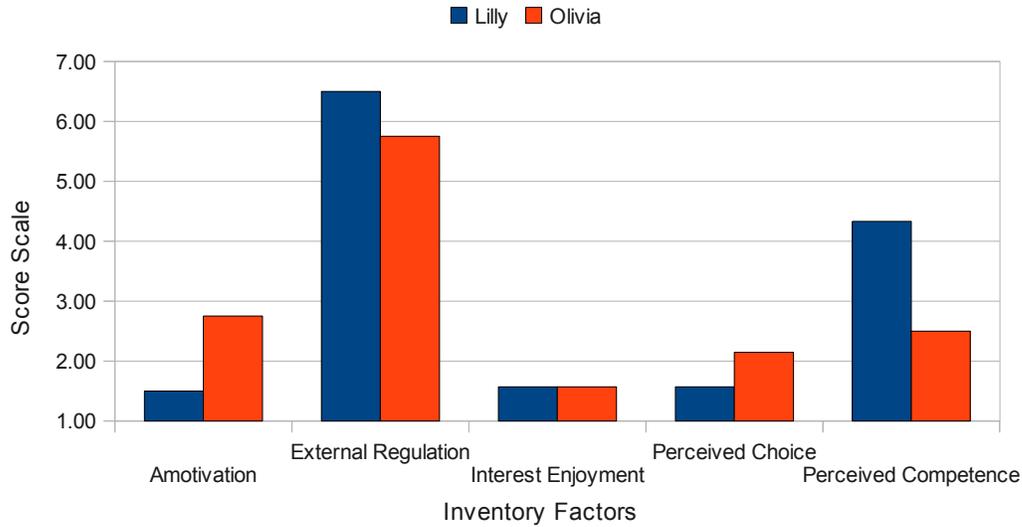
And in this example, Marsha explains her attitudes when asked by the researcher if she ever uses searching. “Well, not through help,” explains Marsha. “Because most of the help is online.” Since Marsha has dial up at home, she limits her online time. After the researcher points out that we are online in this observation, Marsha looks at help and starts reading, “click this, click that, do this, do that,” in an annoyed tone. “I mean, I’m not going to fool with that. You want me to figure out how to do it? I can’t memorize that. So what I have to do is I have to make this go down, minimize it, I clicked on the yellow circle, and then I TRY to remember what the first, sometimes I write it down. And then I try to remember what the first thing was, and I can’t.” Marsha explains. (43:11 Familiar Appendix T - Observation Notes: Marsha)

This last example demonstrates not only intrinsic Mike’s attitude towards searching for help but also his general confusion and inexperience if he actually does try to do that. After the researcher prompts him, Mike talks aloud to himself, “Go to google here, and write a little question and get one of those groups where nobody really knows ANYTHING.” Mike searches for “group email how” in reference to Gmail and selected search result for “windows Microsoft”. When the researcher asks him about that choice, Mike explains, “Because I have windows Microsoft...well now I’m remembering tech has a system, other people have their own systems, so I’m on a tech Gmail thing which doesn’t look like my regular Gmail thing so maybe I better put Gmail in this business just in case.” (20:15 Familiar Appendix V - Observation Notes: Mike)

Six minutes later, Mike succeeds in writing a group email. He repeatedly selected search results that were unrelated while ignoring the first result that was from Gmail Help explaining how to do a group email. Clearly Mike is confused about Gmail by thinking that his computer operating system or his email provider “@mtu.edu” would have a major impact on how to use Gmail webmail.

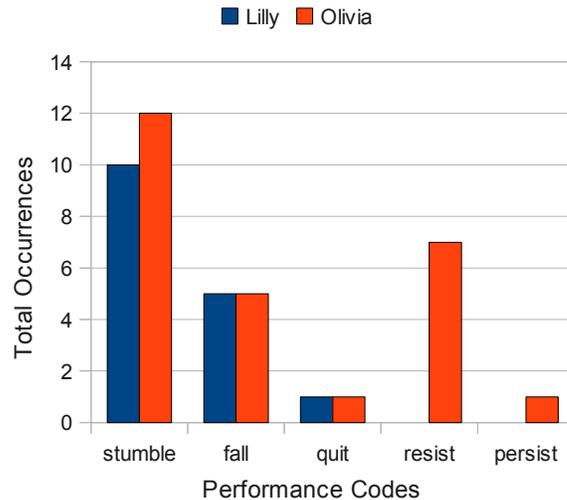
#### **5.4.10 Lowest Interest and Lowest Perceived Choice**

What lesson, if any, can we learn from the two participants with the lowest interest/enjoyment and the lowest perceived choice on the motivation inventory. Let’s look at extrinsics Lilly and Olivia.



**Figure 35: Comparing Lilly & Olivia. Both are the lowest interest and choice of all 16 observed participants.**

Lilly has the lowest scores for interest (1.57) and perceived choice (1.57) among all 16 observed participants. The second lowest scorer is Olivia (1.57 for interest, 2.14 for choice). They are very different people with very similar scores. Olivia is very resistant or obstinate. For example, Olivia says, "I'm not agitated at all. You're just wrong. There's no trash emptying," when one actually can empty trash. (8:40 Familiar Appendix Y - Observation Notes: Olivia) Lilly has almost an apologetic attitude, which seems compliant and opposite of questioning and resisting. For example, Lilly says, "I know you asked me to do something, I'm sorry if I disappointed you." (21:00 Familiar Appendix R - Observation Notes: Lilly)



**Figure 36: Comparing Lilly and Olivia Performance. No bar means zero occurrences of that code.**

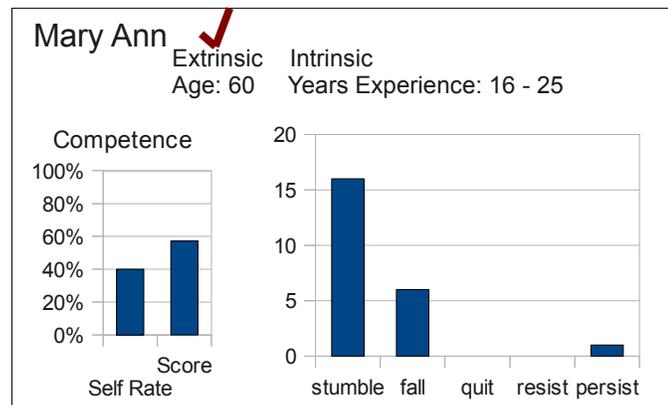
Both Olivia and Lilly are extrinsic (Fig. 35) and both stumbled (Fig. 36) and had difficulty accomplishing unfamiliar skills, but Olivia was annoyed, giving up right away, and blaming the machine. For example, Olivia was adding people to an email group, but they didn't go in because she skipped a step at the end. The researcher says, "But there's no people in it still."

Olivia insists, "I did. I put people in it." (15:49 Familiar Appendix Y - Observation Notes: Olivia)

"But they didn't go because you skipped a step, so let's try again," says the researcher.

"I'm done adding," announces Olivia instead. "Why would it need add, I'm done adding. That's so weird. That's sort of weird you have to add people you added." (16:31 Familiar Appendix Y - Observation Notes: Olivia)

In contrast, Lilly was blaming herself for not being smarter or more skilled. For example, Lilly says, "Ohhh, it's just that feeling, that reminder that, it's not there all the time, but how inept I am at this." (16:09 Lilly Familiar Appendix R - Observation Notes: Lilly)



**Figure 37: Mary Ann Basics**

Both Lilly and extrinsic Mary Ann (Fig. 37), did this type of apologizing and checking if their choices were OK before taking action. This seems to be a character trait, and we suspect there is no relationship between inventory scores, performance coding and apologetic tone. Since the two with the lowest interest and choice, Olivia and Lilly, are also so different from each other in style and attitude, we will not draw any conclusions whether being low interest and low choice have any effect on computer use, other than the hypothesis that low interest and choice is extrinsic motivation and extrinsics will stumble.

### 5.4.11 Test Effects

The observations were modified to fit the experience and state of the participant. This involved some judgment by the researcher, for more detail see 4.6.1 Directing Observations in the Method section. Three effects we observed from being in the test are the changes in emotion, learning, and factors impacting performance.

## Changes in Emotion

Participants expressed many times that their self rating of emotion was greatly lowered because they were in a test and “it didn’t matter”. But some also shared that the test made them nervous and it effected their performance, see Factors Impacting Performance for more information. There are a few examples of both lessening emotion and creating confusion in the section JE User vs. Intrinsic: Walter and Mike. Walter explains that the unfamiliar system of Linux and surroundings in the university computer lab made him nervous enough to be very confused doing a routine task like logging in to email.

Here are some examples of the test lessening anxiety or strength of emotion. As Mary Ann says, “The thing that makes it less scary is that it’s not something I’m responsible for that I use for work. It’s \*just\* a test. So it doesn’t have that element of importance to me. (31:40 Unfamiliar Appendix U - Observation Notes: Mary Ann)

Alice also shares, “It [stress] really isn’t higher because I really don’t feel any true need, I don’t, you know, this is an exercise, it’s not something I’ve got to send out to somebody. But if it was, then it [stress] would be super high by now.” (35:00 Unfamiliar Appendix O - Observation Notes: Alice)

Other examples of the text situation reducing emotion include participants seeming quite agitated but self rating their feelings much lower than how their tone sounds. In this example, Marsha has a popup ad with a video, to which she asks angrily under her breath, “now how the f\*\*\* do you close this stuff?” When the researcher asks if she’s frustrated, Marsha replies, “I don’t like popup windows that want me to do things that it’s impossible for me to do with dial up. It just is very annoying. Yes. And then I can never figure out how to close them. See this is the newer Gmail and they have different icons and different instructions and stuff.” When the researcher prompts for her feelings, Marsha answers, “Mildly frustrated, 4.” (23:38 Familiar Appendix T - Observation Notes: Marsha)

Olivia declares she is only a four or five after alarming the researcher with her strong tone of voice. The researcher says, “Well, you’re kind of mad at me though for telling you you can find it and you can’t.”

Olivia explains, “I’m not mad at you Harriet. I forgive you... No, just like frustrated, because this happens to me a lot, there’s like, some thing that’s supposed to be on the desktop and it’s not. [ask how frustrated] Like a four or five.” (21:55 Unfamiliar Appendix Y - Observation Notes: Olivia)

Interestingly, when intrinsic digital native Peter gets annoyed with the design of Obscure Company webmail, he does not lessen his emotion because of the test. He self rates his emotion as a 6 out of ten just over the window focus, complaining, “Whoa, it took the attention away from my window because it wanted to reload more ads... the main window was grabbing focus when it was loading these ads.” (24:50 Unfamiliar Appendix Z - Observation Notes: Peter)

## Learning Without Teaching

Another test effect is some participants' report that they were learning in the test. The researcher was definitely not teaching, so where did the learning come from? Apparently it is from the implied expectation when being told “do this”, some people hear the encouragement of “you CAN do this”. There is also the security that the researcher is sitting with you and will correct anything

the participant “breaks” in the computer. Some observed participants even expressed gratitude for all they learned during the test.

In the beginning of each observation, the researcher explained to the participant that they had to figure things out without any teaching by researcher. Here is an example with extrinsic digital non-native Alice.

“Can you do a group?” the researcher asks.

“No, I would LOVE to learn how to do a group,” replies Alice.

“Ok, we’re not going to learn, but we’re going to try to do a group,” explains the researcher.

“Ok. Not going to learn, but we’re going to try to do? That’s interesting,” says Alice.

“I’m not going to teach you anything, but you’re going to look for it,” clarifies the researcher.

“Ooohhh, Harriet,” uncomfortably laughs Alice. (10:30 Familiar Appendix O - Observation Notes: Alice)

By the end of the observation, Alice was elated with her “learning”. After the researcher thanked her for being in the study before the unfamiliar phase, Alice said, “It’s a pleasure Harriet, I’ve already learned something new today, a couple of things as a matter of fact. Sending email to a group is AWESOME.”

“I didn’t teach you anything,” the researcher replied.

Alice, laughing, disagrees with, “Oh yes you did!”

“I did not, because I’m just an observer,” insists the researcher.

Alice continues, “First of all you taught me that I could do it. You said ‘do I know how to do it’.”

“I gave you confidence,” states the researcher.

Alice confirms, “Yeah.” (1:38 Unfamiliar Appendix O - Observation Notes: Alice)

Another example of learning is from Marsha, who shares, “Oh. That’s really nice to know. Thanks for helping me learn that. I’ve been trying to do that for ages.” (48:30 Familiar Appendix T - Observation Notes: Marsha)

Mary Ann offers this, “What I realized when we were sitting together and I learned so much from your asking me to look for things that I can do more than I think I can.” (1:06 Appendix U - Observation Notes: Mary Ann)

Wilma admits, “Well it’s easy when YOU’re sitting here, or when my kids are sitting here, but when I’m alone...” The researcher asks why and Wilma answers, “Because you teach me things, well you didn’t teach me, but you showed me new things.”

“I didn’t show you,” argues the researcher.

“Yeah, you did,” disagrees Wilma.

“I encouraged you,” clarifies the researcher. (12:57 Familiar Appendix DD - Observation Notes: Wilma)

Later Wilma says, “I’m actually learning something.”

The researcher replies, “Whoops, I’m not supposed to teach.”

“Well that’s because I’m so smart I just picked up from your innuendos,” explains Wilma. (26:10 Familiar Appendix DD - Observation Notes: Wilma)

This example from Molly indicates how the researcher’s encouragement became mildly addictive. Molly offers, “I bet it’s one of the highlighted ones that hasn’t been read. See how smart I am? I like to hear the, ‘good knowing’... it makes me happy,” referring to the researcher praising her by saying, “good knowing” on other tasks. (16:28 Unfamiliar Appendix X - Observation Notes: Molly)

For Mary Ann, the unfamiliar task drove her to find her own way to do something she was very enthusiastic to use in her routine work. Mary Ann says, “This is very exciting. This is going to be very helpful.” (18:20 Familiar Appendix U - Observation Notes: Mary Ann)

Sometimes just the researcher’s questions initiated learning. In this example, the researcher asked Marsha why she used the search bar one time and the address bar the second time. It became clear that Marsha doesn’t know the difference. “Where’s the address bar?” Marsha asks. “So this is the address bar and that’s the search bar? [surprised] Well I don’t know the difference. I just happened to put it in the address bar... Alright, so now you’re saying I can just press enter and it will take me to that website. Oh, cool!” (11:44 Unfamiliar Appendix T - Observation Notes: Marsha)

One bonus for the researcher was learning from the participants solutions to the tasks, like this example observing Molly. The researcher says, “I didn’t know you could do that!”

Molly confirms, “I can do that.”

“What a handy button! I want to use that. Show me,” demands the researcher.

“Really?” asks Molly.

“Yeah, that looks good,” says the researcher.

Molly explains, “Collapse... expand.”

“Oooohhhh,” exclaims the researcher.

“Are you joking with me?” asks Molly in disbelief.

“No! I learn things every day,” explains the researcher. (2:01 Familiar Appendix X - Observation Notes: Molly)

## Factors Impacting Performance

We observed a number of factors, including age, tiredness, eye strain, and distractions, that had some impact on participant's performance. As the participant became affected, the researcher might assign less demanding tasks, especially if the participant demonstrated tiredness or eye strain. Nobody wants to hurt a respected elder like 87 year old Wilma. The researcher was required to read the situation and direct the test accordingly.

Just being in a test situation could create some anxiety or jitters for participants that might impact their performance or increase their distractability. Here are three quick examples: intrinsic digital native Beth, age 26, shares, "Maybe if I do that on my own, not during the interview, I would be more comfortable with that" (7:16 Familiar Appendix P - Observation Notes: Beth) and extrinsic digital non-native, Mary Ann shares, "I guess I could tell you that I'm feeling a little nervous" (11:32 Familiar Appendix U - Observation Notes: Mary Ann) and Wilma says, "I'm thinking it.... I can't even spell my name .... I'm a little nervous." (8:02 Unfamiliar Appendix DD - Observation Notes: Wilma)

Some participants became distracted, such as Walter stopping to comment on the bridge out the window or Olivia deciding to empty the trash instead of looking for spam. Other distractions are thrust onto the test. Beth had a visitor come by, Lilly stopped to say "Goodbye" to her son leaving for work, and Wilma's husband came in the kitchen to get something while we were on the computer there.

Molly had her young daughter with her which turned out to be very distracting. The researcher was trying to give her daughter something fun to do while Molly was trying to find out how to open IBM Lotus Symphony word processing. The researcher asked, "Did you ever click on applications? [Your daughter] had me distracted," when the researcher returned to observing Molly.

"I did not click on applications," replied Molly, "desktop file system, trash, I think I'm going to close this and go click on 'applications', becaaaaause, I'm no dummy." (24:50 Unfamiliar Appendix X - Observation Notes: Molly) This example shows the negative effects of distraction on both the participant and the researcher.

Eye strain was a problem for some participants, including Walter, who says, "I have to get this position again because it's the only way my eyes work because they're getting tired already." (43:19 Unfamiliar Appendix CC - Observation Notes: Walter) And Wilma shared, "I don't see too well," which is an understatement because she has macular degeneration and could be considered partially blind. (2:12 Unfamiliar Appendix DD - Observation Notes: Wilma) Even later Wilma adds, "Now my eyes are acting up." (12:55 Unfamiliar Appendix DD - Observation Notes: Wilma)

Tiredness and age took their toll on some of the participants. 74 year old intrinsic, Mike, forgets what he's doing in this example. "I forget what I heard two minutes ago, which was login not create a new account...I can look at things and not see it...I saw that stuff [the text box] but I didn't see THAT." (7:20 Unfamiliar Appendix V - Observation Notes: Mike) And 68 year old Marsha says, "I'm getting tired now. I don't like working on computers very much." (11:48 Unfamiliar Appendix T - Observation Notes: Marsha)

In the case of Wilma, 87, great care was taken due to her frailty and age. She shares, "I forgot I was pasting." (27:15 Familiar Appendix DD - Observation Notes: Wilma) And this exchange is early in the observations, "How are you feeling?" the researcher asks.

“Overwhelmed.” answers Wilma. “No, I’m alright, but remind me to drink some water in a few minutes.” (13:31 Familiar Appendix DD - Observation Notes: Wilma)

The researcher became concerned with Wilma’s understanding of where she was and why. Just before the researcher ended the observation, Wilma shares this, “I did it wrong,” when actually she had not.

“No, you didn’t. It didn’t work,” the researcher reassures her.

Wilma asks, “Do you ever get frustrated?”

“Yes,” answers the researcher adamantly. Then the researcher asks Wilma to rate her feelings of frustration.

“I’m ten,” Wilma shares, which is the maximum rating.

The researcher finds the Google website for Wilma and then researcher says, “Aaahh, phew! Do you feel better?” hoping that familiar territory of Google might comfort Wilma.

“Yeah,” Wilma answers. “I don’t know what I’m doing here,” which sounds like either honest confusion about the website, her physical location in the university computer lab, tiredness, age, or just wondering aloud. (15:59 Unfamiliar Appendix DD - Observation Notes: Wilma)

## 5.5 Post Observation Questionnaire Results

It is interesting to note the participants’ feedback regarding how they felt during the test (Table 30). Some participants can’t remember what caused their highest stress, with one jokingly claiming post traumatic stress disorder (PTSD). The feedback comments range from suggestions for making it a harder test to expressing that the test was fun. It wasn’t meant to be fun. The “fun!” comment is from Mike who truly appeared to be completely pissed off at the researcher and the computer, but he insisted he felt fine because it was only a test.

**Table 30: Post Observation Questionnaire Results including feedback from participant: maximum stress self rating on a 1 to 10 scale with 10 being high and 1 being low**

	max stress	cause of max stress	feel now	feedback
Alice extrinsic	6	"figuring out how designers conceived of it"	1 "good, I learned some new things"	"I don't 'play' on my computer or with it either"
Beth intrinsic	1	NA	NA	"more test for other applications. This study is fun and also try to make me more independent once I got into a new environment or apps"
Jane intrinsic	1	NA	1	"I would feel stressed if I was performing unfamiliar tasks in an unfamiliar environment/system. The person conducting the test was pleasant; that creates a welcoming environment"

	max stress	cause of max stress	feel now	feedback
Lilly extrinsic	2	gmail contacts "even 'tho I don't use it!!!"	1	"I hope your work will lead to more user friendly computers!!! Esp. for senior citizens"
Lucy extrinsic	7	make a list, send email to list	1	"Some people have no interest. At all. Thanks! I felt smart :)"
Marsha extrinsic	8	find numbering in outline	3	"maybe test on completely new application. If you had tested me on getting around in government websites you would have seen more frustration"
Mary Ann extrinsic	4	find something	2	"It's great to get to learn something helpful while participating. I feel more confident than before - it's more enjoyable to use computer when work is not at stake"
Mike intrinsic	2	don't remember	1	"fun!"
Miranda extrinsic	10	blocked it out, PTSD	2	"It was interesting. I learned I wasn't totally helpless with computers (Just feel that way)"
Molly extrinsic	5	add a row to a table, "make another one of those [picture]"	1	"you encouraged me. Fun - learned new things"
Olivia extrinsic	5	trying to find trash	2	"using folders and finding stuff is harder"
Peter intrinsic	6	"when the browser lost focus because of loading ads and I lost the attachment window"	1	NA
Rebecca intrinsic	1	NA	NA	NA
Roger intrinsic	1	NA	NA	"longer tasks for users to complete. Put them into an error scenario, ask to get out to do something"
Walter extrinsic	5	can't remember (was weeks later)	1	NA
Wilma extrinsic	10	find internet on Linux (Firefox)	5	"very well conducted. I actually enjoyed participating even tho' somewhat stressed"

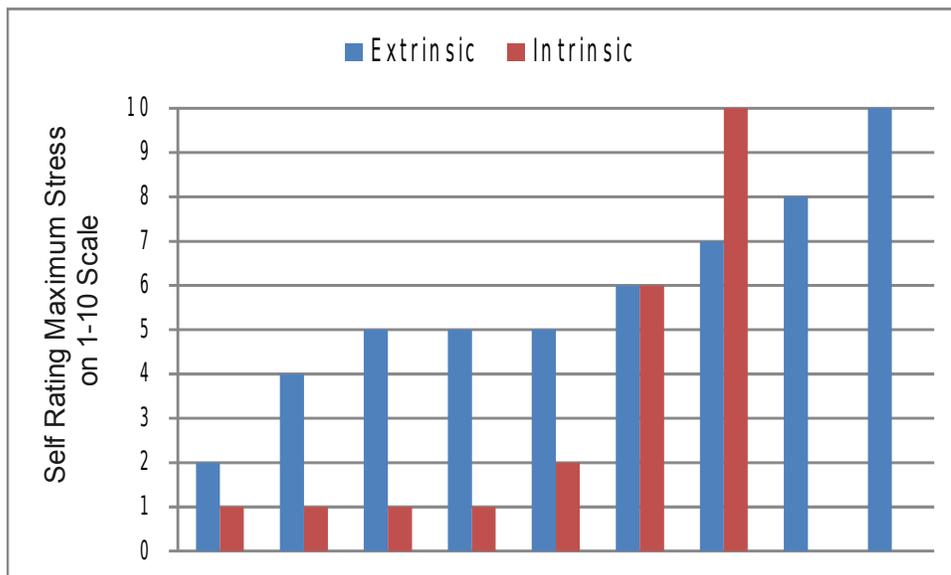
Table 30's feedback also gives more evidence for the test effect of participants claiming to learn during the test even without any explicit teaching by the observer. And intrinsic novice Wilma self rates as the maximum stress of 10 but still says, "I actually enjoyed participating even tho' somewhat stressed."

When we compare maximum stress between extrinsics and intrinsics we can see some differences (Table 31). We did not analyze these results statistically. We can get an overall picture of how strongly each participant felt during the test from these self ratings. Notice that only two participants had a stress level of the maximum of 10, one is intrinsic and the other extrinsic.

**Table 31: Max Stress Self Rating of Participant by intrinsic (left) and extrinsic (right) on a scale of 1 to 10 with 10 being high and 1 is low. Ordered from low stress to high for both groups.**

	max stress		max stress
Beth	1	Lilly	2
Jane	1	Mary Ann	4
Rebecca	1	Molly	5
Roger	1	Olivia	5
Mike	2	Walter	5
Peter	6	Alice	6
Wilma	10	Lucy	7
		Marsha	8
		Miranda	10

It is no surprise that the intrinsics mostly report the minimum of 1, which equals no stress. And that is not just digital natives, 65 year old Rebecca, a digital non-native also reported no stress (1). These stress results are not a surprise because the intrinsics readily did unfamiliar tasks and skill transfer with few difficulties, so there isn't much to get stressed about. But intrinsic Peter, a digital native, says he had stress of 6 when he was irritated with the bad design of the unfamiliar webmail. That is pretty high stress, not at himself, but at someone writing bad code in the software.



**Figure 38: Self Rating of Max Stress for extrinsic and intrinsic participants on a scale of 1 to 10 where 10 is high and 1 is low. There are only 7 intrinsics so no red bar for intrinsic on the far right.**

Lilly has the lowest stress of all the extrinsics and Mary Ann is next lowest. Interesting considering they are the two who appeared most ashamed if they didn't know something or cautious

about proceeding and making sure to ask permission before acting, see Appendix U - Observation Notes: Mary Ann or Appendix R - Observation Notes: Lilly. It is also reassuring to see that extrinsics Lucy, Marsha, and Miranda are at the top for stress self rating because they did seem quite upset at times. Glad they were honest.

But from looking at Error: Reference source not found we can see that mostly intrinsics had lower maximum stress than extrinsics who sort of hover in the middle range for maximum stress. Stress level is an important measure, even with the inaccuracies of self reporting, because it indicates how uncomfortable the participant feels. Extrinsics are uncomfortable, intrinsics are less uncomfortable. There is no statistical difference in their competency or age. Are extrinsics uncomfortable because they don't enjoy using computers and aren't interested? Intrinsics like using computers. That is the measure in the motivation inventory that separates the groups. Seems reasonable to guess that people are more comfortable when they like something. Or as Deci and Ryan explained, intrinsic motivation brings well-being (Deci and Ryan 1991).

## 5.6 JE User Questionnaire Results

Weeks later we sent an email questionnaire to the 9 extrinsics that were observed to find out what they thought about the term Just Enough user. We first explained our definition of JE user and then asked: Would you consider yourself a "Just Enough" computer user?; What feelings do you have about that?; What do you think about the term "Just Enough" user? (Appendix I - JE User Questionnaire and Results (weeks later))

The results were interesting. Some extrinsics didn't like the term, like Marsha, who argued about the wording before answering, "I guess so" to the question if she considers herself a JE user. Others were proud to be a JE user, like Olivia, who felt it was efficient to know just enough. For all the details, see Appendix I - JE User Questionnaire and Results (weeks later).

Direct quotes from individuals are included in Introducing Observed Participants in the Results section. Generally the term seemed acceptable and the extrinsics were comfortable self identifying as JE users. This is a good area of future research.

## 6 Discussion

The JE users all had confirmable proficiencies. They are competent daily users. They knew *just* enough. When asked to accomplish more than enough, they had difficulty. In contrast the intrinsic users we observed seemed to go directly to the buttons that were relevant for doing the unfamiliar tasks. Having intrinsic motivation, which means high interest and enjoyment, does imply more curiosity (Martens et al. 2004). How do intrinsics' interest and curiosity translate into finding the unfamiliar task solution in less than 20 seconds - especially for a novice such as Wilma?

With JE users, we identified the problem that usually proficient daily users become unproductive doing unfamiliar tasks and transferring routine tasks to unfamiliar software. So a solution would be limiting exposure to unfamiliar tasks or software. Where do these unfamiliar tasks and software come from? Certainly from the industry itself, which changes famously quickly, but also from the users changing their attitudes, needs, or wants. Limiting exposure does not seem possible.

We did not study attitudes towards change, but in our motivation research we did not find any association between aversion to change and intrinsic or extrinsic motivation. We did not observe any difference between extrinsics and intrinsics in their aversion to change. Both extrinsics and intrinsics expressed negative attitudes to change, but they expressed acceptance that change is a reality. For example, some intrinsics complained that they hated change until they got used to it, and some extrinsics explained their strategy to avoid change as long as possible and then they would adjust to it.

JE users will adapt to change as necessary but they maintain their just enough-ness by dropping proficiencies that are no longer needed when interfaces change. For example, very few JE users we observed knew how to get to their contacts in Gmail. This may be due to the trend toward auto completion of addresses in email clients. These users all claim to have more than 6 years experience, meaning they were probably using email in the mid 2000's when address books were commonly used, but none know where their address book is in Gmail. This indicates they only bother to know what they need to. With Gmail's conveniences like suggesting names in the "to" field, none of the JE users bothered learning that "address book" is now named "contacts" or where it is. They don't need it. They don't use it. They know just enough without it.

Unfortunately for JE users, the world of using computers does not stand still. Things change rapidly and that version of Word Perfect they loved and knew inside out in 1989 is not still available for their new fast machines. As JE users move forward, or are pushed, they learn just enough with the new software version to get the results they need. How can we say this? Because when asked them to do unfamiliar tasks, they stumbled, they complained, they commented on how they would never attempt these tasks, or they refused. We could confirm their competency in their known and familiar system. They knew just enough.

Each JE user is an individual with a plethora of attitudes, some of which are directly related to performance and exploring. Some appear to have little experience or confidence at problem solving unfamiliar tasks. Some JE users were annoyed to have to bother. They seemed to have such a strong expectation of failure that they were primed to hate having to try. Some participants refused to try. For example, Olivia passed her mouse and presumably her eye over the needed button's word many times in a seemingly random and listless search for the correct way to accomplish the unfamiliar. She was very quick to say, "you can't do it", as in, "nobody can do it, it's not possible," even though it was a normal function visible on the interface.

Some attitudes are directly related to interface design. These were usually expressed as frustration and design complaints. For example, Marsha gave a veritable lecture outlining interface flaws. See Table of Appendices for more details. Motivation research indicates intrinsic motivation includes a sense of control. Since extrinsics would have less sense of control, maybe they are taking charge by criticizing? Extrinsics Marsha and Olivia seemed like they would like more control.

Another attitude participants sometimes expressed was a vague sense of not belonging, like Walter saying the “geekitude” of the university computer lab was enough to throw him into confusion. Or Lilly talking about how she was embarrassed or shy to ask questions from people who knew the answers. This could be translated as, Lilly didn’t feel like she belonged enough to ask questions. This implies an “us” different from “them” mentality.

What are the effects of that? Does that cause more isolation? We know from Ryan and Deci (Ryan and Deci 2000) that intrinsic motivation is associated with a sense of relatedness and belonging. How can JE users build intrinsic motivation if they feel separated from being “in the know”?

In general, JE users might have an idea that experts have secret knowledge, as evidenced by Marsha explaining the right click is the secret answer to most computer usage problems (pretty accurately). Or the general problem of specific computer visual and verbal vocabulary that results in creating walls and dividing people instead of welcoming them. Vocabulary confusion strengthens the sense of not belonging. Walter is an example of someone who is fairly proficient but he expresses that he doesn’t know anything, that he is an outsider. An outsider attitude across a population is not easy to fix, but the fix might start with acknowledging that outsider-ness could be related to extrinsic motivation.

Among experienced computer users there also seems to generally be an “us” and “them” attitude. One overhears power users discounting inflexible problem solvers as “those are just novices,” or inexperienced, or disabled by age and vision issues. This study shows how wrong it can be to dismiss users. We would claim a JE user is impossible to spot as different from any other competent user, until faced with the unfamiliar.

We have shown in this study that many users are perfectly functional and proficient on their routine tasks. In our observations, confirming proficiency was eye opening because many extrinsics had high functionality and very diverse skills in computer use. Yet they stumbled. Some of them didn’t know basic vocabulary or never noticed that their performance created a transferable pattern. That would be another good future study.

Marsha is a good example of a very high functioning user, yet she did not have any understanding of the difference between her address bar and the search bar on her browser. She had never known that she could type a web address in the address bar and press enter to go there. She treated both address and search as a search and never went directly to addresses. Of course, modern browsers like Chrome are treating the address bar as a search bar, so Marsha is ahead of the curve. It is one more example of a skill that a JE user can forget or un-learn now that interface designs are simplified.

Inflexible proficiency is a problem. Our research indicates JE users are predisposed to stumble and fall. What is the solution? Helping all users become intrinsic? That seems challenging. Some obvious stumbling blocks we saw in the observations included not understanding the big picture, not relating patterns from one situation to another, not understanding the visual and vocabulary tools presented. These are specific and teachable skills that could help extrinsics, not just to ac-

complete unfamiliar tasks, but to also feel like they are “in the know” and have some relatedness which could lead to intrinsic motivation.

JE users exist and are perfectly functional. Of course we used a sample of convenience in our rural college town, so many questions remain, but this is a start at identifying that some proficient daily users, not just one age group or competence level, could have hollow competence when faced with unfamiliar tasks or the need to do routine tasks on new software.

## 7 Future Work

We identified proficient daily users as having intrinsic or extrinsic motivation and we found that extrinsics have performance difficulties. But humans are variable. Their level of tenacity or reluctance deeply impacted the participant's efforts. There are other ways to study humans that are more quantifiable but eliminate the richness of personality that ethnographic methods and a think aloud protocol capture. As a first identification of JE users, the methods employed here are effective to draw attention to this group of daily users.

### Weaknesses

There were a number of design flaws in this study: the sample was a convenient sample, ordinal Likert scale results should not be averaged, and all participants had different tasks so they are not easily comparable. We have some compelling results, but our sample size was small. There are arguments for and against qualitative ethnographic techniques as used here. A study designed to measure the quantity, rate, and type of task failure and success would have a different objective and result, but could help to define and understand Just Enough users.

Some of the study choices that could be changed include:

- randomizing respondent selection for motivation inventory to get an evenly distributed sample
- standardizing tasks assigned to measure rate and type of stumbling and success
- standardizing unfamiliar and familiar system and software
- have written instructions instead of verbal
- keep researcher ignorant of motivation scores before observations
- participant alone in a room with the observer outside the room
- possibly observing through one way glass or video camera and screen capture
- eliminating researcher interaction with participants

Then how different would the results be? There would be almost no interaction, or influence, from the researcher. But then it would be a different study. This study had limitations because it is observing human behavior and humans are wonderfully variable for so many reasons including character, history, genetics, culture, age, and current condition.

### Strengths

The flaws were also strengths. The fields of psychology and social science routinely use Likert scale averages. Data was not gathered with the intention of quantifying success rates, but we could quantify failure. The inventory results worked as a tool for pre-screening participants to be observed into extrinsic or intrinsic groups. Our sample was suitable for statistical analysis.

This study intended to capture the home system of each participant and to observe a cross section of daily proficient users with a variety of experience levels. This required customizing the observations to fit the familiar system, software, and experience of the participant. This study design succeeded in confirming the familiar tasks and capturing performance on unfamiliar tasks and near skill transfer for a wide range of individual proficient daily users.

This study included interview, motivation inventory, and customized observations with a think aloud protocol. Interview and ethnographic techniques during observation both require the re-

searcher to be in contact with the observed group. The benefit of this is to gain richer insights and be able to follow up on observed attitudes and behaviors right away to gain a stronger picture of the JE user.

The researcher learned during each observation. For example, think aloud protocol was explained the same way to each participant, but the amount of prompting needed to keep the participant thinking aloud varied. The customized directions sometimes may have become too helpful based on the researcher's perception of the participant's state. When participants expressed discomfort, adjustments to tasks were made.

Essentially, as soon as a participant faltered at a task, it counted as a stumble and the researcher felt free to interact through hints, questions, and conversation with the participant. This was intended to learn more about the user's condition and attitudes, but also to protect the participant from discomfort. The researcher learned quickly that asking about "stress" was not helpful. The participants had emotions other than stress. So asking about feelings on a 1 to 10 rating scale was developed as the observations went along. The study intended to "do no harm" to the participants.

There is a great deal of data in the original recordings and transcripts that could be re-analyzed with other emphases, for example to study digital literacy, or communication patterns, or the misinformation or ignorance of a novice. Included in the recordings is an interview with Wilma about her attitudes to life long learning and an interview with a "refuser" who was not included in this study. We hope that more can be gleaned from the data already collected.

## **Bigger Sample**

What happens if 100 extrinsics and 100 intrinsics are studied? Or a thousand? Do they remain significantly different for stumbles and fall, persists and quits? How do digital natives and non-natives differ on perceived competence? Our sample had no difference in the intrinsic or extrinsic group based on age, perceived competence, or being digital native. Is this still true with a larger sample?

How many JE users are there among daily computer users? Or among digital natives? Are they rare? Is it mostly a digital non-native condition?

## **Describing the Group**

It would be great to find out how many people would affiliate themselves with being a Just Enough user and what they thought of the term. We could ask people to self identify as Just Enough, maybe even without explaining what we mean by the term. Then we could test their motivation style and share the results with them. Maybe we could test their performance. After discussing our findings with them, we could get their further thoughts about the term JE user.

What happens when the 37% of Others from the High-High and Low-Low motivation groups are studied in similar observations to those we ran? How do the Others perform and what could that tell us about flexible problem solving?

We would like to pay attention to gender, socioeconomic status, years of experience, and especially age in future studies. What other characteristics can describe JE users? Is there any connection between aversion to change and JE users? Or intrinsics? How does being in control re-

late to being a JE user or intrinsic? Are there knowledge limits, like limited vocabulary? Or misunderstanding of heuristic patterns?

How can we best describe stumbling? Many people guess that users stumble because, "They're old, that's why they stumble," or "They're novice, that's why they stumble," or even, "They didn't grow up with computers, that's why they stumble." The stumbler is one of the first to claim these handicaps. But is that really true? There are many research studies proving the cognitive and physical effects of aging, so that is a factor. But how does it all interrelate? How could it be studied and how could it help people avoid frustration with their computer devices?

Digital natives could be studied and described better. How about their motivation style? There must be some who are extrinsically motivated. Digital natives use computers for everything including entertainment of many kinds. This implies that their interest/enjoyment score would be high because they have interest/enjoyment for entertainment. Can a further study eliminate social media and entertainment from the category of "using computers" in order to assess motivation for digital natives? If "fun" computer use were somehow removed from the "computer use" of the motivation inventory, then would there be more extrinsic digital natives? Would everyone be extrinsic?

Narrowing the definition of computer "usage" when taking the motivation inventory would be interesting to follow up. Maybe one could separate work, entertainment, communication, required tasks, or other categories of usage and see how the scores for intrinsic and extrinsic varied.

How about infrequent users? We were studying proficient daily users, what if the grouping were once a week or once a month users? How would that change the results for motivation style? Would digital natives that are infrequent users be more intrinsic or more extrinsic? How would the percent of Others change? We required "daily" usage as a first cutoff for participants to observe. If a digital native is extrinsically motivated, they might be a Just Enough but they also might not use computers very often, so we might find the digital native extrinsics if the usage frequency was relaxed. But moving away from regular daily users could blur Just Enough users with computer "refusers" that choose to not use computers.

## **Test Conditions**

We could change the test conditions to learn more about skill transfer. Is far transfer easier? Harder? Is skill transfer really as much trouble for a JE user as unfamiliar tasks? How about setting up a more complex problem situation where the participant does more elaborate troubleshooting? What are the different rates of difficulty for intrinsics and extrinsics then?

If the study could realistically add some sense of necessity or consequences, then participants would feel a need to accomplish the unfamiliar task. How different would the study be? Many of the participants in this study commented on how their stress or frustration was way less, even half, of what it would be if it were a task that they had to accomplish. This study included fairly gentle direction and support so the participant was not too uncomfortable, and even still there were times when participants seemed genuinely agitated with frustration.

## 8 Conclusions

The results of this study bear out our hypothesis. Some proficient daily users who look perfectly competent will stumble over unfamiliar tasks while others with intrinsic motivation have no difficulties. The “Just Enough” users that we defined by their proficient daily computer use and predominantly extrinsic motivation style did turn out to stumble, fall, persist, and quit significantly more than predominantly intrinsically motivated users. JE users account for over 80% of all occurrences of performance difficulties. These difficulties were not explained by age, perceived competence, or whether they are digital natives or not because there is no statistically significant difference between the two groups on any of those factors.

We identified that JE users are 18% in our sample, a sizable proportion. Identifying that JE users exist in all age groups and competence levels and have weak productivity when faced with the unfamiliar is enough to advocate considering them in HCI design plans and evaluations. This is not just a novice problem, these are functional, effective, independent, daily users that become unproductive, and sometimes crazy with frustration, when faced with change.

Software changes against their wishes. For example, a dead computer has to be replaced with changed versions of old software favorites, or cloud computing adjusts a web-based application whenever manufacturers feel like it. These daily users have inflexible proficiency and lose their problem solving ability when these changes happen.

It currently seems that the software manufacturers are still working on the expectation that their users are flexible and driven to learn new ways. But JE users are not driven. They are content for things to stay the same as long as they're getting the functionality they want and need. JE users are consumers and productive workers. Human Computer Interaction professionals should try to include JE users in their design plans and even more importantly in their software evaluations.

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## 10 Table of Appendices

Appendix A - Documenting exceptions to use copyrighted materials.....	125
Appendix B - IRB Protocol and Approval.....	126
Protocol.....	126
Objectives .....	126
Significance.....	126
Procedures.....	126
Recruitment, Selection of Participants and Voluntariness.....	127
Compensation.....	128
Deception.....	128
Privacy and Confidentiality.....	128
Potential risks.....	128
Benefits.....	128
Informed Consent.....	129
Conflict of Interest.....	129
Appendix C - Consent to Participate in Research.....	130
Appendix D - Preliminary Questionnaire.....	133
Appendix E - Motivation Inventory.....	134
Appendix F - Demographic Questionnaire.....	136
Appendix G - Interview Questions.....	137
Appendix H - Post Observation Questionnaire.....	138
Appendix I - JE User Questionnaire and Results (weeks later).....	139
RESULTS from the questions.....	139
Appendix J - Inventory Results.....	141
Scores: All 66 Inventory Respondents.....	141
Table 32: Results: motivation inventory all 66 respondents, mean raw scores per person.....	141
Inventory Statistics: All 66 Inventory Respondents.....	143
Table 33: Parametric Independent Samples T test: are extrinsic and intrinsic different in all 66 inventory respondents. Test run with IBM SPSS statistics software.....	143
Table 34: Parametric Pearson Correlation test: all 66 inventory respondents. Run using IBM SPSS statistics software.....	143
Table 35: Non Parametric Spearman's rho correlations: all 66 inventory respondents. Run using IBM SPSS statistics software.....	144
Inventory and Code Scores: All 16 Participants.....	145
Table 36: Results motivation inventory, age, experience, self rating of competence, performance codes from transcripts for all 16 observed	

participants per person.....	145
Statistics: All 16 Participants.....	146
Table 37: Descriptive statistics of all 16 observed participants. Run using IBM SPSS statistics software.....	146
Table 38: Descriptive statistics, 16 observed separated into 9 extrinsic and 7 intrinsic. Run using IBM SPSS statistics software.....	146
Table 39: Non Parametric Mann-Whitney U test Mean Rank: 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.....	147
Table 40: Non Parametric Mann-Whitney U test 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.....	148
Table 41: Parametric Independent Samples T test 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.....	148
Table 42: Pearson Correlations for all 16 observed participants.....	149
Table 43: Non Parametric Spearman's rho correlation tests for all 16 observed participants. Run with IBM SPSS statistics software.....	151
Table 44: Parametric Pearson Correlation for 9 extrinsic separate from 7 intrinsic. Run using IBM SPSS statistics software.....	152
Appendix K - Coded Transcript Results.....	156
Coded Results.....	156
Table 45: All 16 Observed Participants: separated by 9 extrinsic and 7 intrinsic for all code occurrences per participant with descriptive statistics. Also separated into Phase 2: familiar system, Phase 3: unfamiliar system, and combine phase 2 & 3.....	156
Inter Rater Reliability Results.....	157
Table 46: Inter Rater Reliability Results: Rater P.M. and H.K.....	157
Table 47: Inter Rater Reliability Results: Rater S.K. and H.K.....	158
Coded Results Statistics.....	159
Table 48: Descriptive Statistics for all 16 observed participants. Run with IBM SPSS statistics software.....	159
Table 49: Non Parametric Mann-Whitney test Mean Ranks, comparing extrinsic and intrinsic separated for phase 2, phase 3, or combined	

phases 2 & 3. Test run with IBM SPSS statistics software.....	159
Table 50: Non Parametric Mann-Whitney U test: are extrinsic and intrinsic different, separated into phase 2, phase 3, and combined phase 2 & 3. Test run with IBM SPSS statistics software.....	160
Table 51: Non Parametric Mann-Whitney U test: are phase 2 and phase 3 difference, separated into intrinsic and extrinsics. Test run with IBM SPSS statistics software.....	161
Table 52: Non Parametric Spearman's rho correlation tests: separated into phase 2, phase 3, and combined phase 2 & 3. Statistics run with IBM SPSS statistics software.....	161
Appendix L - Observation Script and Worksheet.....	164
Appendix M - Example Directive Wording.....	166
For Think Aloud Protocol.....	166
For Confirming Proficiency.....	166
For Unfamiliar Task Performance.....	166
For Word Processing, both familiar and then unfamiliar.....	166
For Unfamiliar Environment.....	167
For Prompting the Participant.....	167
For Completing a Task.....	167
Participant Hesitation wording .....	167
Participant Exploring Actions.....	168
Appendix N - Instructions to Rater.....	169
Table 53: Transcript Code Rules.....	169
Table 54: Explanation of "Time" column in transcripts.....	169
Appendix O - Observation Notes: Alice.....	170
Table 55: Alice Detail Summary.....	170
Table 56: Alice Familiar and Unfamiliar Transcripts.....	170
Alice FAMILIAR SYSTEM.....	170
Alice UNFAMILIAR SYSTEM.....	172
Appendix P - Observation Notes: Beth.....	174
Table 57: Beth Detail Summary.....	174
Table 58: Beth Familiar and Unfamiliar Transcripts.....	174
Beth: Familiar System.....	174
Beth: Unfamiliar System.....	175
Appendix Q - Observation Notes: Jane.....	176

Table 59: Jane Detail Summary.....	176
Table 60: Jane Familiar and Unfamiliar Transcripts.....	176
Jane: Familiar System.....	176
Jane: Unfamiliar System.....	177
Appendix R - Observation Notes: Lilly.....	178
Table 61: Lilly Detail Summary.....	178
Table 62: Lilly Familiar and Unfamiliar Transcripts.....	178
Lilly: Familiar System.....	178
Lilly: Unfamiliar System.....	180
Appendix S - Observation Notes: Lucy.....	183
Table 63: Lucy Detail Summary.....	183
Table 64: Lucy Familiar and Unfamiliar Transcripts.....	183
Lucy: Familiar System.....	183
Lucy: Unfamiliar System.....	185
Appendix T - Observation Notes: Marsha.....	187
Table 65: Marsha Detail Summary.....	187
Table 66: Marsha Familiar and Unfamiliar Transcripts.....	187
Marsha: Familiar System.....	187
Marsha: Unfamiliar System.....	192
Appendix U - Observation Notes: Mary Ann.....	194
Table 67: Mary Ann Detail Summary.....	194
Table 68: Mary Ann Familiar and Unfamiliar Transcripts.....	194
Mary Ann: Familiar System.....	194
Mary Ann: Unfamiliar System.....	196
Appendix V - Observation Notes: Mike.....	199
Table 69: Mike Detail Summary.....	199
Table 70: Mike Familiar and Unfamiliar Transcript.....	199
Mike: Familiar System.....	199
Mike: Unfamiliar System.....	202
Appendix W - Observation Notes: Miranda.....	205
Table 71: Miranda Detail Summary.....	205

Table 72: Miranda Familiar and Unfamiliar Transcripts.....	205
Miranda: Familiar System.....	205
Miranda: Unfamiliar System.....	206
Appendix X - Observation Notes: Molly.....	209
Table 73: Molly Detail Summary.....	209
Table 74: Molly Familiar and Unfamiliar Transcripts.....	209
Molly: Familiar System.....	209
Molly: Unfamiliar System.....	212
Appendix Y - Observation Notes: Olivia.....	214
Table 75: Olivia Detail Summary.....	214
Table 76: Olivia Familiar and Unfamiliar Transcripts.....	214
Olivia: Familiar System.....	214
Olivia: Unfamiliar System.....	216
Appendix Z - Observation Notes: Peter.....	219
Table 77: Peter Detail Summary.....	219
Table 78: Peter Familiar and Unfamiliar Transcripts.....	219
Peter: Familiar System.....	219
Peter: Unfamiliar System.....	220
Appendix AA - Observation Notes: Rebecca.....	222
Table 79: Rebecca Detail Summary.....	222
Table 80: Rebecca Familiar and Unfamiliar Transcripts.....	222
Rebecca: Familiar System.....	222
Rebecca: Unfamiliar System.....	223
Appendix BB - Observation Notes: Roger.....	224
Table 81: Roger Detail Summary.....	224
Table 82: Roger Familiar and Unfamiliar Transcripts.....	224
Roger: Familiar System.....	224
Roger: Unfamiliar System.....	225
Appendix CC - Observation Notes: Walter.....	226
Table 83: Walter Detail Summary.....	226
Table 84: Walter Familiar and Unfamiliar Transcripts.....	226

Walter: Familiar System.....	226
Walter: Unfamiliar System.....	227
Appendix DD - Observation Notes: Wilma.....	232
Table 85: Wilma Detail Summary.....	232
Table 86: Wilma Familiar and Unfamiliar Transcripts.....	232
Wilma: Familiar System.....	232
Wilma: Unfamiliar System.....	234
Wilma: Extra Interview (weeks later).....	235
Appendix EE - Poster of JE Users for World Usability Day.....	239

## ***Appendix A - Documenting exceptions to use copyrighted materials***

Figures 3, 4, 5, 6, 19, 21 and 32 include images of copyrighted material from publicly available internet websites. As we explain below, the "fair use" principle applies to our use of these images; hence we may use them without permission from the copyright holders.

- Our purpose for including the images is compatible with fair use: we are commenting on and criticizing the usability of the interfaces shown in the images.
- The nature of our use is also in keeping with fair use: we are assessing usability aspects of publicly used email services.
- The amount and substantiality of the images do not conflict with fair use: they are screenshots representing only small regions of the interfaces, and capturing only individual moments in the interactions.
- The final obstacle to fair use is the risk of depriving the copyright holder of income or new potential markets. Our small screenshots represent only tiny portions of the full interactive experiences of the email services, and they provide no email functionality themselves, so we are clearly not appropriating the work in any meaningful way. Our negative comments regarding the usability of the interfaces have the potential to drive readers away from these services, but this risk is entirely compatible with fair use.

# **Appendix B - IRB Protocol and Approval**

DATE OF IRB APPROVAL: **5/22/2012**

IRB NUMBER: **333101-2**

PROJECT EXPIRATION DATE: **5/21/2013**

PI: Dr. Charles Wallace, Computer Science Associate Professor  
and Harriet King, candidate for MS in Computer Science, MTU  
Fall 2012

## **Protocol**

All test instrument questionnaires and interview questions are attached. Data collectors have been trained by the CITI Collaborative Institutional Training Initiative Basic Course and RCR course.

## **Objectives**

We hypothesize that “Just Enough” (JE) users spend time to be effective with computers but have fragile competency and narrow problem solving because they do not value computers for their own sake and they lack intrinsic motivation. The purpose of this research is to discover the effects of motivation and value on computer aptitude. We will test for skill transference by repeating confirmed competencies in an unfamiliar domain. And we will test for new skill adoption by requesting further competency in their familiar domain. To test these hypotheses, we plan to collect qualitative data assessing participant’s existing and adaptive aptitudes through ethnographic observation while directing the participant through a set of familiar and unfamiliar tasks. There will be questionnaires and interviews before and after as well.

## **Significance**

Identifying “Just Enough” users can be directly applied to improving methods of reaching common and novice users, which in turn can help democratize computer use and break down the poverty and knowledge gap. This is especially important as computers continue to change rapidly and become more prevalent in all aspects of society. Users that do not adapt need education, motivation, and usability designs that consider their needs.

## **Procedures**

After assessing their competence, values for computers, and motivation, we will test their competence in two ways. We will test for skill transference by repeating confirmed competencies in an unfamiliar domain. And we will test for new skill adoption by requesting further competency in their familiar domain.

To carry out this research, we will first give participants a questionnaire and briefly interview them to find out their experience with computers, their motivation in using computers and value for computers. These conversations will be recorded in audio form. We will be prescreening for either low or high intrinsic motivation to use computers and also prescreening for “digital natives” or not through questionnaires. This will give us background information for analyzing the results of our observations. This step will take approximately 10 minutes to complete.

During the second stage, we will observe, video tape, and time the participants using a think-aloud protocol while doing computer tasks that are familiar and comfortable for them to do. The purpose of this is to gauge their existing aptitude to use as a baseline for testing skill transference and new skill adoption. This observation will take approximately 30 minutes to complete.

The third stage will study skill transference and new skill adoption. We will ask the participant to perform the same tasks they already know from stage two but with unfamiliar software. For example, if they usually use yahoo webmail, then we ask them to use gmail webmail (with a dummy user ID) to learn about task transference. We will also ask them to perform unfamiliar tasks in their familiar software. For example, if they know yahoo webmail but never use address lists then we might ask them to use a yahoo address list. The purpose of this is to learn about new skill adoption. We will continue to observe, video tape, and time the participants as they work using the think-aloud protocol. This session will last approximately 45 minutes.

Finally, we will conduct a post-test interview designed to capture the participant's overall experience during the study and this will also be recorded in video form. This stage will take approximately 10 minutes.

## **Recruitment, Selection of Participants and Voluntariness**

### **(a) Participant Population**

Our research procedure will include ethnographic techniques to study 5 digital natives and 5 older computer users that self identify as experienced and competent in some usability but inflexible to change. We will contrast these 10 JE users with 5 experienced, competent, and intrinsically motivated users who value computers for their own sake, aka Power users.

### **(b) Methods for Selecting Participants**

We will pre-screen users using an adaptation of the Intrinsic Motivation Inventory (Deci & Ryan, University of Rochester) and other questionnaires and interview questions (attached) to confirm participants have high time using computers, competency, and low or high, value for computers as an end in themselves.

### **(c) Explain the Need If Specific Population**

The point of the study is to identify and understand the effects of extrinsic motivation on computer competency, therefore we need a participant population that has only extrinsic motivation. For comparison purposes within the study, we will study digital natives and non-natives. Digital natives are defined as people who "grew up using computers", i.e. used computers before age 18. We will also be contrasting with Power users as described above in "Participant Population" section, those users who have intrinsic motivation.

### **(d) Procedures for Assuring Participation Is Voluntary**

We will recruit subjects from two sources in the local community (Michigan Technological University and the local grocery stores) via written and oral invitation flyers. Copies are attached.

## Compensation

Participants input is very important so as a token of our appreciation for their participation, we will be happy to provide a 30 minute one-on-one help session in using computers after their completion of the research session. If the participant chooses to not complete the research session then they will be offered a 10 minute only one-on-one help session in using computers. There are no alternate compensation activities and participants who do not complete any part of a research session will be not be eligible for any one-on-one help session in using computers.

## Deception

There is no deception in this research plan. Users will not be deceived.

## Privacy and Confidentiality

Any information that is obtained in connection with this study and that can be identified with the participant will remain confidential and will be disclosed only with participant's permission or as required by law. We will be making audio and video recordings of the study, with participant's permission, but our research (including published results) will only use written transcripts of these recordings with personally identifying information removed. After transcribing the recordings, we will destroy them.

## Potential risks

**Disclosure of personally identifying information.** The audio and video recordings we take may contain information that reveals the identity of subjects, so the possibility arises for embarrassing information to be released to the public. To mitigate this risk, we will use only transcripts of these recordings, and the publicly available material from the study will include only edited transcript material that does not include personally identifying information. Furthermore, we will show study participants the edited version of their transcripts, so that they can determine whether all identifying information has been removed satisfactorily.

We will be using a digital video camera for recording. This camera will be locked in the office of PI Dr. Wallace when not in use. The video recordings will be downloaded to the desktop computers in the offices of the PIs, both of which are secured with ISO password protection. Only the PIs will have access to the video recordings.

**Feelings of frustration or inadequacy.** The computer activities that the subjects will perform may present difficulties that annoy them or make them feel unskilled or unintelligent. To mitigate this risk, we have included text in the consent letter that identifies the potential for difficulties and assures the reader that the tests are not evaluating intelligence or skill, but rather the effects of motivation and value on computer aptitude. Furthermore, since we will be present during the subjects' computer activities, we will monitor their comfort level and stop the exercise if the frustration level gets too high.

## Benefits

The participant's input is very important for us and we will provide compensation as described above.

The successful completion of this study will give great support to our research in this area. Understanding “Just Enough” users can be directly applied to improving methods of supporting common and novice users, which in turn can help democratize computer use and break down the poverty and knowledge gap. This is especially important as computers continue to change rapidly and become more prevalent in all aspects of society.

## **Informed Consent**

Please see attached file: consent\_UnderstandingJustEnoughUsers.pdf

## **Conflict of Interest**

There is no conflict of interest to disclose.

# **Appendix C - Consent to Participate in Research**

## CONSENT TO PARTICIPATE IN RESEARCH

### Understanding Computer Users

You are asked to participate in a research study conducted by Charles Wallace and Harriet King, from the Computer Science Department at Michigan Technological University. All the results collected from this research will be used by the co-investigator, Harriet King, to prepare a thesis which will be submitted as part of the requirements of the Masters in Computer Science for Michigan Technological University. Your participation in this study is entirely voluntary. Please read the information below and ask questions about anything you do not understand, before deciding whether or not to participate.

#### · PURPOSE OF THE STUDY

The purpose of this research is to discover the effects of motivation on computer aptitude. We will test for skill transference by repeating confirmed competencies in an unfamiliar domain. And we will test for new skill adoption by requesting further competency in their familiar domain. We will assess individual's existing and changing aptitudes through ethnographic observation while directing the participant through a set of familiar and unfamiliar tasks. There will be questionnaires and interviews before and after as well. It is very important to point out that our assessment is testing the effects of motivation on user's aptitudes. The research is not testing or judging *you, the participant*, in any way.

#### · PROCEDURES

If you volunteer to participate in this study, you will be asked to do the following things:

First, we will give you a questionnaire and briefly interview you to find out your experience with computers, motivation in using computers for computers. This will give us background information for analyzing the results of our observations. This step will take approximately 10 minutes to complete.

During the second stage, we will observe you doing computer tasks that are familiar and comfortable for you to do. The purpose of this is to gauge your existing aptitude to use as a baseline for testing skill transference and new skill adoption. We will ask you "think aloud" and we will record our observations including time and your activity as you work. Remember, you are not being judged. This is just to have a starting point to test the effects of motivation on computer aptitude. This observation will take approximately 30 minutes to complete.

The third stage will study skill transference and new skill adoption. We will ask you to perform the same tasks you already know from stage two but with software that is unfamiliar to you. We will also ask you to perform unfamiliar tasks in your familiar software. The purpose of this is to learn about new skill adoption. This is designed to test the effects of motivation on computer aptitude. This observation will take approximately 45 minutes to complete.

After the completion of the research we will ask you a few basic questions related to your overall experience during the study. This session will last approximately 10 minutes.

#### · POTENTIAL RISKS AND DISCOMFORTS

There is always a risk of feelings of frustration or unease when using a computer, or when answering questions about yourself, and so we want you to be aware of that possibility as you participate in our study. If the level of frustration gets so high that you do not wish to continue with a particular task, or with the entire study, you may stop at any time. We will be with you as you work on the tasks, and you may let us know if you would like to stop.

In the event of physical and/or mental injury resulting from participation in this research project, Michigan Technological University does not provide any medical, hospitalization or other insurance for participants in this research study, nor will Michigan Technological University provide any medical treatment or compensation for any injury sustained as a result of participation in this research study, except as required by law.

· POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

Your input is really important for us and we would greatly appreciate your help. As a token of our appreciation for your participation, we would be happy to arrange a one-on-one help session after the completion of the project where we would answer your basic questions related to computer usage.

The successful completion of this study will give great support to our research in this area. Understanding computer users can be directly applied to improving methods of reaching common and novice users, which in turn can help equalize computer use and break down the poverty and knowledge gap. This is especially important as computers continue to change rapidly and become more prevalent in all aspects of society.

· CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. We will be making audio and video recordings of the study, with your permission, but our research (including published results) will only use written transcripts of these recordings with personal identifiable information removed. After transcribing the recordings, we will destroy them.

· PARTICIPATION AND WITHDRAWAL

If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits to which you are otherwise entitled. You may also refuse to answer any questions you do not want to answer. There is no penalty if you withdraw from the study and you will not lose any benefits to which you are otherwise entitled.

· IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about this research or about your role in the study, please feel free to contact Dr Charles Wallace by mail (1400 Townsend Drive, Houghton, MI 49931-1295), by phone (906-487-3431), or by email ([wallace@mtu.edu](mailto:wallace@mtu.edu)). You may also contact Harriet King by mail (1400 Townsend Drive, Houghton, MI 49931-1295), or by email ([hcking@mtu.edu](mailto:hcking@mtu.edu)).

· RIGHTS OF RESEARCH SUBJECTS

The Michigan Tech Institutional Review Board has reviewed my request to conduct this project. If you have any concerns about your rights in this study, please contact Joanne Polzien of the Michigan Tech-IRB at 906-487-2902 or email [jpolzien@mtu.edu](mailto:jpolzien@mtu.edu).

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

\_\_\_\_\_  
Printed Name of Subject

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Date



## Appendix E - Motivation Inventory

INSTRUCTIONS: This questionnaire has three pages with two sections, so remember to answer all three pages please.

Thank you for answering every question based on your best answer.

### SECTION ONE:

Question	not at all true		some what true			very true	
1. I would describe using computers as very interesting.	1	2	3	4	5	6	7
2. I think I am pretty good at using computers.	1	2	3	4	5	6	7
3. I enjoy using computers very much	1	2	3	4	5	6	7
4. I feel like I have to use computers.	1	2	3	4	5	6	7
5. I think I do pretty well at using computers, compared to other people.	1	2	3	4	5	6	7
6. I think using computers is a boring activity.	1	2	3	4	5	6	7
7. I feel like it is not my own choice to use computers.	1	2	3	4	5	6	7
8. While I am using computers, I am thinking about how much I enjoy it.	1	2	3	4	5	6	7
9. I am pretty skilled at using computers.	1	2	3	4	5	6	7
10. I believe I have some choice about using computers.	1	2	3	4	5	6	7
11. I use computers because I have to.	1	2	3	4	5	6	7
12. I don't really have a choice about using computers.	1	2	3	4	5	6	7
13. Using computers is an activity that I can't do very well.	1	2	3	4	5	6	7
14. I am satisfied with my performance at using computers.	1	2	3	4	5	6	7
15. Using computers does not hold my attention at all.	1	2	3	4	5	6	7
16. I think using computers is quite enjoyable.	1	2	3	4	5	6	7
17. I use computers because I have no choice.	1	2	3	4	5	6	7
18. I use computers because I want to.	1	2	3	4	5	6	7
19. After working on computers for awhile, I feel pretty competent.	1	2	3	4	5	6	7
20. Using computers is fun to do.	1	2	3	4	5	6	7

### SECTION TWO

INSTRUCTIONS: Please answer the following questions based on your agreement with them as answers to this questions:

Why do you use computers?

Question	not at all true			truesome what			very true
1. Because I feel that I have to use computers	1	2	3	4	5	6	7
2. Because I think that this activity is good for me	1	2	3	4	5	6	7
3. Because I don't have any choice about using computers	1	2	3	4	5	6	7
4. I don't know; I don't see what using computers brings me.	1	2	3	4	5	6	7
5. Because I'm doing it for my own good	1	2	3	4	5	6	7
6. There may be good reasons to use computers, but personally I don't see any	1	2	3	4	5	6	7
7. Because using computers is something that I have to do	1	2	3	4	5	6	7
8. By personal decision	1	2	3	4	5	6	7
9. I use computers but I am not sure if it is worth it	1	2	3	4	5	6	7
10. Because I am supposed to use computers	1	2	3	4	5	6	7
11. I use computers, but I am not sure it is a good thing to pursue it.	1	2	3	4	5	6	7
12. Because I believe that this activity is important for me	1	2	3	4	5	6	7

## ***Appendix F - Demographic Questionnaire***

Please answer these questions. Thank you.

Name

Age

Gender

Nationality

Highest level of education you have completed

Highest level of education your parents completed

Race (optional)

## ***Appendix G - Interview Questions***

Please complete the following questions (or answer by interview)

What would you say your main reasons are for using a computer, or wanting to learn how?

Please list some things you do regularly on the computer (e.g. email? facebook? entertainment?)

Do you use word processing or email? Webmail? What kind?

How would you rate yourself from 1 to 10, 10 being expert and 1 being novice, in computer skills?

Part of the study is to observe computer activities that are already comfortable for you. Can we observe you doing word processing or webmail?

## ***Appendix H - Post Observation Questionnaire***

Please circle only one to answer the questions below. Thank you.

1. On a scale of 1 to 10, with 10 being very stressed and 1 being no stress, what was the most stress you experienced DURING the test?
2. What were you trying to do when you had your maximum stress level DURING the test?
3. On a scale of 1 to 10, with 10 being very stressed and 1 being no stress, how do you feel right now?
4. Please give any feedback that would help in our study of the effects of motivation on computer competency.
5. Please give any further comments here.

## **Appendix I - JE User Questionnaire and Results (weeks later)**

1. A. Would you consider yourself a "Just Enough" computer user? (yes/no)
2. B. If you consider yourself a "Just Enough" user, what feelings do you have about that?
3. What do you think about the term "Just Enough" user?
4. Do you have suggestions regarding "Just Enough" users?

<b>RESULTS from the questions</b>	
alice	yes, though i've never heard the term before i feel slightly inadequate, but i do well enough most of the time. as the definition says, i know enough to get what i want, most of the time. and it definitely is not a pleasure for me to try to figure out things on my own. n-o-t at a-l-l. nor will i ever become a dangerous hacker. :- ) it's pretty spot on for my abilities. i'll never achieve 'knows too much' status, that's for sure. i suspect that it covers a wide range of people's skill levels though. maybe everyone thinks they are a "just enough" user. wouldn't that be a hoot!
lilly	Yes, i am a just enuf I am okay with that, I really want computers to be as unobtrusive in my daily life as can be. Just Enough term sounds a bit lazy, maybe means to an end user or toolkit user?
lucy	YES I am fine using the computer only for what I need. I think they are ruining the world quite frankly, and am slightly proud I find them somewhat repulsive machines. (enough feeling words? :- ) Just Enough means to me that I fit it into my life so it does for me what I need it to (work, Skype) and it does not consume my time for needless faffing. (faffing - to aimlessly waste time doing useless tasks).
marsha	I guess so. I consider myself a medium computer user. There are many more people who are not as used to computers but on the othr hand, I do not explore new uses as much as use the ones that have served me well. I would consider a "just enpugh" user to be one who uses only email, or only cruises the web for news, or only uses one application.
mary ann	Yes, I think I am a just enough user My feelings are that I would like to be more than that. I do not want to be a "dinosaur." I want to be able to do what I need to do to stay current as well as to enjoy. For example, I have trouble using canvas (necessity). I would like to know how to create a blog or put pictures on facebook (enjoy) I am not sure. I sometimes can do a little more than just enough if I get up my courage to try.
miranda	yes my feelings are why would I spend any more time at the computer? I'd rather read a book or take a walk Just enough is a perfect name. The computer is an amazing tool!
molly	Yes Mixed feelings... My primary use of the computer is getting information and communicating. I do like to catch up on FB mostly because I don't want to be left behind or be out of the loop. I do like to see what my friends are up too and view pictures! I want a presence on the Web, but not much of one! The term "Just Enough" is kind. I don't feel judged or "less than" (stupid). Thanks!
olivia	Sure very proud that i can do it enuf Fine very reasonable
walter	Mostly, yes - but I do have hankerings to do wonderful things like Google things from my pocket rather than on a laptop, and enter my food intake and practice singing intervals via apps

## ***RESULTS from the questions***

the same way. Also take better pictures on a smart phone -- &c &c. I guess most people want to improve in every way. But then, after all, people do get on without a computer at all, so perhaps "No Computer" (or "The Computer They Make You Use At Work") is the true "Just Enough Computer"

## Appendix J - Inventory Results

### Scores: All 66 Inventory Respondents

Table 32: Results: motivation inventory all 66 respondents, mean raw scores per person.

digital native	code name	amotivation	extrinsic integrated	extrinsic motivation	Interest/Enjoyment	Perceived Choice	Perceived Competence
	101	1.00	6.25	4.00	3.43	3.43	1.00
	102	2.25	5.00	4.75	3.00	2.29	1.83
	103	2.75	2.25	5.75	1.57	2.14	2.50
	104	3.75	3.75	5.25	1.29	2.14	2.50
	105	4.25	4.25	5.25	3.14	3.43	2.50
	106	1.00	6.50	3.75	5.00	4.71	2.67
	107	2.00	6.25	5.75	2.71	1.71	2.67
	108	1.00	6.75	7.00	5.00	2.29	2.83
	109	1.50	3.25	2.75	4.14	4.14	3.00
	110	3.50	3.00	3.50	2.00	3.57	3.33
	111	2.50	3.75	3.25	2.86	3.86	3.33
1	112	2.75	3.25	1.50	4.14	5.86	3.33
	113	1.75	6.25	3.00	4.29	4.71	3.33
	114	1.00	5.75	3.00	4.86	4.86	3.33
	115	2.00	5.75	4.50	2.00	3.14	3.33
	116	1.00	2.50	3.25	4.57	5.43	3.50
1	117	2.75	6.00	4.25	3.43	5.57	3.67
	118	1.00	3.50	1.50	4.86	5.29	4.00
	119	1.25	4.00	6.50	3.71	2.57	4.00
	120	1.00	7.00	5.50	6.00	5.14	4.00
1	121	1.75	5.00	5.25	4.86	4.71	4.00
	122	1.00	6.50	7.00	5.00	2.00	4.00
	123	1.00	6.75	6.25	4.86	2.43	4.00
	124	1.75	4.25	1.00	5.00	6.57	4.17
	125	1.00	4.75	4.75	4.00	3.29	4.17
	126	2.75	3.25	5.25	4.14	4.00	4.17
1	127	2.75	3.00	6.00	3.00	1.57	4.33
	128	1.00	3.25	4.50	2.57	2.43	4.33
	129	1.50	4.50	6.50	1.57	1.57	4.33
	130	2.00	4.75	4.50	4.71	3.86	4.33
1	131	2.25	4.25	5.00	5.00	3.43	4.33

digital native	code name	amotivation	extrinsic integrated	extrinsic motivation	Interest/Enjoyment	Perceived Choice	Perceived Competence
	132	1.25	4.50	3.25	3.86	3.71	4.50
1	133	3.00	4.25	4.00	3.71	4.86	4.50
	134	1.00	5.50	4.25	5.14	3.57	4.50
	135	3.50	5.25	4.00	5.00	4.00	4.67
	136	1.50	5.00	3.25	5.29	5.14	4.83
	137	1.00	4.00	5.25	4.14	2.57	4.83
1	138	5.00	3.25	4.00	3.57	4.71	5.00
	139	1.00	5.50	4.00	5.57	4.29	5.17
1	140	1.00	5.25	3.75	5.43	3.43	5.17
	141	1.00	4.75	3.00	3.71	5.14	5.33
	142	1.25	4.25	1.50	4.29	4.43	5.33
1	143	2.00	3.75	5.00	5.29	4.57	5.33
1	144	1.00	3.75	2.00	6.86	5.57	5.50
1	145	2.00	3.50	4.50	4.71	3.57	5.50
1	146	2.00	5.75	2.75	5.43	4.86	5.67
1	147	1.00	5.50	2.00	5.71	6.00	5.83
	148	2.50	4.25	2.00	4.57	4.57	5.83
1	149	1.25	6.50	3.25	4.14	5.43	5.83
	150	1.00	5.75	5.50	5.00	3.43	5.83
1	151	1.25	5.75	2.75	5.43	4.00	6.00
1	152	1.00	5.25	5.25	6.00	4.00	6.00
1	153	2.25	4.25	5.00	4.43	3.57	6.00
1	154	1.25	5.50	5.50	4.43	4.43	6.17
1	155	1.00	6.75	1.00	6.43	5.86	6.33
1	156	2.75	3.50	2.00	5.29	5.29	6.33
	157	1.00	5.25	2.25	7.00	4.86	6.33
	158	1.00	4.25	3.75	4.57	2.86	6.50
1	159	1.00	6.00	3.25	5.14	4.57	6.50
	160	1.00	6.25	4.75	6.00	4.43	6.50
1	161	1.00	7.00	2.50	6.71	5.14	6.67
1	162	1.50	4.00	1.75	6.29	6.43	6.67
1	163	1.00	6.50	2.00	6.14	5.29	6.83
1	164	1.00	6.00	3.75	6.29	5.43	6.83
1	165	1.00	6.25	2.50	6.57	4.86	7.00
1	166	1.00	6.75	6.25	5.29	3.29	7.00

## Inventory Statistics: All 66 Inventory Respondents

**Table 33: Parametric Independent Samples T test: are extrinsic and intrinsic different in all 66 inventory respondents. Test run with IBM SPSS statistics software.**

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
AMOT	Equal variances assumed	3.99	0.05	-3.21	40.00	.003	-0.85	0.27	-1.39	-0.32
	Equal variances not assumed			-2.65	14.69	.018	-0.85	0.32	-1.54	-0.17
ExIDReg	Equal variances assumed	0.06	0.80	1.59	40.00	.120	0.66	0.42	-0.18	1.51
	Equal variances not assumed			1.58	20.04	.131	0.66	0.42	-0.21	1.54
ExMOT	Equal variances assumed	0.33	0.57	-9.19	40.00	.000	-2.70	0.29	-3.29	-2.10
	Equal variances not assumed			-9.69	22.82	.000	-2.70	0.28	-3.27	-2.12
INTenj	Equal variances assumed	0.00	0.99	9.03	40.00	.000	2.70	0.30	2.10	3.31
	Equal variances not assumed			8.97	20.01	.000	2.70	0.30	2.08	3.33
PCH	Equal variances assumed	0.48	0.49	7.38	40.00	.000	2.35	0.32	1.71	2.99
	Equal variances not assumed			6.57	16.39	.000	2.35	0.36	1.59	3.11
PCOM	Equal variances assumed	2.13	0.15	4.72	40.00	.000	1.96	0.42	1.12	2.80
	Equal variances not assumed			5.52	29.42	.000	1.96	0.35	1.23	2.68

**Table 34: Parametric Pearson Correlation test: all 66 inventory respondents. Run using IBM SPSS statistics software.**

Correlations							
		AMOT	Ex-IDReg	ExMOT	INTenj	PCH	PCOM
AMOT	Pearson Correlation	1	-.481**	.105	-.525**	-.121	-.323**
	Sig. (2-tailed)		0.00	0.40	0.00	0.33	0.01

Correlations							
		AMOT	Ex-IDReg	ExMOT	INTenj	PCH	PCOM
	Sum of Squares and Cross-products	55.19	-36.03	9.60	-41.99	-9.18	-27.38
	Covariance	.849	-.554	.148	-.646	-.141	-.421
	N	66	66	66	66	66	66
ExIDReg	Pearson Correlation	-.481**	1	.086	.430**	.079	.197
	Sig. (2-tailed)	0.00		0.49	0.00	0.53	0.11
	Sum of Squares and Cross-products	-36.03	101.61	10.67	46.66	8.12	22.69
	Covariance	-0.55	1.56	0.16	0.72	0.13	0.35
	N	66	66	66	66	66	66
ExMOT	Pearson Correlation	.105	.086	1	-.397**	-.785**	-.337**
	Sig. (2-tailed)	0.40	0.49		0.00	0.00	0.01
	Sum of Squares and Cross-products	9.60	10.67	152.52	-52.85	-99.03	-47.59
	Covariance	0.15	0.16	2.35	-0.81	-1.52	-0.73
	N	66	66	66	66	66	66
INTenj	Pearson Correlation	-.525**	.430**	-.397**	1	.602**	.674**
	Sig. (2-tailed)	0.00	0.00	0.00		0.00	0.00
	Sum of Squares and Cross-products	-41.99	46.66	-52.85	116.10	66.25	82.90
	Covariance	-0.65	0.72	-0.81	1.79	1.02	1.28
	N	66	66	66	66	66	66
PCH	Pearson Correlation	-.121	.079	-.785**	.602**	1	.415**
	Sig. (2-tailed)	0.33	0.53	0.00	0.00		0.00
	Sum of Squares and Cross-products	-9.18	8.12	-99.03	66.25	104.40	48.39
	Covariance	-0.14	0.13	-1.52	1.02	1.61	0.74
	N	66	66	66	66	66	66
PCOM	Pearson Correlation	-.323**	.197	-.337**	.674**	.415**	1
	Sig. (2-tailed)	0.01	0.11	0.01	0.00	0.00	
	Sum of Squares and Cross-products	-27.38	22.69	-47.59	82.90	48.39	130.38
	Covariance	-0.42	0.35	-0.73	1.28	0.74	2.01
	N	66	66	66	66	66	66

**Table 35: Non Parametric Spearman's rho correlations: all 66 inventory respondents. Run using IBM SPSS statistics software.**

Correlations							
		AMOT	Ex-IDReg	ExMOT	INTenj	PCH	PCOM
Spearman's rho	AMOT	Correlation Coefficient	1.000	-.520**	.095	-.536**	-.111

Correlations								
			AMOT	Ex-IDReg	ExMOT	INTenj	PCH	PCOM
		Sig. (2-tailed)	.	.000	.448	.000	.375	.005
		N	66	66	66	66	66	66
	ExIDReg	Correlation Coefficient	-.520**	1.000	.071	.441**	.071	.205
		Sig. (2-tailed)	.000	.	.570	.000	.570	.099
		N	66	66	66	66	66	66
	ExMOT	Correlation Coefficient	.095	.071	1.000	-.383**	-.771**	-.351**
		Sig. (2-tailed)	.448	.570	.	.002	.000	.004
		N	66	66	66	66	66	66
	INTenj	Correlation Coefficient	-.536**	.441**	-.383**	1.000	.546**	.687**
		Sig. (2-tailed)	.000	.000	.002	.	.000	.000
		N	66	66	66	66	66	66
	PCH	Correlation Coefficient	-.111	.071	-.771**	.546**	1.000	.386**
		Sig. (2-tailed)	.375	.570	.000	.000	.	.001
		N	66	66	66	66	66	66
	PCOM	Correlation Coefficient	-.339**	.205	-.351**	.687**	.386**	1.000
		Sig. (2-tailed)	.005	.099	.004	.000	.001	.
		N	66	66	66	66	66	66

## Inventory and Code Scores: All 16 Participants

**Table 36: Results motivation inventory, age, experience, self rating of competence, performance codes from transcripts for all 16 observed participants per person.**

name	beth	jane	mike	Peter	Rebecca	Roger	Wilma	alice	lilly	lucy	marsha	maryann	Miranda	Molly	Olivia	Walter
stumble	3	0	8	0	3	0	7	6	10	3	10	16	10	10	12	14
fall	2	0	6	0	0	0	3	4	5	3	8	6	9	6	5	10
quit	0	0	1	0	0	0	0	0	1	1	1	0	1	2	1	2
resist	0	0	2	0	0	0	0	0	0	1	3	0	2	0	7	0
persist																
count	0	0	2	0	0	0	0	4	0	1	2	1	0	1	1	5
age	26	27	74	24	65	23	87	71	48	34	68	60	58	40	48	74
dignat	2	2	1	2	1	2	1	1	1	2	1	1	1	2	1	1
experrate	8	9.5	4	10	5	11	3	3	7	6	3	4	4.	6.	4	2
exper	16- to25	16- to25	16- to25	16- to25	more to25	16- to25	16- to25	16- to25	6to1 5	16- to25	more to25	16- to25	6to1 5	more to25	16- to25	6to1 5
amotivation	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.50	2.75	1.00	1.25	2.00	2.75	2.75	2.00
external regulation	1.00	2.50	2.75	2.50	4.00	2.00	3.75	4.75	6.50	6.00	4.50	6.50	4.50	4.25	5.75	5.75

name	beth	jane	mike	Peter	Rebecca	Roger	Wilma	alice	lilly	lucy	marsha	maryann	Miranda	Molly	Olivia	Walter
Interest Enjoyment	6.43	6.71	4.14	6.57	5.57	6.14	5.00	4.00	1.57	3.00	2.57	3.71	2.00	3.43	1.57	2.71
Perceived Choice	5.86	5.14	4.14	4.86	4.29	5.29	4.71	3.29	1.57	1.57	2.43	2.57	3.14	5.57	2.14	1.71
Perceived Competence	6.33	6.67	3.00	7.00	5.17	6.83	2.67	4.17	4.33	4.33	4.33	4.00	3.33	3.67	2.50	2.67
extr2Int1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2

## Statistics: All 16 Participants

Table 37: Descriptive statistics of all 16 observed participants. Run using IBM SPSS statistics software.

Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
age	16	51.69	20.82	23.00	87.00	28.75	53.00	70.25
digital native	16	1.38	0.50	1.00	2.00	1.00	1.00	2.00
amotivation	16	1.53	0.69	1.00	2.75	1.00	1.13	2.00
identified regulation	16	5.09	1.54	2.25	7.00	3.44	5.63	6.44
external regulation	16	4.19	1.68	1.00	6.50	2.56	4.38	5.75
Interest/Enjoyment	16	4.07	1.80	1.57	6.71	2.61	3.86	6.00
Perceived Choice	16	3.64	1.51	1.57	5.86	2.21	3.71	5.07
Perceived Competence	16	4.44	1.54	2.50	7.00	3.08	4.25	6.04
YesExtrin	16	1.56	0.51	1.00	2.00	1.00	2.00	2.00

Table 38: Descriptive statistics, 16 observed separated into 9 extrinsic and 7 intrinsic. Run using IBM SPSS statistics software

Descriptive Statistics			
YesExtrin		Mean	Std. Deviation
Intrinsic	age	46.57	27.68
			N
			7

Descriptive Statistics				
	digital native	1.57	0.54	7
	amotivation	1.07	0.19	7
	identified regulation	5.96	1.29	7
	external regulation	2.64	1.02	7
	Interest/Enjoyment	5.80	0.95	7
	Perceived Choice	4.90	0.59	7
	Perceived Competence	5.38	1.84	7
extrinsic	age	55.67	14.05	9
	digital native	1.22	0.44	9
	amotivation	1.89	0.74	9
	identified regulation	4.42	1.41	9
	external regulation	5.39	0.89	9
	Interest/Enjoyment	2.73	0.89	9
	Perceived Choice	2.67	1.26	9
	Perceived Competence	3.70	0.72	9

**Table 39: Non Parametric Mann-Whitney U test Mean Rank: 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.**

Mann-Whitney Test				
Ranks				
	YesExtrin	N	Mean Rank	Sum of Ranks
age	Intrinsic	7	7.36	51.50
	extrinsic	9	9.39	84.50
	Total	16		
digital native	Intrinsic	7	10.07	70.50
	extrinsic	9	7.28	65.50
	Total	16		
amotivation	Intrinsic	7	5.36	37.50
	extrinsic	9	10.94	98.50
	Total	16		
identified regulation	Intrinsic	7	11.57	81.00
	extrinsic	9	6.11	55.00
	Total	16		
external regulation	Intrinsic	7	4.00	28.00
	extrinsic	9	12.00	108.00
	Total	16		
Interest/Enjoyment	Intrinsic	7	13.00	91.00
	extrinsic	9	5.00	45.00
	Total	16		
Perceived Choice	Intrinsic	7	12.14	85.00
	extrinsic	9	5.67	51.00
	Total	16		

Mann-Whitney Test				
	Total	16		
Perceived Competence	Intrinsic	7	10.93	76.50
	extrinsic	9	6.61	59.50
	Total	16		

**Table 40: Non Parametric Mann-Whitney U test 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.**

Test Statistics <sup>b</sup>		Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. [2*(1-tailed Sig.)]
	age	23.50	51.50	-0.85	0.40	.408a
	digital native	20.50	65.50	-1.39	0.17	.252a
	amotivation	9.50	37.50	-2.50	0.01	.016a
	identified regulation	10.00	55.00	-2.28	0.02	.023a
	external regulation	0.00	28.00	-3.34	0.00	.000a
	Interest/Enjoyment	0.00	45.00	-3.34	0.00	.000a
	Perceived Choice	6.00	51.00	-2.70	0.01	.005a
	Perceived Competence	14.50	59.50	-1.81	0.07	.071a

**Table 41: Parametric Independent Samples T test 9 extrinsic vs. 7 intrinsic. Run using IBM SPSS statistics software.**

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
age	Equal variances assumed	13.39	0.00	-0.86	14.00	0.41	-9.10	10.59	-31.80	13.61
	Equal variances not assumed			-0.79	8.39	0.45	-9.10	11.46	-35.32	17.13
digital native	Equal variances assumed	2.22	0.16	1.43	14.00	0.17	0.35	0.24	-0.17	0.87

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
	Equal variances not assumed			1.40	11.60	0.19	0.35	0.25	-0.20	0.90
amotivation	Equal variances assumed	13.84	0.00	-2.83	14.00	0.01	-0.82	0.29	-1.44	-0.20
	Equal variances not assumed			-3.18	9.31	0.01	-0.82	0.26	-1.40	-0.24
identified regulation	Equal variances assumed	0.38	0.55	2.26	14.00	0.04	1.55	0.69	0.08	3.02
	Equal variances not assumed			2.29	13.58	0.04	1.55	0.68	0.09	3.00
external regulation	Equal variances assumed	0.05	0.82	-5.74	14.00	0.00	-2.75	0.48	-3.77	-1.72
	Equal variances not assumed			-5.64	12.08	0.00	-2.75	0.49	-3.81	-1.69
Interest/Enjoyment	Equal variances assumed	0.04	0.84	6.64	14.00	0.00	3.07	0.46	2.07	4.06
	Equal variances not assumed			6.58	12.64	0.00	3.07	0.47	2.06	4.07
Perceived Choice	Equal variances assumed	1.66	0.22	4.31	14.00	0.00	2.23	0.52	1.12	3.34
	Equal variances not assumed			4.69	11.92	0.00	2.23	0.48	1.19	3.27
Perceived Competence	Equal variances assumed	8.97	0.01	2.51	14.00	0.03	1.68	0.67	0.25	3.11
	Equal variances not assumed			2.28	7.43	0.06	1.68	0.74	-0.04	3.40

**Table 42: Pearson Correlations for all 16 observed participants.**

Correlations									
		age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment		
age	Pearson Correlation	1	-.872*	-.082	-.260	.396	-.404	-.363	-.763**
	Sig. (2-tailed)		.000	.762	.330	.129	.121	.167	.001
	Sum of Squares and Cross-products	6503.44	-136.13	-17.84	-124.78	207.94	-227.36	171.64	366.98
	Covariance	433.56	-9.08	-1.19	-8.32	13.86	-15.16	-11.44	-24.47
	N	16	16	16	16	16	16	16	16
digital native	Pearson Correlation	-.872**	1	.060	.429	-.546*	.581*	.566*	.710**

Correlations									
		age							
	Sig. (2-tailed)	.000		.825	.097	.029	.018	.022	.002
	Sum of Squares and Cross-products	-136.13	3.75	0.31	4.94	-6.88	7.86	6.43	8.21
	Covariance	-9.08	0.25	0.02	0.33	-0.46	0.52	0.43	0.55
	N	16	16	16	16	16	16	16	16
amotivation	Pearson Correlation	-.082	.060	1	-.421	.509*	-.645**	-.403	-.541*
	Sig. (2-tailed)	0.76	0.83		0.10	0.04	0.01	0.12	0.03
	Sum of Squares and Cross-products	-17.84	0.31	7.23	-6.73	8.91	-12.11	-6.36	-8.68
	Covariance	-1.19	0.02	0.48	-0.45	0.59	-0.81	-0.42	-0.58
	N	16	16	16	16	16	16	16	16
identified regulation	Pearson Correlation	-.260	.429	-.421	1	-.579*	.651**	.678**	.486
	Sig. (2-tailed)	0.33	0.10	0.10		0.02	0.01	0.00	0.06
	Sum of Squares and Cross-products	-124.78	4.94	-6.73	35.36	-22.41	27.04	23.64	17.26
	Covariance	-8.32	0.33	-0.45	2.36	-1.49	1.80	1.58	1.15
	N	16	16	16	16	16	16	16	16
external regulation	Pearson Correlation	.396	-.546*	.509*	-.579*	1	-.821**	-.879**	-.631**
	Sig. (2-tailed)	0.13	0.03	0.04	0.02		0.00	0.00	0.01
	Sum of Squares and Cross-products	207.94	-6.88	8.91	-22.41	42.31	-37.29	-33.54	-24.48
	Covariance	13.86	-0.46	0.59	-1.49	2.82	-2.49	-2.24	-1.63
	N	16	16	16	16	16	16	16	16
Interest/Enjoyment	Pearson Correlation	-.404	.581*	-.645*	.651**	-.821**	1	.815**	.763**
	Sig. (2-tailed)	0.12	0.02	0.01	0.01	0.00		0.00	0.00
	Sum of Squares and Cross-products	-227.36	7.86	-12.11	27.04	-37.29	48.78	33.41	31.81
	Covariance	-15.16	0.52	-0.81	1.80	-2.49	3.25	2.23	2.12
	N	16	16	16	16	16	16	16	16
Perceived Choice	Pearson Correlation	-.363	.566*	-.403	.678**	-.879**	.815**	1	.541*
	Sig. (2-tailed)	0.17	0.02	0.12	0.00	0.00	0.00		0.03
	Sum of Squares and Cross-products	-171.64	6.43	-6.36	23.64	-33.54	33.41	34.41	18.95
	Covariance	-11.44	0.43	-0.42	1.58	-2.24	2.23	2.29	1.26
	N	16	16	16	16	16	16	16	16
Perceived Competence	Pearson Correlation	-.763**	.710**	-.541*	.486	-.631**	.763**	.541*	1
	Sig. (2-tailed)	0.00	0.00	0.03	0.06	0.01	0.00	0.03	

Correlations									
		age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence
	Sum of Squares and Cross-products	-366.98	8.21	-8.68	17.26	-24.48	31.81	18.95	35.60
	Covariance	-24.47	0.55	-0.58	1.15	-1.63	2.12	1.26	2.37
	N	16	16	16	16	16	16	16	16

**Table 43: Non Parametric Spearman's rho correlation tests for all 16 observed participants. Run with IBM SPSS statistics software.**

Correlations										
			age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence
Spearman's rho	age	Correlation Coefficient	1.000	-.841*	.048	-.303	.361	-.339	-.390	-.710**
		Sig. (2-tailed)	.	.000	.859	.255	.169	.199	.136	.002
		N	16	16	16	16	16	16	16	16
	digital native	Correlation Coefficient	-.841*	1.000	-.090	.477	-.534*	.561*	.575*	.647**
		Sig. (2-tailed)	.000	.	.740	.062	.033	.024	.020	.007
		N	16	16	16	16	16	16	16	16
	amotivation	Correlation Coefficient	.048	-.090	1.000	-.519*	.592*	-.704**	-.502*	-.602*
		Sig. (2-tailed)	.859	.740	.	.039	.016	.002	.048	.014
		N	16	16	16	16	16	16	16	16
	identified regulation	Correlation Coefficient	-.303	.477	-.519*	1.000	-.688**	.683**	.726**	.396
		Sig. (2-tailed)	.255	.062	.039	.	.003	.004	.001	.128
		N	16	16	16	16	16	16	16	16
	external regulation	Correlation Coefficient	.361	-.534*	.592*	-.688**	1.000	-.807**	-.876**	-.483
		Sig. (2-tailed)	.169	.033	.016	.003	.	.000	.000	.058
		N	16	16	16	16	16	16	16	16
	Interest/Enjoyment	Correlation Coefficient	-.339	.561*	-.704**	.683**	-.807**	1.000	.787**	.622*
		Sig. (2-tailed)	.199	.024	.002	.004	.000	.	.000	.010
		N	16	16	16	16	16	16	16	16
	Perceived Choice	Correlation Coefficient	-.390	.575*	-.502*	.726**	-.876**	.787**	1.000	.419
		Sig. (2-tailed)	.136	.020	.048	.001	.000	.000	.	.106
		N	16	16	16	16	16	16	16	16

Correlations										
			age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence
	Perceived Competence	Correlation Coefficient	-.710*	.647**	-.602*	.396	-.483	.622*	.419	1.000
		Sig. (2-tailed)	.002	.007	.014	.128	.058	.010	.106	.
		N	16	16	16	16	16	16	16	16

**Table 44: Parametric Pearson Correlation for 9 extrinsic separate from 7 intrinsic. Run using IBM SPSS statistics software.**

Correlations										
			age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence
YesExtrin	Intrinsic	Pearson Correlation	1	-.972**	.437	-.547	.754	-.879*	-.733	-.962*
		Sig. (2-tailed)		.000	.327	.204	.050	.009	.061	.001
		Sum of Squares and Cross-products	4597.71	-86.29	13.71	-116.86	127.68	-138.33	-72.16	-294.52
		Covariance	766.29	-14.38	2.29	-19.48	21.28	-23.05	12.03	-49.09
		N	7	7	7	7	7	7	7	7
	digital native	Pearson Correlation	-.972**	1	-.471	.641	-.787*	.880**	.815*	.898**
		Sig. (2-tailed)	0.00		0.29	0.12	0.04	0.01	0.03	0.01
		Sum of Squares and Cross-products	-86.29	1.71	-0.29	2.64	-2.57	2.67	1.55	5.31
		Covariance	-14.38	0.29	-0.05	0.44	-0.43	0.45	0.26	0.89
		N	7	7	7	7	7	7	7	7
	amotivation	Pearson Correlation	.437	-.471	1	-.930*	.046	-.770*	-.561	-.570
		Sig. (2-tailed)	0.33	0.29		0.00	0.92	0.04	0.19	0.18
		Sum of Squares and Cross-products	13.71	-0.29	0.21	-1.36	0.05	-0.83	-0.38	-1.19
		Covariance	2.29	-0.05	0.04	-0.23	0.01	-0.14	-0.06	-0.20
		N	7	7	7	7	7	7	7	7
	identified regulation	Pearson Correlation	-.547	.641	-.930**	1	-.274	.824*	.751	.593

Correlations										
			age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence
Yes	Extrinsic	Sig. (2-tailed)	0.20	0.12	0.00		0.55	0.02	0.05	0.16
		Sum of Squares and Cross-products	-116.86	2.64	-1.36	9.93	-2.15	6.02	3.44	8.43
		Covariance	-19.48	0.44	-0.23	1.66	-0.36	1.00	0.57	1.41
		N	7	7	7	7	7	7	7	7
	external regulation	Pearson Correlation	.754	-.787*	.046	-.274	1	-.495	-.819*	-.574
		Sig. (2-tailed)	0.05	0.04	0.92	0.55		0.26	0.02	0.18
		Sum of Squares and Cross-products	127.68	-2.57	0.05	-2.15	6.23	-2.87	-2.97	-6.46
		Covariance	21.28	-0.43	0.01	-0.36	1.04	-0.48	-0.50	-1.08
		N	7	7	7	7	7	7	7	7
	Interest/Enjoyment	Pearson Correlation	-.879**	.880**	-.770*	.824*	-.495	1	.732	.925**
		Sig. (2-tailed)	.009	.009	.043	.023	.259		.062	.003
		Sum of Squares and Cross-products	-138.33	2.67	-0.83	6.02	-2.87	5.38	2.47	9.69
		Covariance	-23.05	0.45	-0.14	1.00	-0.48	0.90	0.41	1.62
		N	7	7	7	7	7	7	7	7
	Perceived Choice	Pearson Correlation	-.733	.815*	-.561	.751	-.819*	.732	1	.633
		Sig. (2-tailed)	0.06	0.03	0.19	0.05	0.02	0.06		0.13
		Sum of Squares and Cross-products	-72.16	1.55	-0.38	3.44	-2.97	2.47	2.11	4.15
		Covariance	-12.03	0.26	-0.06	0.57	-0.50	0.41	0.35	0.69
		N	7	7	7	7	7	7	7	7
	Perceived Competence	Pearson Correlation	-.962**	.898**	-.570	.593	-.574	.925**	.633	1
		Sig. (2-tailed)	0.00	0.01	0.18	0.16	0.18	0.00	0.13	
		Sum of Squares and Cross-products	-294.52	5.31	-1.19	8.43	-6.46	9.69	4.15	20.37
		Covariance	-49.09	0.89	-0.20	1.41	-1.08	1.62	0.69	3.40
		N	7	7	7	7	7	7	7	7
extrinsic	age	Pearson Correlation	1	-.753*	-.731*	.299	-.180	.207	-.138	-.153
		Sig. (2-tailed)		0.02	0.03	0.44	0.64	0.59	0.72	0.69
		Sum of Squares and Cross-products	1580.00	-37.33	-60.83	47.50	-18.08	20.76	-19.57	-12.39

Correlations										
YesExtrin		age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment	Perceived Choice	Perceived Competence	
		Covariance	197.50	-4.67	-7.60	5.94	-2.26	2.60	-2.45	-1.55
		N	9	9	9	9	9	9	9	9
	digital native	Pearson Correlation	-.753*	1	.659	.033	-.167	.307	.407	.233
		Sig. (2-tailed)	0.02		0.05	0.93	0.67	0.42	0.28	0.55
		Sum of Squares and Cross-products	-37.33	1.56	1.72	0.17	-0.53	0.97	1.81	0.59
		Covariance	-4.67	0.19	0.22	0.02	-0.07	0.12	0.23	0.07
		N	9	9	9	9	9	9	9	9
	amotivation	Pearson Correlation	-.731*	.659	1	-.047	.003	-.267	.161	-.489
		Sig. (2-tailed)	0.03	0.05		0.90	1.00	0.49	0.68	0.18
		Sum of Squares and Cross-products	-60.83	1.72	4.39	-0.40	0.01	-1.41	1.20	-2.09
		Covariance	-7.60	0.22	0.55	-0.05	0.00	-0.18	0.15	-0.26
		N	9	9	9	9	9	9	9	9
	identified regulation	Pearson Correlation	.299	.033	-.047	1	-.348	.231	.464	-.170
		Sig. (2-tailed)	0.44	0.93	0.90		0.36	0.55	0.21	0.66
		Sum of Squares and Cross-products	47.50	0.17	-0.40	16.00	-3.52	2.33	6.61	-1.39
		Covariance	5.94	0.02	-0.05	2.00	-0.44	0.29	0.83	-0.17
		N	9	9	9	9	9	9	9	9
	external regulation	Pearson Correlation	-.180	-.167	.003	-.348	1	-.199	-.715*	.023
		Sig. (2-tailed)	0.64	0.67	1.00	0.36		0.61	0.03	0.95
		Sum of Squares and Cross-products	-18.08	-0.53	0.01	-3.52	6.39	-1.27	-6.44	0.12
		Covariance	-2.26	-0.07	0.00	-0.44	0.80	-0.16	-0.81	0.02
		N	9	9	9	9	9	9	9	9
	Interest/Enjoyment	Pearson Correlation	.207	.307	-.267	.231	-.199	1	.445	.364
		Sig. (2-tailed)	0.59	0.42	0.49	0.55	0.61		0.23	0.34
		Sum of Squares and Cross-products	20.76	0.97	-1.41	2.33	-1.27	6.39	4.01	1.88
		Covariance	2.60	0.12	-0.18	0.29	-0.16	0.80	0.50	0.23
		N	9	9	9	9	9	9	9	9
	Perceived Choice	Pearson Correlation	-.138	.407	.161	.464	-.715*	.445	1	.009
		Sig. (2-tailed)	0.72	0.28	0.68	0.21	0.03	0.23		0.98

Correlations										
			age	digital native	amotivation	identified regulation	external regulation	Interest/Enjoyment		
YesExtrin		Sum of Squares and Cross-products	-19.57	1.81	1.20	6.61	-6.44	4.01	12.69	0.06
		Covariance	-2.45	0.23	0.15	0.83	-0.81	0.50	1.59	0.01
		N	9	9	9	9	9	9	9	9
	Perceived Competence	Pearson Correlation	-.153	.233	-.489	-.170	.023	.364	.009	1
		Sig. (2-tailed)	0.69	0.55	0.18	0.66	0.95	0.34	0.98	
		Sum of Squares and Cross-products	-12.39	0.59	-2.09	-1.39	0.12	1.88	0.06	4.15
		Covariance	-1.55	0.07	-0.26	-0.17	0.02	0.23	0.01	0.52
		N	9	9	9	9	9	9	9	9



	stumble	fall	quit	resist	persist count	persist time	stumble	fall	quit	resist	persist count	persist time	stumble	fall	quit	resist	persist count	persist time
0.0	-1.7	-1.8	-0.6	-1.2	-1.2		-2.9	-2.1	0.0	0.0	0.0		-3.7	-3.0	-0.6	-1.2	-1.2	
total	61	37	8	9	11		51	30	2	6	6		112	67	10	15	17	
extrinsic	82%	86%	88%	78%	82%		80%	80%	100%	100%	100%		81%	84%	90%	87%	88%	
intrinsic	18%	14%	13%	22%	18%		20%	20%	0%	0%	0%		19%	16%	10%	13%	12%	

## Inter Rater Reliability Results

Table 46: Inter Rater Reliability Results: Rater P.M. and H.K.

COMPAR- ISONS PM	how many chances	quit	resist	how many chances	quit	resist	
alice		0	0				
hk	8	0	0	13	0	1	lilly
					0	0	hk
lucy		1	2		0	0	lucy
hk	7	1	1	5	0	0	hk
					0	0	marsha
				11	0	2	hk
mike		2	1		0	0	mike
hk	6	1	2	12	0	0	hk
Olivia		1	4		0	2	Olivia
hk	12	1	3	17	0	4	hk
Rebecca		0	0				
hk	4	0	0				
Roger	7	0	0		0	0	Roger
hk		0	0	13	0	0	hk
hk	44	4	7	71	0	3	
rater		3	6		0	6	
difference		1	1		0	-3	
percent disagree		2.3%	2.3%		0.0%	-4.2%	

COMPAR- ISONS PM							
	how many chances	quit	resist		how many chances	quit	resist
percent agree		97.7%	97.7%			100.0%	104.2%

**Table 47: Inter Rater Reliability Results: Rater S.K. and H.K.**

COMPAR- ISONS SK							
	how many chances	quit	resist		how many chances	quit	resist
alice		0	0				
hk	8	0	0	13	0	1	lilly
					0	0	hk
lucy		1	2		0	0	lucy
hk	7	1	1	5	0	0	hk
marsha		1	6		0	2	marsha
hk		1	1	11	0	2	hk
mike		1	2		0	0	mike
hk	6	1	2	12	0	0	hk
Olivia		0	3		0	3	Olivia
hk	12	1	3	17	0	4	hk
Rebecca		0	0				
hk	4	0	0				
Roger	7	0	0		0	0	Roger
hk		0	0	13	0	0	hk
hk	44	2	7	71	0	6	
rater		3	6		0	6	
difference		-1	1		0	0	
percent dis- agree		-2.3%	2.3%		0.0%	0.0%	
percent agree		102.3%	97.7%		100.0%	100.0%	

## Coded Results Statistics

**Table 48: Descriptive Statistics for all 16 observed participants. Run with IBM SPSS statistics software.**

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
stumble	48	0	16	4.67	3.996	.803	.343	.260	.674
fall	48	0	10	2.79	2.568	.824	.343	.354	.674
quit	48	0	2	.42	.613	1.199	.343	.462	.674
resist	48	0	7	.63	1.362	2.885	.343	9.906	.674
persist count	48	0	5	.71	1.148	2.017	.343	4.186	.674
Valid N (listwise)	48								

**Table 49: Non Parametric Mann-Whitney test Mean Ranks, comparing extrinsic and intrinsic separated for phase 2, phase 3, or combined phases 2 & 3. Test run with IBM SPSS statistics software.**

Mann-Whitney Test	Ranks				
fam1un2both3		ext2int1	N	Mean Rank	Sum of Ranks
1	stumble	1	7	4.50	31.50
		2	9	11.61	104.50
		Total	16		
	fall	1	7	4.57	32.00
		2	9	11.56	104.00
		Total	16		
	quit	1	7	6.07	42.50
		2	9	10.39	93.50
		Total	16		
resist	1	7	7.21	50.50	
	2	9	9.50	85.50	
	Total	16			
persist count	1	7	6.71	47.00	
	2	9	9.89	89.00	
	Total	16			
2	stumble	1	7	5.36	37.50
		2	9	10.94	98.50
		Total	16		
	fall	1	7	5.57	39.00
		2	9	10.78	97.00
		Total	16		

Mann-Whitney Test	Ranks				
fam1un2both3		ext2int1	N	Mean Rank	Sum of Ranks
	quit	1	7	7.50	52.50
		2	9	9.28	83.50
		Total	16		
	resist	1	7	7.50	52.50
		2	9	9.28	83.50
		Total	16		
	persist count	1	7	6.00	42.00
		2	9	10.44	94.00
		Total	16		
3	stumble	1	7	4.71	33.00
		2	9	11.44	103.00
		Total	16		
	fall	1	7	4.79	33.50
		2	9	11.39	102.50
		Total	16		
	quit	1	7	5.50	38.50
		2	9	10.83	97.50
		Total	16		
	resist	1	7	7.07	49.50
		2	9	9.61	86.50
		Total	16		
	persist count	1	7	5.79	40.50
		2	9	10.61	95.50
		Total	16		

**Table 50: Non Parametric Mann-Whitney U test: are extrinsic and intrinsic different, separated into phase 2, phase 3, and combined phase 2 & 3. Test run with IBM SPSS statistics software.**

Test Statistics <sup>b</sup>						
fam1un2both3		stumble	fall	quit	resist	persist count
1	Mann-Whitney U	3.500	4.000	14.500	22.500	19.000
	Wilcoxon W	31.500	32.000	42.500	50.500	47.000
	Z	-2.995	-2.996	-2.048	-1.161	-1.528
	Asymp. Sig. (2-tailed)	.003	.003	.041	.246	.127
	Exact Sig. [2*(1-tailed Sig.)]	.001a	.002a	.071a	.351a	.210a
2	Mann-Whitney U	9.500	11.000	24.500	24.500	14.000
	Wilcoxon W	37.500	39.000	52.500	52.500	42.000
	Z	-2.357	-2.244	-1.291	-1.288	-2.277
	Asymp. Sig. (2-tailed)	.018	.025	.197	.198	.023
	Exact Sig. [2*(1-tailed Sig.)]	.016a	.031a	.470a	.470a	.071a

Test Statistics <sup>b</sup>						
fam1un2both3		stumble	fall	quit	resist	persist count
3	Mann-Whitney U	5.000	5.500	10.500	21.500	12.500
	Wilcoxon W	33.000	33.500	38.500	49.500	40.500
	Z	-2.843	-2.785	-2.449	-1.288	-2.168
	Asymp. Sig. (2-tailed)	.004	.005	.014	.198	.030
	Exact Sig. [2*(1-tailed Sig.)]	.003a	.003a	.023a	.299a	.042a

**Table 51: Non Parametric Mann-Whitney U test: are phase 2 and phase 3 difference, separated into intrinsic and extrinsics. Test run with IBM SPSS statistics software.**

Test Statistics <sup>b</sup>						
ext2int1		stumble	fall	quit	resist	persist count
1	Mann-Whitney U	22.500	23.500	21.000	21.000	21.000
	Wilcoxon W	50.500	51.500	49.000	49.000	49.000
	Z	-.274	-.161	-1.000	-1.000	-1.000
	Asymp. Sig. (2-tailed)	.784	.872	.317	.317	.317
	Exact Sig. [2*(1-tailed Sig.)]	.805a	.902a	.710a	.710a	.710a
2	Mann-Whitney U	30.500	24.500	21.500	34.000	37.000
	Wilcoxon W	75.500	69.500	66.500	79.000	82.000
	Z	-.896	-1.450	-1.910	-.685	-.334
	Asymp. Sig. (2-tailed)	.370	.147	.056	.494	.738
	Exact Sig. [2*(1-tailed Sig.)]	.387a	.161a	.094a	.605a	.796a

**Table 52: Non Parametric Spearman's rho correlation tests: separated into phase 2, phase 3, and combined phase 2 & 3. Statistics run with IBM SPSS statistics software.**

Correlations								
fam1un2both3				stumble	fall	quit	resist	persist count
1	Spearman's rho	stumble	Correlation Coefficient	1.000	.866**	.439	.324	.197
			Sig. (2-tailed)	.	.000	.089	.221	.464
			N	16	16	16	16	16
		fall	Correlation Coefficient	.866**	1.000	.538*	.550*	.465
			Sig. (2-tailed)	.000	.	.031	.027	.070
			N	16	16	16	16	16
		quit	Correlation Coefficient	.439	.538*	1.000	.393	.540*
			Sig. (2-tailed)	.089	.031	.	.027	.070
			N	16	16	16	16	16

Correlations								
fam1un2both3				stum- ble	fall	quit	resist	persist count
			Sig. (2-tailed)	.089	.031	.	.133	.031
			N	16	16	16	16	16
		resist	Correlation Coefficient	.324	.550*	.393	1.000	.152
			Sig. (2-tailed)	.221	.027	.133	.	.574
			N	16	16	16	16	16
		persist count	Correlation Coefficient	.197	.465	.540*	.152	1.000
			Sig. (2-tailed)	.464	.070	.031	.574	.
			N	16	16	16	16	16
2	Spearman's rho	stumble	Correlation Coefficient	1.000	.857**	.311	.378	.659**
			Sig. (2-tailed)	.	.000	.241	.149	.006
			N	16	16	16	16	16
		fall	Correlation Coefficient	.857**	1.000	.466	.190	.477
			Sig. (2-tailed)	.000	.	.069	.480	.062
			N	16	16	16	16	16
		quit	Correlation Coefficient	.311	.466	1.000	-.143	.252
			Sig. (2-tailed)	.241	.069	.	.598	.346
			N	16	16	16	16	16
		resist	Correlation Coefficient	.378	.190	-.143	1.000	.503*
			Sig. (2-tailed)	.149	.480	.598	.	.047
			N	16	16	16	16	16
		persist count	Correlation Coefficient	.659**	.477	.252	.503*	1.000
			Sig. (2-tailed)	.006	.062	.346	.047	.
			N	16	16	16	16	16
3	Spearman's rho	stumble	Correlation Coefficient	1.000	.877**	.608*	.317	.532*
			Sig. (2-tailed)	.	.000	.013	.232	.034
			N	16	16	16	16	16
		fall	Correlation Coefficient	.877**	1.000	.753**	.444	.635**
			Sig. (2-tailed)	.000	.	.001	.085	.008
			N	16	16	16	16	16
		quit	Correlation Coefficient	.608*	.753**	1.000	.473	.512*
			Sig. (2-tailed)	.013	.001	.	.064	.043
			N	16	16	16	16	16
		resist	Correlation Coefficient	.317	.444	.473	1.000	.326
			Sig. (2-tailed)	.232	.085	.064	.	.218
			N	16	16	16	16	16

Correlations								
fam1un2both3				stum- ble	fall	quit	resist	persist count
		persist count	Correlation Coeffi- cient	.532*	.635**	.512*	.326	1.000
			Sig. (2-tailed)	.034	.008	.043	.218	.
			N	16	16	16	16	16

# ***Appendix L - Observation Script and Worksheet***

## SET UP BEFORE

set up mic and video, get out pens and consents and questionnaires and interview questions and score sheet for preliminary questions

Review obscure webmail and make sure ready to use, review obscure word processor and make sure ready to use

webmail, "obscurecompany" and "gmx" for the unfamiliar webmails. For word processing, we will have "lotus symphony" and "abiword" for the unfamiliar word processing. For unfamiliar operating system, we will use Linux. These are free and can be used in the Linux lab in Rekhi 112 where we will conduct our testing for the unfamiliar portion of the tests.

## Equipment

voice recorder on android, video camera, power cords, extension cords, name tag as MTU researcher, pens, questionnaires, score sheet, tripod, as needed: mac, Linux, or windows

## RESEARCHER COMPLETES

environment (describe)

date

time of day

distractions

kind of computer, age, general condition

## SCRIPT

Preliminary Part

introduce myself

Thank you for participating

give consent #1

give preliminary questionnaire (one page)

score it and see if they fit testing

Main Questionnaires

13. give second consent
14. give extrinsic questionnaire
15. take demographics
16. start tape recorder
17. ask interview questions and log answers

Observe in Comfortable Domain

1. explain think aloud
2. observe environment
3. If not already done: set up mic and video, get out pens and consents and questionnaires and interview questions and score sheet for preliminary questions
4. direct participant to do webmail or word process from interview questions, OR BOTH
5. encourage think aloud with
  1. "What are you thinking?"

2. "What are you trying to decide?"
3. "What are you seeing?"
6. Watch for highlights and patterns, behavior, codes, how much time, affect
7. Stop participant and thank them!

#### Observe in Comfortable Domain with Expanding Skills

8. direct user to do some task that they don't know how, that you tell them to do
9. Watch for highlights and patterns, behavior, codes, how much time, affect
10. Stop participant and thank them!

#### Observe in Unfamiliar Domain

- explain think aloud
- observe environment
- If not already done: set up mic and video, get out pens and consents and questionnaires and interview questions and score sheet for preliminary questions
- direct participant to do webmail or word process from interview questions, OR BOTH

<http://www.gmx.com/>

user: hcking@gmx.com

pw: JEstudy2012

<http://512828.svc.e1m.net/email/scripts/loginuser.pl?EV1=13422090714797831>

user: hcking

pw: JEstudy2012+

- encourage think aloud with
  - "What are you thinking?"
  - "What are you trying to decide?"
  - "What are you seeing?"
- Watch for highlights and patterns, behavior, codes, how much time, affect
- Stop participant and thank them!

#### Post Questionnaire

5. Give post questionnaire
6. Thank Participant.
7. Pay participant

## **Appendix M - Example Directive Wording**

### **For Think Aloud Protocol**

“one thing we’re going to do is use this thing called “think aloud”, and it’s what it sounds like. You’re going to tell me if you can what you’re thinking and I will prompt you if you stop. So, I’m clicking on the send button, I can’t understand why I can’t find the such and such, I’m looking at the left”

“Think aloud is where you say what you are thinking, say what you see and say everything you can think of “

“basically you talk the whole time”

### **For Confirming Proficiency**

“let’s open that email”

“can you reply to that email?”

“can you add an attachment?”

“go ahead and send that”

“can you read that attachment”

“let’s see forward”

“ok, good” “ok, cool”

### **For Unfamiliar Task Performance**

“do you ever use your address book or your contacts?”

“have you ever used this before?” “have you ever done this before?”

“we’re going to make a group list in your contacts”

“can you find the trash?”

“go ahead and find your spam”

“can you delete all your spam at once?”

“can you figure out how to create a label?” 17:52 (Rebecca)

### **For Word Processing, both familiar and then unfamiliar**

“Just drag your fingers over the keys to add a bunch of gobbledygook and some returns so we have something to work with”

“yeah, just add a couple of new lines”

“what are some things you do in your word processor?”

“so you can do bold, and italic, and stuff like that, so just show me how you do bold”

“let’s do some copy and paste”

“can you insert a picture?” “ok, go ahead and do that”

“is this usual for you or is this unusual?”

“did you ever use a table?” [no] “let’s insert a table”

## For Unfamiliar Environment

“have you ever done Linux before?” “never” “ok, open your email, how would you do that”  
[after browser open] “ok, now, go to your email please”  
“I’m going to make you go to an email you’ve never used before. [showing typed paper] The first line is it’s address on the internet. The second line is the user name and password to use and this password is case sensitive. So, can you go to this website?”  
“ok, let’s read an email”  
“let’s delete it”  
“let’s write a new email to this same address”  
“can you make that even bigger?”  
“how are you feeling?” 12:20, “fine”  
“can you go to the inbox?”

## For Prompting the Participant

“go ahead and tell me what you’re seeing”  
“please tell me what you’re thinking”  
“Are you trying to decide something, can you tell me about it?”  
“did that work?”  
“how can you tell that it worked?”  
“what seems odd about this?”  
“what are you thinking?”  
“you’re giggling, what are you feeling?”  
“you’re sighing, what are you feeling?”  
“you sound angry, what are you feeling?”  
“I can see it, right now”  
“how’s your frustration level, or your feelings, what are you feeling?”  
“there’s a way that’s really obvious, I’m wondering if your eye will see it”  
“you tell me if you give up”  
“where are you looking?”  
“tell me if you give up. Obviously I don’t want you pulling your hair out but I do want you to try”  
“cool, I didn’t know you could do it like that!”

## For Completing a Task

“good!”  
“that’s good”  
“Ok, good.”  
“how did you know to do that?”  
“oh, ok, that’s smart”

## Participant Hesitation wording

“uhhhh”  
“I’m looking for a way to do ....”  
“maybe if I go here”  
“what’s this?”  
“I don’t see a way to do...”  
“I’m going to come in here”

“I thought I could go here and put it in here, but it’s already...”  
“I can’t...”  
“ummm”  
“let’s see”  
“let’s go back here”  
[giggling]  
“I guess I can check here”  
“aaaaannnnnnnd”  
“I could try like..”  
“no I can’t drag that..”  
“I’ll try this”  
“I’ll look in here, no I just looked in there”  
“I think I can just... click on this here, and... that didn’t work”  
“ok, that didn’t work, annnnnnd...”  
“you can’t even do those” [menu] researcher: “how can you tell?” “because they’re not highlight-  
ed” [disabled]  
“I looked at the bottom but there’s nothing there”  
“I saw this click to ... but that isn’t it”  
“hmmm, [repeat what looking for, over and over e.g. “contacts....contacts....contacts”]  
“that doesn’t look very promising”  
[sigh]  
“no, that’s not it”  
“maybe this”  
“so, we’re not doing that”  
“I wouldn’t think it’d be under that”  
“I’m going to try right click again”  
“I’ll try select all”  
“I could send them each an email” [instead of to group list]  
“ok, one last look here”  
“I don’t know if that will be a table of not, probably not”  
“you mean insert a table here? You think I can do it down here?”  
“What is signing in called? I forget things like that. Oh yes, login, that’s not “signing up”, I want  
“signing in” “  
“I forgot what you said to do”  
“this damn mouse”  
“I don’t know if I can send to myself” (4:52 intrinsic Rebecca familiar) “Oh I guess I can, ok”  
(4:55) - only 3 seconds, tried it, it worked

## Participant Exploring Actions

highlighting things with mouse, clicking things, looking at drop down and context menus, using  
hover hints

## Appendix N - Instructions to Rater

Please review the transcript given to you and mark in the columns for the codes: stumble, fall, quit, quit resist, and persist per the rules in the following table. Time marks are shown in parenthesis like (15:03) and are minutes:seconds. The time to complete a task is important in the rating. Most tasks are inside one box in the table, but sometimes a task took so long that it is separated and clearly marked that it continues in another box.

Thank you for your help.

**Table 53: Transcript Code Rules**

CODE	meaning	detail
stumble	[action] >= 20 seconds	something takes 20 seconds or longer (mark just one per task)
fall	[action] >= 1 minute	something takes one minute or longer (mark just one per task, and all falls will have a stumble first)
persist	[action] >= 3 minutes	trying to accomplish task 3 minutes or longer (mark just one per task, and all persist will have a stumble and fall first)
quit	attitude towards a task (might be just words, might not be actions)	participant indicates they would give up, quit, leave, stop, are done, or finished with a task (could be quit before “stumble” or before “falls”, mark just one per task), BUT not necessary that they actually stop, just that they express this as something would do, examples: “I give up” or “I’m leaving this now”
resist	attitude towards a task (might be just words, might not be actions)	resisting doing a TASK (only one per task), not “resist” if/when sharing attitude or story and not on a current task: examples of “resist”: says “I’m not going to” or “it doesn’t exist” or “it’s broken” or “it’s wrong” (examples of not “resist” if say “I don’t usually do that or I don’t know how”), example resist: “I’m not going to...” deny, refuse, contradict, reject, refuse (with words, not with actions), deny existence of something. saying software, system, or task is incorrect or is the reason something doesn’t work

“Time” column is for:

**Table 54: Explanation of “Time” column in transcripts.**

nt	not test, or no time	as in, don’t look at time, yes do look for attitude, or could be not part of test, but still look for attitude (quit or resist)
b	begin	b 13:02, task began at 13:02
e	end	e 13:21, task ended at 13:21, so 13:21 minus 13:02 is less than 20 seconds, NOT a stumble
[nothing]	success	means they succeeded in doing in less than 20 seconds

# Appendix O - Observation Notes: Alice

**Table 55: Alice Detail Summary**

Date	Thursday 07/19/12 1130 AM
Motivation	Extrinsic Motivation Style
Summary	age 71, not digital native, self rate for competency 3, 16-25 years experience, external regulation =4.75, Interest/enjoyment =4.0, Perceived Choice =3.29
Setting for Familiar	Rehki Hall 112 Linux computer lab, mixed cloud and sun outside, good light in window, quiet environment, one other lab user who is older professor (distraction), air conditioned and cool inside lab
Familiar System	using Sony Vaio windows 7 laptop 2 months old, clean, gmail
Setting for Unfamiliar	Rekhi Hall 112 Linux computer lab, four others in lab and one was talking that I asked to be quiet (distractions), window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

**Table 56: Alice Familiar and Unfamiliar Transcripts**

time	ALICE [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	<b>Alice FAMILIAR SYSTEM</b>					
nt	[right away, like as an introduction] participant: "I don't do ANYTHING that I'm not taught. And that is a big drawback in my learning, but, uh, I think I was raised that way. I claim that anyway." (1:18)					
nt	(9:09) "I put the cursor over the word sent, which is the only thing I don't like about gmail but right here it's visible because I haven't written a long message, but send disappears up and you've got to scroll...I think that's a pain. I think send should be where something else is. I have actually communicated that to gmail."					
nt	(10:05) me: "Can you do a group?" "no, I would LOVE to learn how to do a group." (10:10) "ok, we're not going to learn, but we're going to try to do a group." "ok. Not going to learn, but we're going to try to do? That's interesting." "I'm not going to teach you anything, but you're going to look for it." "ooohhh, Harriet" [laughing uncomfortably. I explain project until 10:45.					
b 10:45 e 10:53	At 10:45 she starts to look to add group. Succeeds in adding group at 10:53]					

time	ALICE [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
b 10:53 e 19:02	(10:53) [Looking for way to add people to the new group, tried enter key, tried drag, (11:41) me: "I can see it". (12:30) She tried button that selected all] "Oh I clicked on them all... but I've wondered about how to do that" (14:56), 14:57 "now I'm getting into scary territory because it's doing things I didn't ask it to do" 15:00 <i>ANTHROPOMORPHISM</i> me: "you can't hurt anything, and remember you have a back arrow up here [point to browser] just to give you a little more confidence. What would you say your stress level it right now?" "Well I'm kind of annoyed, at myself, uh... I'm not extremely stressed. I would give myself a 5. I'm not happy. And I'm not relaxed. And I'm very frustrated because I can't get it to go beyond XXX and I know there's a way. Come on you guys, play fair [talking to computer]" (15:56) <i>ANTHROPOMORPHISM</i> <i>Generally as explores, surprised at choices</i> 7:14 "should I ask for help? I don't know what to ask." [clicked on gmail's help in upper right and took her straight to add a contact to a contact group page] [reading aloud] "that sounds possible" [tried what remembered from instructions but didn't do what they said] "that's not fair" [direct that she didn't do the instructions exactly, she went back to them, read them again, figured out what she had missed, went and did it like the instructions, it worked] "Ahhhh" [happy <b>scream</b> and laughing and a big hug to me]"(19:02)	1	1			6
b 24:14 e 28:30	(24:14) "Can you find your spam?" "I never have. Is it a site?" "I'm not telling anything. Sorry." (24:14) "spam. spam. spam" [whispering to self] (24:47) me: "tell me what you're looking at" "I'm looking at this black toolbar across the top. It's the only thing I know to look at." "are there other toolbars that you could look at that are on the window?" "on the window... welllll.... you imply that there were." (25:30) [looking at stuff in the browser menu, goes to google search, Finds spam by typing spam in gmail search] 28:30	1	1			4
b 28:32 e 29:20	(28:32) [finding trash, looking on left side where folders are]. me: "where are you looking?" "I'm looking over here on this side" "how come?" "[laughing] well it seemed like a likely place" "why didn't you think of spam being over there?" "well I didn't SEE it over there. And I don't see trash over here either, so it might be a disappointment... but now I know how to find it" [29:20 finds trash after types trash in gmail search]	1				

time	ALICE [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
b 30:23 e 36:46	[30:23 ask to delete all trash at once. looking and looking and encouragement. At 34:32 clicks on "more" in folders but can't see it] participant: [whispering] "what happened to it?" me directing: "It went in the chat box, you need to get just your mouse hovering back in the mail part." (34:32) "ack, come on, just hold still" [regarding mouse] (35:32) <i>ANTHROPOMORPHISM</i> "They're alphabetical!" [but they're not] (36:00) 36:46 I ended test, still had not found trash. I looked for her and found it at 38:00	1	1			8
	<b>Alice UNFAMILIAR SYSTEM</b>					
nt	<i>generally: finds everything, just plods through it, no problems</i>					
nt	me: "thank you for helping me out in my study" "it's a pleasure Harriet, I've already learned something new today, a couple of things as a matter of fact. Sending email to a group is AWE-SOME." me: "I didn't teach you anything." Alice laughing, "Oh yes you did!" "I did not, because I'm just an observer" "first of all you taught me that I could do it. You said "do I know how to do it"" "I gave you confidence" "yeah" (1:38)					
	[success opening firefox: tried desktop Firefox, then saw it wasn't doing anything, then went straight to the Firefox icon in the toolbar]					
	[success logging in to GMX, saw where to put user name and password right away] me: "how did you know where to put it?" "well, I looked for a blank spot" (5:34)					
nt	[interrupt here to talk about not finding trash earlier]					
	(8:43) [success: went straight to compose mail.]					
b 9:00 e 9:40	(9:00) [tried to select "harriet king" so could copy and paste it into to, but it won't let her. tried it again, four times, then stopped trying] (9:40)	1				
	[success: found send right away, success: went straight to inbox]					
nt	[trying to find email just sent to self. clicks on "newest first" in inbox and expects to see newest first, but design is backwards. Is showing what it is, not what the click will make it. Clicking "newest first" makes it oldest first.]					
b 18:47 e 19:00	(18:47) [had her find trash in gmx, [laughing because it was so hard in her gmail], look and found trash (19:00)]					
b 19:03 e 19:19	(19:03) [ ask to empty, did empty trash at 19:19.] <i>so much much easier than in gmail</i>					

time	ALICE [action] “quote” (time on video) <i>analysis</i>	stumble	fall			
nt	[distraction, another pair of students came in talking, asked them to be quiet after a bit, 21:00]					
nt	[After she goes into obscurecompany webmail, reads the details of what they offer, 21:30]					
	obscure mail: success: read, success: reply... easy					
	success: attach. participant: “Here’s attach. Some things don’t change a whole lot” (25:35)					
nt	[opened an attachment in IBM Lotus Symphony, and when document first opened, said] “I see, it looks just like any other. Doesn’t make any sense to me though” (29:14)					
b 32:00 e 39:10	(32:00) [ask if she ever inserts pictures in word, yes, so try that here] [ask her about her stress level] “It’s probably just a five. I’m thinking I will find it. (34:20) [searching] “It really isn’t higher because I really don’t feel any true need, I don’t, you know, this is an exercise, it’s not something I’ve got to send out to somebody. But if it was, then it would be super high by now.” (35:00) [Went to help 35:15, she doesn’t see the search in the help, but I show her.] participant: “I almost never go to help, because I almost never find it helpful. But it was helpful today.” (36:26) [finds that have to do “create a graphic   from file”.Ask about her stress level] “It’s good, a little disgusted with them for making the language so obscure.” 39:10 “I’m not totally sure I could do this again, so I still have some. I would be down at four [stress level]” 39:25	1	1			7

## Appendix P - Observation Notes: Beth

**Table 57: Beth Detail Summary**

Date	Monday 07/16/12 1100 AM
Motivation	Intrinsic Motivation Style
Summary	Age 26, digital native, (from China) self rate for competency 8, 16-25 years (whole life) experience, external regulation =1.0, Interest/enjoyment =6.43, Perceived Choice =5.86
Setting for Familiar	rekhi grad student office, hot and muggy, overcast, door shut, air conditioned but hot inside, big window, overhead light not on, no distractions
Familiar System	using Asus windows 7 really new 3 months, great condition and also running mtu Linux box, gmail
Setting for Unfamiliar	Walker 120 mac lab, small room, no windows or daylight, no one there, inside big lab with other working, cool air conditioned, bright overhead lights on
Unfamiliar System	using iMac 27" on table with two chairs, nothing else in small room

**Table 58: Beth Familiar and Unfamiliar Transcripts.**

time	<i>BETH [action] "quote" (time on video) analysis</i>					
	<b>Beth: Familiar System</b>					
nt	<i>not much talking for think aloud ( international student)</i>					
nt	[distraction, visitor to office at 0:45]					
b 4:40 e 6:42	[4:40 looking for address book, looking in settings, account, I gave hints; me: "it's not in settings", [she searched online on google 6:27] "Do I have that?" (6:42) [then clicks on it] "That's weird. I never noticed that. I don't even know that I can click on that" (6:49) me: "what's your frustration level right now?" "Five. And also. it's like, maybe if I do that on my own, not during the interview, I would be more comfortable with that" 7:16	1	1			
b 7:25 e 7:57	(7:25) [make new group, uses google search, looks around for "new group", then finds it.] (7:57)	1				
b 8:14 e 9:38	(8:14) [To add people to group, goes back to search results instead of trying buttons.] "I didn't even see this button." (8:32) <i>Tries instructions but has to explore also.</i> (9:38) [adds a person.]	1	1			
nt	<i>USES RESOURCES instead of exploring</i>					

time	<i>BETH [action] "quote" (time on video) analysis</i>	stumble	fall	quit	resist	persist
	[9:45 start to send email to group. success: Went straight to compose email and started typing the name of group, so went straight to it]					
	<b>Beth: Unfamiliar System</b>					
nt	[finding browser] me: "how did you know to pick that?" "I have iPhone" (1:17)					
	[very excited to work on mac big screen. Very happy to play on it] participant: "Actually I notice the keyboard is different. Here, like, I usually have, like, backspace, but also delete, so it delete forward instead of backward as I usually take on the window system." (3:50)					
	<i>cruised through gmx mail: success: login, success: read, success: reply, success: attach</i>					
nt	[we had trouble finding obscurecompany by googling] me: "That doesn't matter, just find obscure company email somehow", (3:15)					
	<i>cruised through obscurecompany mail: success: login, success: read, success: reply, success: attach</i>					
	<i>in general, had no trouble transferring skills to both webmails</i>					

## Appendix Q - Observation Notes: Jane

**Table 59: Jane Detail Summary**

Date	Friday 07/20/12 1000 AM
Motivation	Intrinsic Motivation Style
Summary	Age 27, digital native, (from India), self rate for competency 10, 16-25 years (whole life) experience, external regulation =2.5, Interest/enjoyment =6.71, Perceived Choice =5.14
Setting for Familiar	Rekhi grad student office, air conditioned but hot, window shades open, lots of natural light, overhead light off, no office mate and door shut (no distraction)
Familiar System	using Linux Fedora desktop, oldish condition, gmail
Setting for Unfamiliar	Walker 120 mac lab, small room, no windows or daylight, no one there, inside big lab with other working, cool air conditioned, bright overhead lights on
Unfamiliar System	using iMac 27" on table with two chairs, nothing else in small room

**Table 60: Jane Familiar and Unfamiliar Transcripts**

time	JANE [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Jane: Familiar System</b>					
nt	<i>lots of really clear think aloud, explaining all the things she's thinking, for example that it's ok to make a group because can't hurt anything, and explaining understanding about the functionality</i>					
nt	<i>would be great for learning from her example</i>					
	(13:30) [direct to go to contacts. went straight to contacts (13:48), ask to make new group 14:30: made group right away, success: populated group easily, explaining design of where to look for commands, comments on how group list won't create harm]					
	[16:00 went straight to add people to group, ask her how she knew that and she explains the design]					
nt	[(17:50) ask her to send email to new group, went straight to compose and tried typing group but didn't come up, had some discussion if the group list was in personal or mtu email, find later that was just a refresh issue, a bug in gmail] Participant: "That not a really good placement for a button" (19:12)					

time	JANE [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
nt	[spent time looking for why (18:00)] [used google search and found instructions and found it was exactly what she'd done so had it correct first time, but system had trouble]					
	<b>Jane: Unfamiliar System</b>					
nt	<i>really nothing happens in unfamiliar system except she gets unhappy that I ask her to attach a file to an email because they are not our files, so this is a big ethical dilemma for her because we are logged in as someone else.</i>					
nt	(7:03) comments that gmx doesn't have a bad look and feel, seems OK.					
	(7:53) typing into "to" and comments that good to have suggestion in "to" field					
	(19:12) participant notices that sent folder is only populated if check the box in mail while composing					
nt	[She points out how "sketchy" obscurecompany webmail looks with both the name of the site and also the long site address and how that is a deterrent and only "sketchy" people would use that.]					

## Appendix R - Observation Notes: Lilly

**Table 61: Lilly Detail Summary**

Date	Monday 07/23/12 0830 AM
Motivation	Extrinsic Motivation Style
Summary	Age 48, not digital native, self rate for competency 7, 6-15 years experience, external regulation =6.5, Interest/enjoyment =1.57, Perceived Choice =1.57
Setting for Familiar	outside a home in side yard, outside in shade at side of house at wooden table (distraction, teenage son says goodbye on way to work, we are distant from a quiet street), hot but lovely in shade with a breeze
Familiar System	using a macbook, a few years old in great shape, gmail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one else in lab so no distractions, window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

**Table 62: Lilly Familiar and Unfamiliar Transcripts**

time	LILLY [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Lilly: Familiar System</b>					
nt	GENERALLY: is a mix of learning and exploring					
nt	[gmail on safari]					
nt	[delete email, read email, compose email, uses suggestions]					
nt	attach a file is a stretch, doesn't use mac at work, doesn't use gmail, uses windows and work email the most					
b 8:11 e 8:51	(8:11) [doesn't know how to remove an attachment, would throw away the mail, discard was unfamiliar] <b>WORK-AROUND</b> me: "Do you see a checkbox?" (8:38) [directed her to send the email with checkbox beside attachment unchecked which I directed her to notice (8:51)]	1				
nt	[doesn't use save to drafts] "I don't like to do that." (8:55) participant: "That's the kind of thing that if I had sat here, alone, long enough I might have, uh, done that, unchecked that box, cuz, if I was really, I would have to really, really want to get rid of it, like, oh shoot, I really goofed on that. You know? But I would *probably* just discard the whole thing." (9:17)					

time	<b>LILLY [action] "quote" (time on video) analysis</b>	stumble	fall	quit		
nt	[ask about her feelings] participant: "ohhh, you know, that kind of feeling like, ohhh, why am I so stupid? How can I not know how to do this? I dread asking one of my kids because they have no patience." (9:41) <i>low self esteem</i>					
nt	<i>doesn't use folders, check spam, or empty trash, basically just does forwards, reply, compose, read, and delete, and can copy and paste.</i> participant: "On my PC I'm better at it." (12:40)					
nt	[went to word processing, pages in mac, normally would just do font size, don't know how to do undo, can only set font size and then type, but not select and then change font size, try to show her undo with command and Z] participant: "I don't know anything that has command in it" (15:47)					
nt	[prompt for feelings] "ohhh, it's just that feeling, that reminder that, it's not there all the time, but how inept I am at this." (16:09) me: "Wow. I feel so bad." "No. It's OK. It's just one small part of life. A tiny part." me: "I got to tell you, you are NOT inept. I'm sorry, it's not part of the test, but really, I can't help, I can't let you think you are, because look at you, you know three kinds of word processing on two different systems. Hello! That's not inept." (16:31) <i>low self esteem</i>					
nt	participant: "I think this year I will spend more time on this and I will get more used to it." (16:45) [tells story about writing a grant and having to ask for help.] "I had to ask for help and I don't like having to do that. Not from my kids. If I were at work, I would ask a student or a colleague." (17:15) <i>low self esteem</i>					
nt	[directed her back to gmail]					
	[success: directed to find trash, went to it right away (17:53)]					
	[success: directed to find address book, contacts 18:40]					
	[success: empty trash, did right away (8:20)]					

time	LILLY [action] "quote" (time on video) analysis					
b 18:50 e 20:35	(18:50) [ask her to go to contacts] Participant: "I never use it." (18:55) "I don't know where the address book is. I never use it. Because I don't need it. Because when I type in the first letter of the email then these things pop up for me." (19:40) <i>NOTE: study is on the cusp of change from using address book to not, makes study dated.</i> [hint that might be called contacts, looking down left side and across top but not in left corner.] "I do not know. I give up." (20:35) prompt for feelings, ask if she feels annoyed "Umm, no because I know that, I know you asked me to do something, I'm sorry if I disappointed you. But, [interrupting, "I'm not disappointed"] "I don't use the address book." (21:00) feels nothing because never uses the address book. "In fact I feel, like, um, I'm a little bit, smart not to get all worked up about something that I don't ever use." (21:25)	1	1	1		
nt	[teach her contacts]					
b 24:00 e 24:40	(23:40) [asked her to make a new group. She doesn't know what a group would be used for. Explain that it's for sending email to a list of people at once.] "I have actually been wanting to know how to do that." [starts looking at 24:00, saw where to do new group at 24:40]	1				
b 24:50 e 26:30	(24:50) [directed to add names to group] "Blllluuuh. Just so to let you know, I just said "bluh" because it is frustrating because now I have to like, figure this out. [big sigh]" (25:10) me: "Try it out, see what happens." (25:58) [didn't have the correct emails in her gmail so added her mom, herself, her son, but was hesitant because didn't want them to get any mail (26:30)] <i>MISUNDERSTANDING HOW LIST WORKS.</i> [I explained that nobody will get anything until send them an email]	1	1			
nt	<i>Teach her about drop down menus</i>					
b 27:00 e 27:45	(27:00) [in compose email did group with hint] me: "What do you usually do to write email?" (27:45)	1				
nt	[test over: taught her save draft and directed to go to drafts and then she did some moving because didn't know had anything in there and didn't want things in drafts. Worked on that until showed her how to search at 32:10]					
	<b>Lilly: Unfamiliar System</b>					
	[success: finding firefox, went to desktop icon, then to icon on top bar right away]					
	[success: went to gmail right away and logged in]					

time	LILLY [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
nt	[had her do regular stuff in gmail webmail] <i>all was easy</i>					
	[3:55 asked to go to gmx (logged off gmail first)] [success: went straight to gmx and success: read email, success: reply, success: compose (minutes 5:00 and 6:00)]					
nt	[7:52 explain there are many ways to do the exact same thing in computers.] "Why do they do that? It's confusing." (7:52)					
b 8:09 e 9:20	[8:09 direct to reply to email just sent, which requires that email has come and in this system that means clicking on "check mail"] me: "Is it here?" (8:14) [Not there yet.] me: "Can you see anything you can do to check to see where it is? Or to get it to come?" participant [incredulous]: "Are you tricking me?" (8:22) me: "Nope." [me: laughing] Participant [baffled]: "Well I don't know why it's not here" me explaining, "this is sort of 1990's. In the 90's you had to do this a lot." (8:37) [confirms that it's in sent folder] me hinting: "see anything about checking mail" "check mail" (9:20) "that's ridiculous." <i>modern meets old school</i>	1	1			
b 11:18 e 11:25	[11:18 go to obscurecompany] participant: "Who uses this?" [in disgusted tone] me: "computer science researchers." (11:25)					
	[success: went straight through login, success: did read, success: reply, success: found compose right away]					
b 15:05 e 16:29	(15:05) [composing and directed to save in sent folder, encouraged her to look around, in exploring, clicked on buttons and got popup warning asking if sure want to leave page, says "no", taught her about hover hint instead of clicking on buttons, (16:29) finds it after I hint that you just "mark it"]	1	1			
	[success: navigates through files to find attachment easily, doesn't know gif or png but I tell her they are picture files when I direct her to use.]					
b 17:55 e 18:12	[17:55 direct to remove attachment and says at first, would discard, but then sees check box on right to remove attachment. (18:12) ]	1				
b 19:45 e 21:23	[19:45 directed to find lotus symphony, went to "computer" icon on desktop first and looked around [wrong] 21:23 found it under applications]	1	1			
b 21:45 e 22:22	(21:45) [doing bold, tried without selecting, then with selecting, got it at 22:22. Rates it only mildly annoying, a 2] Participant: "I don't know, that's frustrating" (23:13)	1				
	(23:53) direct to save, success: did right away					

time	<i>LILLY [action] "quote" (time on video) analysis</i>	stumble	fall	quit	resist	persist
nt	[25:30 story of bad design in an email link for writing grant and how lost hours of work, discussion of select all and copy, then do lesson on copy, lesson pdf vs. doc]					

## Appendix S - Observation Notes: Lucy

Table 63: Lucy Detail Summary

Date	Saturday 07/21/12 1200 PM noon
Motivation	Extrinsic Motivation Style
Summary	Age 34, digital native (from U.K.), self rate for competency 6, 16-25 years experience, external regulation =6.0, Interest/enjoyment =3.0, Perceived Choice =1.57
Setting for Familiar	living room in a home, hot, no air conditioning, plenty of day light, sitting on couch with 2 1/2 year old daughter playing (distraction) and large dog (distraction)
Familiar System	using Acer netbook, windows 7, 2 years old, beat up, no "b" key, YAHOO mail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, xxx (distractions), window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

Table 64: Lucy Familiar and Unfamiliar Transcripts

time	LUCY [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Lucy: Familiar System</b>					
nt	<i>Generally: not great think aloud, had to keep asking her to think aloud, wants to stop quickly, not bother with figuring things out. Has her easy way and wants to stick to that. Not much trouble using the interface. List goofed her up and writing to the list. Has some strong opinions (23:00). No problems with gmx or obscurecompany</i>					
nt	[using YAHOO mail, Netbook doesn't have a "b" key because 2 year old daughter pulled it off. She also threw the netbook on the floor and the screen was all fuzzy but it got fixed. (2:01)] "I'm not attached to it at all. I'm not thinking, this is something wonderful I need to take care of." (2:11)					
nt	[yahoo read email, delete, reply, compose, attachment]					
nt	<i>[usually does computer at work (2 hours a day) and at home (only 5 minutes) (6:00)]</i>					
nt	[open office, [husband] can save as word doc, but she doesn't know how.] [can do bold, double space, italic, typing, save (8:30)]					

time	<i>LUCY [action] "quote" (time on video) analysis</i>	stumble	fall	quit	resist	persist
	[UNFAMILIAR IN yahoo, success: went to contacts OK , although never did that before]					
b 10:04 e 10:14	(10:04) [directed to make a group list.] [Participant saying I will just do my own thing] "I'll just do it when I send the email, I'll just type it in there" (10:10) [prompting that want her to make a group list instead.] "You want me to make a list?" "yes please" (10:14) [success: found new list right away]					
b 10:15 e 13:25	(10:15) [prompt her to put somebody in the new list and reads to me] Participant: "It says you can drag and drop. Manage your lists using the buttons above. [reading] import contacts. [reading more, then] So there's no way I can import contacts. I'm getting frustrated now. I'm DONE with my computer now. I would never do this." (10:43) "So you would quit at this point?" "I would just send the email. Actually I would just call someone. I would just pick up my phone and talk to them [instead of emailing]... if it's anything important, I'm going to call them" (11:23) [direct her to add her one contact to her list. looks around] "I do not know how to take [friend's name] into my list." me: "I know you don't, that's the point." (11:50) [Ask how high her frustration level is.] "I never become very annoyed with it, but I'm thinking it's stupid. Why would I do this? I guess if I was 16 years old with 50 friends and I wanted to invite everybody over to my house I would have a little party list. I could just send out. If I didn't have Facebook, see?" (12:34) [13:25 adds friend to her list. just over 3 minutes from 10:14 Ask her to rate her stress. "I'm not stressed. I would say annoyance. Probably about a 4. I'm thinking it's stupid. ... I'm not like losing it or anything. I'm still in a good mood, but I think it's stupid." (13:47)	1	1	1	1	3
b 16:00 e 18:00	(14:01) [direct her to write an email to her new list.] "Write an email to my list?" me: "yes, do you know how to do that?" "Absolutely not, but I'll figure it out. Hang on." (14:12) [looking for yahoo mail, 14:45 clicks compose message, but her computer froze up, so she closed the browser and reopened at 16:00 (RESTART TIME COUNT). Composing message at 16:07, then looking for her list on the left edge where folders are. Can find her friend to add but not her list. Looking all over for how to add list to the "to" field, looking at folders, applications.] [Prompted to share what she's thinking] "I'm thinking I have no idea how to find my list." (17:21) "I can't find my list" [I offer to stop test] "Do you give up?" participant agreeing] "I do." 18:00. <i>WANTS TO DO IT HERSELF</i>	1	1			

time	<i>LUCY [action] "quote" (time on video) analysis</i>	stumble	fall	quit		
nt	[ <i>Discussing Attitude: Give her the answer at 18:20</i> ] Participant: "But it doesn't tell me anywhere that that's what I need to do." me: "I know, but you didn't go Google it either, or look at the help." Participant: "Why would I do that?" me: "Tell me, why would you not do that?" Participant "Because it's going to have 50 pages of text that I have no desire whatsoever to read about something that I use rarely, and I don't really care to know. I don't read instruction manuals, generally. And why would I Google it? I wouldn't, because it's a bunch of teenagers who can't spell right, who don't use punctuation, all lower case." (18:51) [we went to Google it just to see. Found instructions and kept both browser tabs open, went back and forth between them following the steps. Got messed up when clicked on "import contacts" instead of "compose message" button. So help didn't help much.]					
nt	[prompted to share what she's feeling] "I'm feeling that it's almost pointless to have all that farting around to create a list when yahoo's going to have all my contacts in there and I don't have that many and I can just type the first letter of their name. Their email address is going to come up anyway. And I'm thinking this is definitely a tool for a younger generation, the whole thing is for teenagers." (21:55)					
nt	[not test anymore, <i>discussing attitude</i> : I explain lots of community organizing reasons to use lists, like playgroup or soccer team or family] Participant: "Maybe people who aren't as busy as me. I've got my way." (23:00) <i>when really the list is a time saver, not time waster.</i>					
	<b>Lucy: Unfamiliar System</b>					
	[success: went straight to firefox]					
nt	[proficiency: went straight to her email at yahoo, thought she knew her password, but it wasn't correct (3:30)]					
	[success: went to gmx right away, success: did compose, success: read, success: attachment, success: remove attachment, success: send, success: open attachment, success: delete email (7:09)]					
	[success: went to obscurecompany easily, success: inbox, success: read, success: reply, success: compose, success: finding save to sent right away on the right.]					
b 15:00 e 16:30	(15:00) [ looking for lotus symphony ] me: "You've already passed it" (16:21) [ finds it (16:30)]	1	1			

time	<b>LUCY [action] "quote" (time on video) analysis</b>					
	[18:30 success: does all in lotus ok. I comment on how I can't trip her up. Ask if she can do a slide show like she would do at work. success: She finds slides right away. success: Makes slides no problem.]					
	[Couldn't stump her in Linux]					

## Appendix T - Observation Notes: Marsha

Table 65: Marsha Detail Summary

Date	Sunday 08/19/12 1330 PM
Motivation	Extrinsic Motivation Style
Summary	Age 69, not digital native, self rate for competency 3 , peer self rate for competency 6, experience more than 25, external regulation =4.5, Interest/enjoyment =2.57, Perceived Choice =2.43
Setting for Familiar	Rehki Hall 112 Linux computer lab, clear day, cool, no others in lab, no distractions, overhead lights on
Familiar System	using mac laptop with large screen, great shape, copper.net webmail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one else in lab so no distractions, window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

Table 66: Marsha Familiar and Unfamiliar Transcripts

time	MARSHA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Marsha: Familiar System</b>					
nt	<i>GENERALLY: has a lot of skill in what she uses but very resistant to change, paranoid? (e.g. google calendar, logging out 26:00), serious privacy concerns (e.g. not using quicken while online at library 25:00), opinionated (e.g. tables in word, 31:00)</i>					
nt	<i>crusading for the "average person" (34:00 regarding word being too fancy compared to pages)</i>					
nt	<i>grateful to learn footer/header 49:00, complaining about outlines being different now. Maybe I should have said "list" for numbers. She is stuck in thinking "outline" rather than ordered list. Google says how to do and is similar to word, so not hard. Spend 7 minutes (48 - 55) trying to figure out numbers and gave up). 3 1/2 minutes to find lotus symphony and seems annoyed.</i>					
nt	[using mac laptop in Rekhi 112]					
nt	[getting online with direction and my login to MTU]					
nt	[uses webmail that is obscure = copper.net, read, forward, mail to self, folders, address book, can't find anything she doesn't already do]					
nt	[16:40 was looking at forwarding, got to pop account requirement and went back, explained how has husband do things then.]					
	(17:30) [direct her to make a signature] "I don't know how." me: "I know, that's the point". [success: She found it right away and didn't want to change it from what her husband had done.]					

time	MARSHA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
b 18:10 e 20:18	(18:10 ) [write an email and add the signature. can't figure out how, so hovers over the buttons for rich text, ask her what she's doing] "Ok, I'm cruising over the little icons that are here and luckily you put your arrow on them and it tells what it is, because they're totally unrecognizable otherwise." (18:58) [20:18 sets options to add signature to all messages, and does compose and signature is visibly there. ]	1	1			
nt	[21:00 had her go to gmail and wasn't sure of her password, tried twice, then switched to a different account. (Don't count in test)]					
nt	(22:40) is in another username gmail. Has a popup ad with a video, under her breath] "now how the f*** do you close this stuff?" (22:50) [ask her if she's frustrated] "I don't like popup windows that want me to do things that it's impossible for me to do with dial up. It just is very annoying. Yes. And then I can never figure out how to close them. See this is the newer gmail and they have different icons and different instructions and stuff." (23:20) Prompt for feelings, "Mildly frustrated, 4." (23:38)					
nt	[knows how to do contacts and lists]					
nt	[DISCUSSING ATTITUDE me: I comment on how high her basic knowledge is and how far past other people and suggest that only when software changes does she have a problem.] Participant: "Yes, I'm always annoyed when they change it around. I use Quicken that's five years old because I WILL NOT upgrade. It constantly wants me to upgrade and I WILL NOT upgrade. I don't use Quicken on this machine at the library, I only use it on the home machine because I feel it's safe because it's household stuff plus there's investments and things, and, um, I CAN'T upgrade at home, you have to go to the library to upgrade and [husband's name] does it... but not my Quicken." (25:20) [I ask her about what happens when machine dies and HAS to learn new, she says I've done that but I'm waiting and then I'll miss some updates at least. Complains about how it changes and upsets her memory actions of entering data to quicken.]					

time	MARSHA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
nt	[DISCUSSING ATTITUDE 26:32 doesn't know how to use tasks, she suggests tasks and suggests what it's for by guessing. Then comments on how [husband's name] uses google calendar] "I never use the google calendar. I'm not telling them what I'm doing every day. Forget that!" (26:50) SECURITY <i>little bit weird to include this as resist, but she's resisting usual and customary use of calendar, not that I asked her to use calendar, but her attitude is helpful to understand. Won't count as resist because not related to me directing her</i>					
nt	DISCUSSING ATTITUDE Participant: "I like to sign out, because then they, THEORETICALLY, aren't watching me, but you know they are because advertisements for something I just looked at turn up on the *weirdest* pages." (27:31) SECURITY					
nt	[direct to move on to word processing, she explains that she has the word processor icon on her bottom bar and she put it there herself and she gets help from her son who is good at mac. Her husband didn't have a mac and now he does but he's not as good at it. (28:40)]					
nt	[uses copy and paste (key combinations and icon button), bold, columns.					
	DISCUSSING ATTITUDE Participant explains she doesn't do table very much and explains story of how hates tables in word and when gets one like a roster that she has to maintain, she'll erase everything in it and put her own stuff in instead of trying to format it or add lines because word is so bad (31:00)] design					
nt	[Talks about how much formatting there is now] Participant: "There's so much more formatting now than there used to be. It used to be really easy. You know. What do you want the margins to be. Now, there's millions of things, headers and footers and rows and, I mean, column width, geez." (31:40) "I think pages is a lot more intuitive for me." (31:55)					
b 33:00 e 33:22	(33:00) [directed to add a row, doesn't know how in pages, but knows how in word, found a way in the side along dialog (33:22)]	1				

time	MARSHA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
nt	[DISCUSSING ATTITUDE I ask how she's feeling and remark that she seems passionate about it, that she's mad at word] Participant: "Passionate?" me: "You sound passionately mad at word." "I am. I'm not MAD at them, I'm frustrated with them. I'm sure they're putting features into it that people in offices or high pressure marketing firms use, but they're leaving out the average person. And maybe that's what open office is for. I don't know." (34:12) OPINION for helping the "average person" <i>social justice</i>					
nt	36:47 me: "I'm sad because you're breaking my study, you're able to do everything." Participant: "but see pages is just easy" (37:00) [she's exploring to find what she doesn't know and gets two connected boxes on the screen and keeps playing with a variety of stuff.] "I don't like fancy stuff much." (38:10) [and continues exploring Pages and uses "outline" and likes it (39:35) and never used it before.] <i>TEST HIJACKING, SHE'S IN CHARGE confident and high literacy</i>					
	[Then complains about how people send documents with indents and she doesn't know how to fix it or get rid of it and it's really annoying but in pages she would know how. (40:00)]					
nt	[teach: explain toggle to her]					
nt	[She explores shapes, headers and footers. ]					
b 42:30 e 45:12	( 42:30) [direct her to do a header/footer on page, explores a bit] Participant: "headers and footers I usually have to look up." [ask how she looks it up] Participant: "Well, not through help" [I ask why not] "Because most of the help is online." (43:11) me: "Ok, so how do you do it?" [explains that some of help is available without being online. we are online though, I point out.] [She looks at help and starts reading, click this, click that, do this, do that in an annoyed tone] Participant: "I mean, I'm not going to fool with that. You want me to figure out how to do it? I can't memorize that. So what I have to do is I have to make this go down, minimize it, I clicked on the yellow circle, and then I TRY to remember what the first, sometimes I write it down. And then I try to remember what the first thing was, and I can't." [goes back to just checking different menus and buttons instead of re-opening her help that is minimized, although she found the wrong help section, is about "facing pages" instead of basic header/footer. (44:12)] [(45:12) point out to her that she's already put the header on there. ]	1	1		1	

time	MARSHA [action] "quote" (time on video) analysis	stumble	fall	quit		
b 45:30 e 47:00	(45:30) [She types text, "jan to june" on first page and wants second page to automatically say "july to dec". Ask her to do page numbers instead. They are already on the footer even though she didn't do anything. Then looks for how to add them anyway (47:00)] 48:30 "Oh. That's really nice to know. Thanks for helping me learn that. I've been trying to do that for ages."	1	1			
b 49:00 e 55:08	(49:00) [ask her to do numbering of paragraphs. Doesn't know how to do numbering, looks around, happy to find "strike through" by accident, trying to understand how is in "table" mode, can do bullets but not numbers, adds a comment instead, another table] "Boy this is pretty powerful." (52:50) [decides wants a new document instead.] [53:00 complains about how new document in pages has default of header/footer and even though can easily uncheck them, wants it to be default that could check if wants so doesn't have to bother unchecking. sounds angry] "I would have it without headers and footers because it takes up space" [more complaining about it]. "Because I'm unchecking it for 95% of the time instead of checking it for 5%" [I encourage her to google how to set defaults next time she's in library] "Yeah, right. I usually can't find it. If I'm at the library, I can't find it usually." (53:42) [54:00 does an outline and does a heading, then puts two things under each heading] "But, you need two of them under every one, so I have to put at least two." me: "Why?" "Well, technically, an outline needs two things. If it's only one thing, it should be in the header. That's what I was taught anyway in English. [pause] You didn't know that?" (54:25) Ask her why it is outline and not numbering.] (55:08) "Well, I cannot figure out how to do that. Now that's something that I cannot do."	1	1	1		6
nt	[DISCUSSING ATTITUDE ask how she's feeling] "Well, I'm not really that frustrated because I don't have to do this." prompt for level. "Four I guess. I mean I know I don't have to do this, but I suppose if I was really having to try to make an outline, I would be really frustrated because I can't find how to do what I learned as a child years ago, which of course is totally wrong now because everything's changed. Grammar's changed. Spelling's changed. "Night" is no longer spelled n-i-g-h-t, it's spelled n-i-t-e, and the way I learned to do outlines is not making itself apparent" (56:00) <i>WONDER IF SHE HAS MISUNDERSTANDING OF USING NUMBERS!?</i> Maybe should have said do a list					

time	<b>MARSHA [action] "quote" (time on video) analysis</b>					
	<b>Marsha: Unfamiliar System</b>					
b 0:20 e 0:48	[( 0:20) looking for browser, looking at desktop, skype, finds it at 0:48 (quick)]	1				
	[success: goes straight to gmx.com]					
b 2:12 e 4:07	[(2:12) sees where to put username and password, made a typo first try, then second try counted the letters in password before clicked login and then corrected it, logged in (4:07)] OLD SCHOOL when couldn't do more than 3 attempts	1	1			
	[success: read an email OK, success: delete ok, success: sees compose right away, uses suggested name, success: sees send right away]					
b 5:35 e 7:22	(5:35) Me: "Is it [the email just sent] here yet?" Participant: "Doesn't look like it" "How can you make it come?" "Well, I just have to wait for it to go through the email system." [she's looking around as I prompt her] Participant: "This is a very busy screen, and the letters are all the same, there's no differentiation, a few things are in bold, but that's it. The blue is hard to read, so I think this is not as good as my email thing." (6:40) (6:50) me: "Can you see anything for checking the mail?" [Tried "newest first", prompt again and she says it's not actually newest first because of the dates. Prompt if she sees anything for checking the mail.] Participant: "Yeah. It says "check mail". So do you mean that you have to go and check the mail, it doesn't just automatically show if something comes in while you're online?" (7:22) [still not showing, prompt her to check if she's at the top of the scroll bar, it was hidden] "Not a good design." (7:46)	1	1		1	
	[success: reply ok, success: attachment ok, success: send ok, success: read ok, success: inbox ok. success: look at attachment ok. Directed to see attachment bigger, success: did right click.] "If I don't know what to do, I always do right click. Because, I mean, it's never on the screen the things that are in right click. So that's the secret place." (9:18)					
b 9:40 e 11:44	(9:40) [go to obscurecompany email, starts to type it in search. I ask her why she's doing that when she used the address bar for gmx.com and I provided the address. She is surprised that address bar and search are different] Participant: "Where's the address bar?... so this is the address bar and that's the search bar? [surprised] Well I don't know the difference. I just happened to put it in the address bar" (10:40) [Researcher taught address bar] [going to obscurecompany.com] Participant: "Alright, so now you're saying I can just press enter and it will take me to that website. Oh, cool!" (11:44)	1	1			

time	MARSHA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
nt	"I'm getting tired now. I don't like working on computers very much." (11:48)					
	[success: found compose easily, prompted her to look up when typing name and she saw the suggestion (13:00)]					
	[Email sent to self showed up without having to go look for it] Participant: "This is WAY better than the first one [gmx.com]" (14:00)					
b 15:00 e 18:37	(15:00) [ask her to go to lotus symphony, looking around] "I don't know where to find applications. This is not in alpha order, so it's really hard to find anything." (15:43) [prompt for her feelings] "Bemused. There's really nothing here to help me find it." (15:56) [give her hint that she's totally cold] "Can I search somewhere and find it?" (16:30) [Sounds annoyed at 16:58] "See, on mine, there's a "mycomputer" and it gives an outline of everything that's there." (16:44) [hint again that she's totally cold, she's on C:\ drive, 17:00] "I have no idea what thing to click on." (17:06) [sounds annoyed, I remind her to find an application for lotus symphony] "I know that. But I don't see anything that says that here. And I don't see anything that gives me a view of the inside of the computer." (17:18) [17:35 sees "applications" across the top, notes that it's not alphabetized in there either. Asks what the purpose of lotus symphony is, I answer, "word processing". She looks over everything in applications and doesn't find it. (18:30), then does find it (18:37)]	1	1		1	3
nt	(19:30) [Ask her to do a bold word. Does a work around. I teach her how to do first three rows numbered and toggle it.] "Oh that's nice. I never saw anything like that." (20:14)					

## Appendix U - Observation Notes: Mary Ann

Table 67: Mary Ann Detail Summary

Date	Wednesday 07/25/12 0900 AM
Motivation	Extrinsic Motivation Style
Summary	Age 60, not digital native, self rate for competency 4, 16-25 years experience, external regulation =6.5, Interest/enjoyment =3.71, Perceived Choice =2.57
Setting for Familiar	professional office in Walker at MTU Walker professional office with separate computer desk on first floor in large window with view of trees, steady rain, gray sky, bright overhead light
Familiar System	using windows PC desktop with Windows XP, older than 4 years old, big screen, gmail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one else in lab so no distractions, window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

Table 68: Mary Ann Familiar and Unfamiliar Transcripts

time	MARY ANN [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Mary Ann: Familiar System</b>					
b 9:20 e 9:40	(9:20) me: "can you find labels?" [ she found labels at 9:40]	1				
	(9:59) me: "make a new label" [success: did it right away]					
b 10:12 e 11:26	[direct her to apply a label to an email (10:12) and at (11:26) she applied label	1	1			
nt	"I guess I could tell you that I'm feeling a little nervous because I don't want to lose the correspondence but I'm going to take a chance." (11:32) [applying a file label in gmail] me: "Well, it will still search for it in all your mailboxes" [she uses "question box" for magnifying glass 12:00]					
b 13:50 e 14:20	(13:50) direct to move email to label, did it at (14:20)	1				
b 15:40 e 16:25	[15:40 ask her to go to contacts.] Participant: "Hmm. I don't know where that is. ... Since I've never created contacts in google, I don't know why they'd be in there to begin with." (15:54) me: "I can see it." (16:16) [she found it at 16:25]	1				
b 17:06 e 17:14	(17:06) [doing new group list. After naming the group, asked] Participant: "do "ok"?" me: "I'm not telling you." [success: she found at 17:14]					

time	MARY ANN [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
b 17:52 e 18:00	(17:52) [ <i>She was basically one step ahead of the directions.</i> ] Participant: "So now I have to figure out how to put their names in there." [success: right away saw it (18:00)] Participant: "I'm going to go up here to this little person that says "add"" me: "how did you know to do that?" "weel-lll, the plus sign indicated to me that. This is very exciting. This is going to be very helpful" (18:20) <i>Maybe for this item could argue she is intrinsically motivated because really wants it to work.</i>					
b 21:28 e 22:10	[21:28 directed her to write an email to the entire group, looked for compose in the contacts and then at other options in the contacts. 22:10 she found a way I had no idea about, which is select all in list, then click button top center to send mail and opened compose in a new window]	1				
b 22:45 e 23:28	(22:45) [direct her to go to drafts and looks around contacts, at 23:28 finds drafts] "Maybe I'll just go up to mail, yep, that got me back up to here and drafts is over here" (23:40)	1				
b 23:43 e 27:00	(23:43) [ask to send new email to group (24:40) doesn't know to just type someone's name in "to" field, uses the gmail search if doesn't know someone's email.] me: "how are you feeling?" "um, well, I just don't know what to do. I don't feel too stressed about it. It's just confusing to me where the group... oh here, here, in this black box there's groups" 25:45 [google plus, so that's not correct] [gave her some hints] me: "go back to more basic ways to do an email" [and 27:00 she typed the name right into the "to" field and found the group] "Oh, very nice! So there it is... I forgot that I typed somebody's name and it would give me the email. I think because I was caught up in trying to do this" (27:27)	1	1			
nt	"The way I work that way is, I have to actually try it" 27:36					
b 28:50 e 29:35	(28:50) [directing her to delete all her spam at once, deleted a page at once. Did check all first and then "delete forever" button became visible.] Participant: "All right, here I go. Is that OK with you?" 29:35 <i>CHECKING IF BEHAVIOR IS OK</i>	1				
b 29:35 e 29:37	(29:35) me: "There is another place to delete all" (29:37) [she did it right away]					
b 36:20 e 37:34	(36:20) [ went to ms word, ask her to do bullets.] me: "you flew right over it...way earlier you flew over it. it's obvious, when you see it, it's obvious" (37:10). participant: "oh, THERE it is, look at that" [found it at 37:34]	1	1			

time	MARY ANN [action] “quote” (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	<b>Mary Ann: Unfamiliar System</b>					
nt	“what I realized when we were sitting together and I learned so much from your asking me to look for things that I can do more than I think I can, but that, there are two reasons why I don’t. One is it’s, you know, a little bit more scary to do things on your own and you were sitting there so I knew if I screwed something up you would help me fix it, but more importantly, when I’m at work, I’m so busy, that I don’t have time to play around. I never have a free minute to just sit and try to figure something out. I’ve got so many different things going on at one time, I always have to do things in the fastest way possible, which doesn’t allow exploration.” (1:06) <i>WHY PEOPLE DON’T EXPLORE</i>					
	[went straight to mozilla, I comment to her that went straight to it] Participant: “Well I know that, but we’re in your website [sic]” 2:22 <i>because she is using computer that I logged on to, this is a misunderstand</i>					
nt	[distraction of another student coming in and talking to me very briefly]					
b 3:45 e 4:41	(3:45) [how to get to gmx webmail, paused and thought before going to address bar and starting to erase, but expected it to go to “google” screen and said] “maybe I can just type in the address here” <i>NOVICE not knowing can use address bar.</i> [got to gmx at 4:41]	1				
	[saw where to type gmx user name and password right away and used tab between fields, logged in on first try, so went straight through.]					
b 6:14 e 6:37	[for compose, looked in upper left but not high enough to see compose for first few seconds from 6:14 to 6:33] “I’m looking for something like compose. Oh, there it is. In the most obvious spot” 6:37	1				
	[success: found attachment right away]					
b 7:22 e 7:51	(7:22) [hesitating in file browser after select a file to add] “I clicked on it. I have to figure out how to add it. Sometimes it works on “open”... the “add” isn’t lit up” (7:45) [“add” is a button on left, unrelated, then clicks “open” and it works. (7:51)]	1				
b 7:53 e 8:17	(7:53) [direct to remove attachment, tried to open it first and then said] “that won’t work”, [then did right click on attachment and remove.] (8:17)	1				

time	MARY ANN [action] "quote" (time on video) analysis	stumble	fall	quit		
nt	<i>generally, has a lot more skills at figuring things out than gives self credit for. Find a way to do the task with few false tries. Seems to be using good problem solving, like trying to open attachment to remove it and then realizing that is wrong path. 3-4 times found ways to do things that were different from everyone else: send mail to group from contacts</i>					
nt	[going to obscurecompany webmail] "I guess I would do it up in this thing here" [address bar]					
nt	"It's a very weird address" (10:56)					
	I'm looking at the bar for the pen thing" (13:40) [found compose email right away.]					
b 16:16 e 17:50	(16:16) [directed to find where "save to sent folder" is] "it doesn't seem like it should be that hard to find it" 17:40 me: "I still can see it" Participant: ""Save copy to sent folder" right there." (17:50) me: "Am I mean or what?" [laughing] "No, I'm impressed that I found it" (17:56)	1	1			
nt	[Looking for something to attach, pulled the scroll bar down past all the many many folders. When asked why scrolled, said] Participant: "Just to see if there's anything that's not a folder" 18:20					
b 19:15 e 24:21	[19:15 finding lotus word took her long time. First wanted to go to mozilla. Then tried file explorer. looked at lots of stuff there] me: "maybe you're barking up the wrong tree" [by 24:21 found it on her own after systematically trying different things, but not just skimming over the same stuff or trying the same stuff over and over.]	1	1			5
b 26:29 e 27:55	[26:29 looking to see if she saved her lotus file on the desktop] me: "how would you get to desktop?" "I would probably have to shut this. Well that's probably what I would do" 26:42 me: "Do you ever shrink programs?" "No. That's a minimize thing, isn't it? I don't know how to do that." [directed her to find the minimize] me: "I can see it right now, cold, cold, cold, cold, coooold, hot" Participant: "It's right here. But I'm not on the thing, I'm on the page right here" me: "Do it" [got it at 27:55]	1	1			

time	MARY ANN [action] "quote" (time on video) analysis					
nt	me: "what kinds of feelings did you have in this Linux environment?" "Hmm. I guess I felt a little alienated, not terribly, I wasn't afraid, I just, um, it was just different, that's all. It's so you're, it's not as comfortable, and it's not as familiar. It's a little bit alienating although there were certain things that I found that were similar enough so I recognized how to do it. I guess I was kind of surprised that I could do, I mean I think I pretty much was able to do what I did on my own the things I couldn't do were things I don't know how to do on my own machine anyway." (30:29) [e.g. like the minimize thing]					
nt	[asked if she felt afraid] Participant: "No, not afraid, because I'm with you and I'm not losing something important that I've created. I was a little worried about screwing your things up, but I figured you wouldn't let me do that, so, I guess there's a trust level going on between the two of us" (31:15)					
nt	me: "So, if you didn't know me, it would be different" Participant: "I think so" (31:23) "I don't know if it would be entirely different. I figure if it, the thing that makes it less scary is that it's not something I'm responsible for that I use for work. It's *just* a test. So it doesn't have that element of importance to me.(31:40) ... it's more scary when it's something really valuable that you don't want to lose" (32:10)					

## Appendix V - Observation Notes: Mike

Table 69: Mike Detail Summary

Date	Friday 08/02/12 1930 PM
Motivation	Intrinsic Motivation Style
Summary	Age 74, not digital native, self rate for competency 4, peer self rate for competency 6, 16-25 years experience, external regulation =2.75, Interest/enjoyment =4.14, Perceived Choice =4.14
Setting for Familiar	home bedroom office in a home, hot night with fans going and crowded with bedroom and office things (distractions) and windows open
Familiar System	using HP desktop with windows vista, 3-4 years old, ok shape, gmail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one else in lab so no distractions, window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

Table 70: Mike Familiar and Unfamiliar Transcript

time	MIKE [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	<b>Mike: Familiar System</b>					
nt	<p>[Participant comments: Have to click over here and normally it used to have tech mail over here but now I have to do these two things (not a quote), generally dislikes things to change, prefers old mspaint, prefers vista, prefers old word processing from 1990's]</p> <p><i>in general: able to do things and prefers to think of work around to doing something unfamiliar</i></p> <p><i>interested in usability and unhappy with current state of computers, changing to new and you have to learn it.</i></p> <p><i>persevering, e.g. when attachment didn't show up in explorer in familiar gmail, kept trying different ways and e.g. delete page of spam, first solution, then saw how to delete all and did that</i></p> <p><i>resourceful, kept trying and was willing to try all of it.</i></p> <p><i>Did not give up on send email to group, tried things multiple times and made up scenario to fit it had to keep trying.</i></p>					

time	MIKE [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
b 9:39 e 10:49	[9:39, looking for his address book in gmail, check all over methodically, settings, more, folders, then behind the mail box in top left] "what other kind of mail stuff...contacts might have something, I don't know...ok, there's somebody. Why are they there? I'm not sure what that bunch of people is." 10:49 [I interrupt to tell him he's just found his address book.]	1	1			
	[Ask to make email group list, success: did it right away. Then ask to add people to it, success: did it right away.]					
b 12:26 e see below	(12:26 ) Me: "let's write an email to that list" [Send email to list, trying to do from contacts] Participant: "why am I doing this, this is kind of a waste. I'm not getting anywhere." (13:10) Participant: "I'm feeling like I don't know where we would do that but I'll go to "more" and see what they say, see if they have any suggestions." 14:12 I asked, "do you have any frustrations?" "of course!" "tell me" "there's no obvious place yet that I see to email the whole group" 14:24 [still in contacts] Me: "how frustrated are you?" "If I REALLY needed to do it, I would be very frustrated, like 8, I'm not that frustrated now because the world won't end if I don't get it done. So it's about a 3 right now" 14:49 "maybe I could write an email to xxx or something [looking around by top left] but there's no place to write an email [still in contacts]" 15:39 [Still persevering at trying things on the left side of contacts, clicking and rejecting (think aloud the whole time) including privacy policy, right click on plain white area even.] [continued]	1	1		1	14
	[still trying to write email to list] Participant: "I can give up now if you'd rather go on to something or we could keep playing with this because I HAVE to do this and there's 600 people so I don't want to do them one by one and it needs to be done in the next hour" [making up scenario for why would bother to keep trying]. Participant: "What I might do is go to google and say "how to do you do group blah blah blah"" (17:59, 5 + minutes later) my reply, "feel free, do that" [then he closed the browser, not shrink, closed and opened browser again] [continued]			1		

time	MIKE [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	[still trying to write email to list] Participant: "go to google here, and write a little question and get one of those groups where nobody really knows ANYTHING" [18:26 did "group email how" and selected search result for "windows Microsoft" as he explains] "because I have windows Microsoft" 19:40 "well now I'm remembering tech has a system, other people have their own systems, so I'm on a tech gmail thing which doesn't look like my regular gmail thing so maybe I better put gmail in this business just in case" 20:15 <i>MISUNDERSTANDING [continued]</i>					
	[still trying to write email to list] me hinting: "I gotta say I don't understand why you're ignoring the first one" 22:46, [clicks something in results from google] me: "that's not the first one" [clicks back] Participant: "the first? Oh, ok" [gmail help "how to send email to a group contact"] [continued]					
	[still trying to write email to list] [after reading directions, shrank browser and opened another browser to go back into gmail, when asked him about it] Participant: "Yep, sometimes I close things and sometimes I don't. I often wish I hadn't closed things" 23:38 [continued]					
	[still trying to write email to list] [24:13 back in email] "where did that thing go with groups? Hmmm" me: "I'm here if you give up" 24:41 <i>NOVICE, already found contacts and then can't find it again [continued]</i>					
	[still trying to write email to list] [can't find contacts, looks over folders and such, then goes back to directions from google help, reads aloud] Participant: "go to gmail, then go to contacts" [opens gmail window and says] "where the hell are contacts?" 25:03 [continued]					
	[still trying to write email to list] 25:28 me: "I can see one and one is behind an arrow" [so he starts looking at arrows as I say] "cold"... "cold"... "cold" ... "really cold".. "so cold" 25:34 ... "hot!" "cold" "almost... hot!" "hot!" "almost" "hot" 25:42 [clicks on google plus command from the black ribbon at the top, not contacts] me: "Noooooooooooo" Participant: "it said groups! It's groups" [laughing] "Then it says "contacts" after" [clicks on contacts in black ribbon at top] me: "Yeahhhhhh!" 26:05 [continued]					

time	MIKE [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
e 26:23	[still trying to write email to list] [then starts to select all but not in the group, which I point out, then he goes to group, select all, and button appears to send email which he does, 26:23 almost exactly 14 minutes after being asked to do it.]					
b 30:51 e 31:26	(30:51) [ask him to do a table, does "insert table" from "borders" menu (31:26) has no rows or columns so not what looking for]	1				
b 31:37 e 35:51	(31:37) [ask him to do table with rows. at 33:40 he wants to do tabs for table and will do anything to do work around for table, does not want to figure out table with rows and columns, just keeps making tabs and returns and saying it is columns and rows] Participant: "I can MAKE a thing with four columns and two rows" (34:00) [he means make with returns and tabs, not a table. some arguing between us, me laughing] me; "This is very entertaining... not that I would ever laugh at a test subject or anything" (34:50) [he would NOT do it, so I stopped the test (35:17) and offered to show him how to make a table. He refused my offer but I insisted since it is ONE command.]	1	1		1	4
nt	Me: "how do you feel" "fine" "you feel fine, really?" [him laughing] me: "all right" Participant: "Why not?" None of this is real.... It doesn't really matter to me if I did it or not, but there are times when I want to do something and I get REALLY FURIOUS" (37:16) "what if you had to do this?" "it would be very very frustrating, way up there" "would you have thrown your computer out the window yet?" "I haven't done that yet, but sometimes I beat on the desk or something"					
	<b>Mike: Unfamiliar System</b>					
b 0:30 e 1:10	0:30 me: "please find the internet" Participant: "there's skype which is sort of internet-y but not really, and I see something that says "browse the web" [hover hint] (1:10)	1				
b 1:40 e 3:56	[directed to find gmail in browser, find gmail login but doesn't know password so we stopped there.]	1	1			
nt	<i>Got hung up in address bar with enter key confused with backspace and delete key and talking about how bad mac is that you can't delete</i>					

time	MIKE [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit		
b 6:50 e 9:30	(6:50) [Direct him to sign in to GMX, quoting my directions back to me] "you want me to sign up" [when in GMX, clicked on "sign up" instead of putting sign in stuff in boxes] me: "No, you're going to log in" (7:03) "I forget what I heard two minutes ago, which was login not create a new account." (7:20) <i>CONFUSION and TIRED</i> (7:47) [is back to login screen] me: "It's in plain sight." (9:15) [finally gets it at 9:30 The login box and password at gray inside white box and he can't see it, but denies having color blindness or other vision issues. Long delay] Participant: "I can look at things and not see it...I saw that stuff [the text box] but I didn't see THAT" (9:30) me: "so even though the text boxes said what to do you ignored them because you didn't see the button?" "yeah... right" <i>INTERESTING USABILITY THING</i>	1	1			
nt	Participant: "If I'm in a game, it doesn't matter. I mean it matters a little bit, but not like most people who needed to do it. There's not the same kind of pressure. You annoy me sitting here and interrupting but it's not frustrating. I don't feel under pressure. I'm 74, I don't give a [expletive]." (10:56)					
	[success: went straight to compose email in gmx, "was that nice and obvious?" "Yes but that doesn't mean I'm going to see it every time" (13:10)					
	[success: read, success: compose, success: add attachment, success: enlarge attachment, success: reply, all went smoothly, found the buttons within seconds.]					
nt	(18:55) [Typing address for obscure company was difficult for him, used address bar but was confused about "http" or not. I taught him you don't need "http" in modern browsers. gets to obscure company address by 20:00]					
	[success: saw the input for user and pw right away, immediately, asked him about it, and he said] "because it's right there" [pointing to the left top] 21:30					
b 23:00 e 24:58	(23:00) [direct him to compose email.] Participant: "if I'm writing to this address, then I could just reply to this" 24:00 me: "no, we're doing a new email, no workarounds" [Gets it done at 24:58]	1	1			

<b>time</b>	<b>MIKE [action] “quote” (time on video) <i>analysis</i></b>					
nt	[when typing the “to” address, the suggested address is just below but no color differentiation and looks like it is IN the “cc” field because it is covering the 'cc' field, which he notices, but it is actually the suggested “to” address, not the “cc” field (design confusion) 25:15					
nt	me: “what do you think of their design” “well any of these, just because it's sort of a little funny to find NOW, doesn't mean if I got used to it I would feel mad about it. There's a lot of things I used to hate when I got started, I kind of like Vista for example and a lot of people hate it. I'm used to it now, sooo... I'm sure there's a lot of things that are a lot better that I could use for lots of things that I don't want to do, you know, like the new paint, I'm so happy with the old paint ” (27:30)					

## Appendix W - Observation Notes: Miranda

Table 71: Miranda Detail Summary

Date	Thursday 07/26/12 1000 AM
Motivation	Extrinsic Motivation Style
Summary	Age 58, not digital native, self rate for competency 4, 6-15 years experience, external regulation =4.5, Interest/enjoyment =2.0, Perceived Choice =3.14
Setting for Familiar	Rehki Hall 112 Linux computer lab, cloudy rain, overhead light, no one in lab (distractions)
Familiar System	using HP laptop, windows 7, 3 years old, bit worn out, gmail with "alpha.com" email
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one else in lab so no distractions, window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

Table 72: Miranda Familiar and Unfamiliar Transcripts

time	MIRANDA [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	<b>Miranda: Familiar System</b>					
nt	<i>In General: skills in Linux, gmx, obscurecompany, and lotus were not hesitating much and moved easily through tasks.</i>					
nt	<i>Doing unfamiliar tasks in familiar environment, had lots of stumbling, gave up, was very annoyed. obscurecompany.com inbox broke with Miranda and had no messages and said "searching for new mail" but I directed to go to trash and back to see if reset itself, Miranda suggested it was bad design that couldn't see other emails while waiting for it to get mail</i>					
b 4:55 e 5:15	[never sent an email to herself, did this in gmail familiar so had something to reply to, never before] 4:55 "this is very stressful" at minute 5:15, [gave it a four rating for stress 5:27]	1				
nt	me: "do you use folders?" Participant: "[husband] set some up for me"... "[husband] says I should" (7:49)					
	[9:40 uses contacts and can find OK]					
b 9:50 e 11:18	[9:50 making group list, got it by 11:18]	1	1			

time	MIRANDA [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
b 11:19 e 12:50	[11:19 add names to group. by 12:50 had added two names]	1	1			
b 13:00 e 15:10	[13:00 putting mail into folders] "I don't know what I'm doing. This is why I don't put anything in there because it seems stupid and why should I waste my time staring at the computer, when I could just leave it there and let it build up to 1200" [pointing to email message count at top right (13:54). She kept trying, success at 15:10	1	1		1	
b 15:40 e 17:07	15:40 me: "Let's look at your spam" [told her it was part of mail, rejected "more" which is where spam is] me hinting: "you sure?" 16:50 (17:07) Participant: "Oh there it is. I didn't go down far enough. Oh, and there's trash too!"	1	1			
b 17:25 e 19:08	[17:25 ask her to delete them all at once. deleted one page at once right away. delete all spam at once (a sentence and link at top center of gmail after went to spam folder), did not see it, at all, looked everywhere else.] Participant: "I think if I can delete them here one page at a time then..." (18:41) [directed to keep trying to find one command, at 19:08 had found how to delete all spam at once with one click and said] "That was a LOT easier than doing it a page at a time" [laughing]	1	1			
nt	[19:46 after deleting all spam at once] me: "how do you feel now" "good! now that I got all that spam out of here. And I found out where the trash can was, cuz there was something I was trying to retrieve from there"					
nt	[when asked, says "yes" that inserts pictures to word, but then can't find how to do it, so not really proficient. The usual picture wasn't there, and then the clip art dialog was set for a specific menu which she didn't notice, had to be pointed out to her. ]					
b 27:30 e 28:50	[27:30 doing table ask her to add another row] "I'm going to say you can't have another row in there" [laughing] [trying to add a row to the end of a table] Participant: "Or what I would do is go back, and do this 3 one again and just delete this one" [ an inefficient work around] at 28:50	1	1		1	
nt	[trying to teach her to aim the mouse at the outside left edge of the row to insert and mouse cursor won't "aim" correctly to turn into pointer that when clicked will highlight entire row, so I tried to do for her and couldn't do within 2 seconds, 29:36] "see that would be way too much, that would get my frustration level"					
	<b>Miranda: Unfamiliar System</b>					

time	MIRANDA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
b 0:20 e 1:25	(0:20) [In Linux, went to desktop first (firefox icon is broken, told her so), looked at bottom (no menus, icons, or buttons there), looked at top and moved across top methodically until found "firefox" [sic] icon (1:25)]	1	1			
b 1:47 e 4:12	(1:47) [Linux, firefox, direction to "go to your email" and didn't know how, did not try to type in an address, did not try to use google tool bar or go to google to find it, looked at detailed icons first, starting with configuration icon, (not familiar with firefox) software update, when I prompted] "do you see what the hint is saying?" Participant: "search using google? what do you mean?" [was hover hint] me: "I'll just, you tell me what you're thinking, please", [laughing] Participant: "I'm thinking that I don't know how to do this" 3:03 (Linux find her own gmail in firefox browser) "I'm feeling like this is the time where I go do something else". "so, ready to quit" "yeah" Participant: "Ok, so this is google, so I could try this because gmail is, oh," (3:24) [looking at search brands in drop down on search box, top right] ... "I have it on my favorites, There's a way to get there from gmail but I don't know how to do it, where's the star for favorites" (4:10) [then did find gmail (4:12)] [She actually does have alphacomm mail through gmail, so it is unfamiliar for her (4:23) went to gmail]	1	1	1		
b 4:23 e 6:11	(4:23) [trying to login to gmail, having to prove she's a human in gmail on Linux in firefox] "this is extremely annoying" (6:11) "what would you give it on a one to ten for annoying?" "uuuhhh ten, maybe a nine".	1	1			
	[go to gmx 7:20, success: pretty straight]					
	me: "was this hard to find?" [gmx email] "no, this is a nice email" 10:40					
	<i>in transfer to unfamiliar environment: some slowness in doing the tasks but stepped straight through them, success: found site, success: found boxes to enter user and password, saw login button right away, success: went straight to the inbox to read an email, selected an email, success: deleted an email, success: found compose email right away, knew where to type for to and body of email and then sent it, then needed to refresh to see it (took a bit maybe 10 seconds, isn't something would do in gmail), could read it, success: could find in sent, success: could reply, success: add attachment, success: remove attachment, success: get new mail</i>					

time	MIRANDA [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	<i>obscurecompany.com with just icons takes longer than words to find their place</i> success: login, success: read, success: reply, success: attach					
	[found ibm lotus right away in top right where I didn't even know it was! Very cool! 21:50]					
nt	NOT skill transfer since had trouble showing proficiency in word doing this: [insert a picture in lotus 23:00, had trouble inserting in word which was familiar, so worked logically through trying to do until got it, 25:50, lotus told her to drag it after she selected it and she noticed right away]					

## Appendix X - Observation Notes: Molly

Table 73: Molly Detail Summary

Date	Tuesday 07/31/12 1700 PM
Motivation	Extrinsic Motivation Style
Summary	Age 40, digital native, self rate for competency 6, peer self rate for competency 3, more than 25 years experience, external regulation =4.25, Interest/enjoyment =3.43, Perceived Choice =5.57
Setting for Familiar	her professional office at a large I shaped desk covered in papers in downtown Houghton, bright sun, lots of daylight, overhead lights, 7 year old daughter, code name Patty, is playing nearby and interrupts regularly and co-worker comes in and then leaves (distraction)
Familiar System	using Windows Desktop, windows 7, maybe couple years old, gmail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, daughter Patty playing in lab nearby and still interacting regularly (distractions), window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

Table 74: Molly Familiar and Unfamiliar Transcripts

time	MIRANDA [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit		
	<b>Molly: Familiar System</b>					
nt	<i>In general: good at reading suggestions from screen, but doesn't know what I mean by "suggesting"</i>					
nt	[during confirming proficiency, she teaches me something I didn't know in gmail]					
nt	me: "I didn't know you could do that!" Participant: "I can do that" me: "What a handy button! I want to use that. Show me..." Participant: "Really?" me: "yeah, that looks good" Participant: "collapse... expand" me: "ooooohhh" Participant: "Are you joking with me?" me: "no! I learn things every day" (2:01)					
nt	me: "write an email to yourself" "to myself? I wonder if I even have me, up, there I am" (4:14) [not knowing can send to self]					
nt	[knows where spam is already]					

time	MIRANDA [action] "quote" (time on video) analysis					
b 7:00 e 7:09	(7:00) [in spam] me: "can you delete all those?" "we could" "how would you do it?" "I would probably hit every single one of these, but I bet there's a way.. up, [reading] "delete spam"... yes! that's what I would do" "You deleted all two thousand five hundred at once. Wow! You're a good noticer." (7:09)					
nt	me: "anything else you commonly do in your email?" [whispering] "Sometimes I chat with XXX." me: "oh, you know how to chat on email?" "well, it's VERY rude what we do. She sits over there and I sit here and people come in and we talk about them and they don't know about it. We go to chat, and I'll be like, well, sometimes she does it, there's a little box that comes up. Like, "can't you shut that person up? Can they quit complaining already? Can you get them out of here?" And then we laugh to ourselves cuz we're talking about people but they don't know it." (8:03)					
b 8:12 e 10:37	8:12 [begin looking for contacts] me: "do you ever use your address book?" [looking across top, down left, in folders] me: "what do you think it's called?" Participant: "addresses" me: "yeah, it's not, that's what's confusing, silly gmail" (8:47 FAM) [9:33 still can't find contacts] me: "How do you feel? [pause] Do you feel frustrated, annoyed, happy?" Participant: "I feel, I feel like, indifferent. I'm a little put out that I can't find my contacts." me: "So how put out are you, one to ten with one being none and ten is a lot" Participant: "not too much" me: "what's that number, one to ten" Participant: "one...[confirms what one and ten mean] maybe like a three" (9:56) [still looking for contacts] Participant: "then I'll just go like that, "contacts", oh, it's just going to search the web, but maybe not, we'll do a little search here" (10:07). [uses search at top of gmail by typing in "contacts"] me: "that was smart, I've never seen anyone do that. That was a good idea." Participant: "no... more... no... and then I would give up. I would give up and I would call the person and say "I've lost your email would you give it to me again" and they'd give it to me, and I would send them what I needed to send them. That's how I would do it." (10:33) [then at 10:37 she found "contacts"] Participant: "contacts! And then I'd find it, once I gave up. That's how it works."	1	1	1		
b 11:22 e 11:22	me: "can you please set up a group email list" (11:22) "hmm, no." [starts looking, at (c) found "new group" and made one	1				

time	MIRANDA [action] “quote” (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
nt	lots of distraction from daughter Patty, touched camera, then touching me and I ask her to stop so I can do my work. Then with prompting works through adding people, not much stumbling.					
b 16:08 e 16:38	(15:08) me: “Can you write an email to them, and think out loud please” Participant: “ooohhhh, this is hard” (15:20) me: “how are you feeling?” “How am I feeling? Well I like you, so I’m having fun. But if I had to do this, I would be, a little maybe, overwhelmed” (15:34) [prompting - “what would you have done, if this were work?”] “If I had to do a group email, I would write the email... and then up in the address instead of having group contact or group office, I would do everyone individually. [ at 16:08 starts trying to write email to group] [can’t find way back to email, takes some time searching around] [wrote an email and then typed in group name in “to” field right away at 16:38]	1	1			
b 20:20 e 21:45	(20:20) [applying style to a paragraph in word, unfamiliar task: looked at send to, file, open, edit, cut, copy, clear, edit, select, view, format...style] <i>looks at lots of things, systematically, but not thinking enough about “what” style is so going straight to format</i> [found style 21:13 and applied it by 21:45]	1	1			
nt	me: “do you ever use bullets and numbers?” “I have been known to since I was the secretary to the church, but I get VERY frustrated with that [pause] stuff.” (22:56)					
b 22:45 e 23:31	(22:45) [direct her to make top three lines bulleted] Participant: “uuhhh, what am I going to do, uhhh, tables... I don’t know, format! style, bullet, I don’t know. I’m just going to go for it, it’s not, all right, well then, I’m just going to cancel this. Oh! It’s really easy. Oooh, right there. There it is.” (23:31)	1				
b 24:25 e 25:22	(24:25) me: “can you do a table?” [would have used excel, made her do in word, found tables and borders right away, had to look through for tables, 25:22 found “insert a table”.	1				

time	MIRANDA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
b 26:06 e 29:56	[26:06 now add a row, looked all over, first went to edit, then all kind of other things, right click, menus, highlighted table and inserted more tables inside it, then did undo, with prompting to use undo, 27:33] (28:18) me: "I'm gonna boss you to add a row" Participant: "what I did there is click the other side of my mouse" me: "the right click, which for you I bet doesn't feel like a right click" [she's a lefty] "it's not, that's why it's the "other" side" (28:33) Participant: "I'm stumped. I'm stumped" me: "you already said you would have deleted it and started over" "I would have" "do you give up?" "noo." "what are you thinking?" "I'm thinking tables and borders [huffing noise]" [(28:52) then I gave more directive prompting like] "where's your cursor? Is that helpful?" Participant: "I think I give up... if I wanted to make a new table or a new row I would delete it and use what I just learned" (29:40) me: "Ok, but just think of it, it's got to have a way to do it easily, because people start with two rows and add rows all the time. So why don't you go, start in the cell in the bottom right corner, and then what would you do, you were doing it before" Participant: "I'd hit tab. OOOH!" [inserts new row] (29:56)	1	1	1		3
nt	[end of test (30:41)] me: "do you have any comments you want to make on tape?" Participant: "this is bull crap" "tell me how you feel?" "I feel frustrated. I feel like a five... because this is stupid! word! this all is stupid. This is ridiculous. I don't know why anyone uses computers. This is exactly how I feel. And I feel stupid. I don't really care [interruption from her daughter Patty] I can basically do anything I need to do and I have Bob [IT worker] and if I can't do anything I just call Bob and cry. He sets me up for success. I'm so lucky" (31:00)					
	<b>Molly: Unfamiliar System</b>					
	[Participant found firefox right away. distraction of daughter Patty watching videos on the internet and video ending and needing help getting another video (spent about 2 minutes settling daughter as participant waited for mozilla to open)]					
b 4:34 e 7:40	[once firefox opened] me: "go to your gmail please, do you know how?" Participant: "no, I don't" (4:34) [so tried searching for her professional company. Searched for gmail by looking for "gmail account" and got search results for account. About 3 minutes later she found gmail and logged in.]	1	1			

time	MIRANDA [action] “quote” (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
nt	[when doing gmx web address] Participant: “I would go up there to this place” 8:44 [address bar] and did backspace to the “two lines, what are those called?” [back slash], [went to gmx easily]					
nt	me: “would you say GMX is easy to use?” “yes” “how’s your stress level?” “I don’t feel very stressed out” “Feel anything?” “well, it’s a little weird. It’s a new place but I feel comfortable with you. I worry about Patty [daughter] but she’s ok.” me: “yeah, she’s a little bored.” “She gets ice cream after this” 14:32 [Patty talking to us]					
b 14:40 e 15:11	[14:40 ask her to go to obscurecompany, tried to login to gmx again and then when asked her why, she realized that obscurecompany is a separate site, 15:11 found obscurecompany]	1				
nt	15:23 molly tells Patty to be quiet, then patty is giving researcher an annoyed look, and talking to researcher.]					
nt	[15:40 lots of daughter Patty coming around to talk to us, gave her my phone to play with] me: “God, kids are SO smart! Look at that, she figured my phone out. I didn’t even tell her a thing. Last night I was showing a 65 year old and she was like “How do you do it? I don’t get it, where do you turn it on?” 16:18					
nt	[16:28 participant in obscurecompany] Participant: “Should we read one that hasn’t been read? I bet it’s one of the highlighted ones that hasn’t been read. See how smart I am? I like to hear the, “good knowing”... it makes me happy.”					
nt	[20:00 more interruption from Patty, having her add attachment and then remove]					
b 23:20 e 24:50	(23:20) [ask her to go to lotus, couldn’t find lotus, but daughter Patty distracted me] [24:00 more me trying to get daughter Patty settled doing something] me: “did you ever click on applications? Patty [daughter] had me distracted” (24:20) “I did not click on applications, desktop file system, trash, I think I’m going to close this and go click on “applications”, becaaaaause, I’m no dummy” (24:50) me: “Oh my god, I totally messed up the test!”	1	1			
nt	[more distractions from Patty, game sound noises] Participant: “That sound is driving me crazy” (30:26). me [trying to put my headphones on Patty’s head]: “Oops, that was wrong. You don’t mind that I dropped something on your kid’s head, do you?” Molly: “You don’t mind that we’re going to break your stuff do you?” (30:45)					

## Appendix Y - Observation Notes: Olivia

**Table 75: Olivia Detail Summary**

Date	Saturday 07/21/12 1730 PM
Motivation	Extrinsic Motivation Style
Summary	Age 48, not digital native, self rate for competency 4, 16-25 years experience, external regulation =5.75, Interest/enjoyment =1.57, Perceived Choice =2.14
Setting for Familiar	living room in a home, start in front yard under big old tree, cool in shade, summer day birdsong, some neighbors walking by, teenage son home and in trouble but staying out of the way (distractions), then moved to living room couch, cool, lots of daylight, no lights on
Familiar System	using a large screen mac laptop, not old, gmail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one else in lab so no distractions, window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

**Table 76: Olivia Familiar and Unfamiliar Transcripts**

time	OLIVIA [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	<b>Olivia: Familiar System</b>					
nt	[went straight to her gmail with bookmark and logged in knowing her password (two tries)]					
nt	[complains that can't easily see the attachment in a long conversation of gmails (6:00)]					
nt	[compose, attach, all is readily done]					
nt	[ask to find spam, 7:50, [distraction while looking for spam, stumbles across trash]]					

time	OLIVIA [action] "quote" (time on video) analysis	stumble	fall	quit		
b 7:58 e 9:08	[while looking for spam, stumbles across trash 7:58 and says I'll empty the trash instead, I say go ahead] Participant: "I have no idea how to do that. It's already IN the trash" me: "Look around. ...you can empty the trash." (8:10) Participant: "It's already IN trash. Where do you empty trash to? I'm thinking that I never empty my trash because there's no way to empty trash because it's already trash." (8:25) me: "no, there is a way to empty trash." Participant: "There's no trash emptying." [ask about her agitation] Participant: "I'm not agitated at all. You're just wrong. There's no trash emptying." [ask what she's feeling] Participant: "I think it's dumb that the trash doesn't have an empty." (8:40) me: "It does actually" Participant: "I don't see it. If I click on something in my trash, all I can do is trash something in my trash, which is silly because it's already in my trash" (9:08) me: "Ok, we'll come back to this. Let's look at your spam" [so resistant that I stop this task on test. Never does trash]	1	1		1	
b 9:10 e 9:45	Participant: "I don't know if I have spam" (9:10) me: "You do have spam." "No. Really!? I'm looking at all my folders and I do not have one called "spam"" (9:20) me: "Did you find "more" at the bottom?" "There's a more. Oh look at that, there's spam." (9:45)	1			1	
b 9:50 e 11:10	[directed to delete all spam at once, (9:50), giving her hints] me: "It's not that tricky, it has words and I can see them, I'm looking at it right now" (10:37) (11:10) found "delete all messages now"	1	1			
b 11:20 e 12:10	[11:20 Go to address book] Participant: "I'm not fully sure where my address book is, I think I have to go to my calendar", then found contacts 12:10	1				
b 12:15 e 13:40	[12:15 make a group, participant gets distracted looking at her contacts (13:00) and asks why she can't see all her contacts, there should be more contacts, looks around at that some, 13:40 I direct her back to making the group list, adds new group right away, but with distraction in middle. (13:40)	1	1			

time	OLIVIA [action] "quote" (time on video) analysis					
b 15:00 e 16:31	(15:00) [ask to add people to the group.] Still commenting on how her contacts aren't there, can only see the "a's", so doesn't think can add her friends to her new group. When asked about her feelings] Participant: "Annoyed about contacts, cuz I really like the old system" (14:19) asked about her stress, says it's not stress, just annoyance, "three or four, I find this annoying". (15:00) [With prompting goes to group that made, and finds add button and puts in two friends but closes without committing them] me: "But there's no people in it still." Participant: "I did. I put people in it" (15:49) me: "But they didn't go because you skipped a step, so let's try again." 16:18 "I'm done adding." me: "Are you? What do you need to do to make them go in? Can you see something obvious." "add. Why would it need add, I'm done adding. That's so weird. That's sort of weird you have to add people you added" (16:31)	1	1	1	1	
	[send email to group, went straight to it in compose and typing in "to" box (17:26)]					
nt	[looked at word processing, added words to a blank doc, save the file] Participant: "This is actually the worst thing, is save it in a place and find it again. It is really hard to do. You know what is REALLY hard to do? Is make a new file, like a personal file for my poetry or something. It's impossible to create a new fricking file.... What I have is like a million of these stupid things in my documents in my document file and I can never find what I want unless I remember exactly what it's called." (19:21)					
nt	[showed lots of formatting proficiency]					
nt	[doesn't know about context menus or right click]					
nt	Participant: "Are you sure you want me as your client, as your subject, because I really don't like a lot, don't do a lot of things." (20:37) [Reassured her that she is perfect for the study without giving any reason why.]					
nt	[DISCUSSING ATTITUDE test basically over already, she starts a discussion of how wants to use spell correction but can't control it and doesn't get right click] Participant: "Bad things happen when you do these things." (22:50) Participant: "My frustration level is five or six, because I can't even spell check the stupid word "necessary". I cannot get the mouse to stay on the 'y'." (24:04)					
nt	[26:17 minutes, hurrying because she doesn't have much time.]					
	<b>Olivia: Unfamiliar System</b>					

time	OLIVIA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	[opened firefox right away]					
	[went straight to gmx and typed into user and password boxes]					
	[compose email easily, read email, tried "newest first" which is backwards affordance and makes it sorted "oldest first" (describes the sort that is, but not what button will do) 5:00]					
b 5:18 e 5:40	[She suggests, "sometimes you can reload it." (5:18) me: "Un hunh, do you think there might be a check mail button?" Participant: "There is a thing called "check mail" button. It doesn't work though." (5:22) [thinks computer doesn't work, not that she can't see the results] me: "Well, you know what? I see it now." Participant: "You do? It should be this newest one." (5:33) me: "Do you have it sorted newest on top?" "Yeah, I do. Look at this, oh, ok, now it's here" (clicked the sort again) (5:40)	1			1	
	[success: did reply, no problem, success: did attachment right away, success: sent ok, success: read it, success: saw attachment bigger (7:23)]					
b 8:10 e 8:51	(8:10) [Went to obscurecompany and had some typing trouble, went to google, typing badly, got to obscure at (8:51). Ask how frustrating, rating of 2]	1				
	[success: read email, went straight to inbox]					
	[success: compose and success: attach, all smooth (11:20)]					
b 11:35 e 12:10	[direct her to remove attachment (not discard mail). Doesn't want to remove attachment, will do her own thing, she does workaround of discard email. (11:35). Popup came saying "do you want to leave this page? yes or cancel" and she said] "Of course I want to leave this page, that's why I canceled" [clicked cancel on popup, thus canceling her cancel request CLASSIC USABILITY] 11:42 [Did it again, clicked cancel, read the popup, then she carefully explained that she should hit cancel in popup so she would cancel the email [wrong] 12:05 Did it a third time, this time said, "I think it wants me to hit "ok" [clicked "ok"]" (12:10)]	1			1	
nt	Researcher asks her about her frustration, "I don't know. It was irritating. [ask how irritating] I'd say a three." (12:18)					
b 12:50 e 13:00	[12:50 ask her to remove an attachment, see's the "remove" button on the far right at 13:00.]					

time	OLIVIA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
nt	[Ask if she can see what she just sent in "sent" folder, checks sent folder, can't see it so she explains she must have done address wrong. This is not true, it's just obscurecompany not saving in sent. ]				1	
nt	<i>Distractions</i> Participant: "I wonder why I have these weird pictures here?" [ad in middle of screen in obscurecompany] discuss how it's an ad, "But for what? A policeman? Who would ever care about looking at a policeman checking ID? Who would ever buy him?" (13:54)					
b 14:30 e 14:50	(14:30) [ask her to find compose email, found it in icon without words (14:50), she used hovers from left top to find "compose"] Participant: "Oh look at that, they took away the word compose. They think the icon is so cute, but it's really stupid because it just looks like a piece of white paper with a line over it." (15:01)	1				
b 15:28 e 16:06	(15:28) [Prompted her] me: "Can you see anything you can check that will tell it to save it in sent". Participant [without looking for what I directed her to do]: "If I send it, it will save it in sent." [which is wrong in obscurecompany(15:40). Participant suggests maybe "save draft" will save in sent, which is wrong, then sees correct "save copy to sent folder" 16:06 ]	1				
b 17:15 e 21:55	[17:15 ask her to find lotus symphony word processor, looks at "computer" icon on desktop first, then other places until 21:00] Participant: "I'm not sure how I'm supposed to find it. Which is really annoying not to be able to find these things that you're CLAIMING it's on here. [doubting researcher tone] And it's like, how are you supposed to know where it is." (21:04) me: "so are you angry?" "Um, irritated. I don't get angry at computers. I'm a calm zen person." me: "Well, you're kind of mad at me though for telling you you can find it and you can't." (21:14) "I'm not mad at you Harriet. I forgive you... No, just like frustrated, because this happens to me a lot, there's like, some thing that's supposed to be on the desktop and it's not. [ask how frustrated] Like a four or five." I give hint that it is in where she is looking, finds it at (21:55)]	1	1			4
nt	[24:16, direct her to try to spell "necessary" wrong so can practice right click spell check (which couldn't get to work in familiar Mac), but she spelled it right] me: "you spelled it right" Participant: "I did NOT spell it right because I had [looking closely]... maybe I did, funny." (24:20) [Then she found a spell checker in "ABC" button and liked that.]				1	
	[Could do success: copy and paste, success: save, success: bold, etc easily]					

## Appendix Z - Observation Notes: Peter

Table 77: Peter Detail Summary

Date	Wednesday 07/18/12 1000 AM
Motivation	Intrinsic Motivation Style
Summary	Age 24, digital native, (from Turkey), self rate for competency 10, 16-25 years (whole life) experience, external regulation =2.5, Interest/enjoyment =6.57, Perceived Choice =4.86
Setting for Familiar	rekhi grad student office, air conditioned but hot, window shades drawn, overhead light on but dim, office mate in desk beside us but quiet (distraction)
Familiar System	using Linux Fedora desktop, good condition, little big aged, gmail
Setting for Unfamiliar	Walker 120 mac lab, small room, no windows or daylight, no one there, inside big lab with other working, cool air conditioned, bright overhead lights on
Unfamiliar System	using iMac 27" on table with two chairs, nothing else in small room

Table 78: Peter Familiar and Unfamiliar Transcripts

time	PETER [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Peter: Familiar System</b>					
	<i>Finds everything easily and gives commentary on how to improve the unfamiliar. on his own looks for and comments on multiple ways to do</i>					
	<i>doesn't take the easiest, safari obvious but prefers other browsers so bothers to look for them</i>					
	<i>hover hint on send give key shortcut which he comments could use but doesn't choose to use</i>					
	[unfamiliar task in familiar gmail webmail]					
	[knows to look for little arrow to mark that there are more menu choices behind]					
	[Goes straight through the tasks to start new group]					
	[flew right through all the unfamiliar tasks]					

time	PETER [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	[success: ask him to add people to group at Participant adding people to group] Participant: "I already see a giant icon that looks like a three headed giant which is kind of telling me that it's a group thing" (11:37) [added people at same time as made new group] Participant: "oh look, there it is" [sees the confirmation that made a group at 12:02]					
	<b>Peter: Unfamiliar System</b>					
	me: "have you ever used mac?" Participant; "only at stores to play with it but otherwise no"					
	Participant: "it feels like dragging a mouse through sand... this is really annoying because I have to actually physically move, the other way I just flick my wrist" (2:15)					
	[knew that safari was a browser but doesn't like it so looked for other browsers and found applications and found chrome (right away)] Participant: "and this is not alphabetized, which is terrible, why"					
	Participant: "oh god, it's bouncing" [when application started up, (3:58)] me: "why you say, oh god it's, it's bouncing?" Participant: "because this icon was bouncing. " me: "did it worry you?" Participant: "it didn't so much, but it's just too much flare. Less function, more prettiness." (3:50)					
	[going to unfamiliar webmail] Participant: "I'm going to the URL by typing it in the address bar" (9:12)					
	[goes straight through all the commands to get into email]					
	[after click an email] Participant: "and my first instinct was, where's my email, but then I looked down and saw the loading thing with, that's kind of in an off position. It doesn't immediately tell you that it's loading" (10:56)					
b 11:16 e 11:21	[(11:16) write an email in gmx: direct him at 11:16 and at 11:18 Peter hesitates with] "hmm" (11:18) Participant: "OH there's the compose email button.." (11:21) [so a 2 second pause for him elicited a hesitation that he hadn't seen it right away (only 2 seconds!)] Participant: "again, gmail's giant colored buttons make it much easier to find them" (11:33)					
	Participant: "wonder if I hit enter it will complete... and it did" (11:48)					
	Participant: "a little bit unintuitive, maybe they could put the actual text of my email and say this has been sent" (13:06)					

time	PETER [action] "quote" (time on video) analysis	stumble	fall			
	Participant: "oh man, look at the url, this is terrible! ok, oh, I'm going to, uh, oh boy. It looks like it's passing the user ID from here and I'm wondering if I change this ID a little bit I can get someone elses..." (18:56) [tried the hack of passing different ID in web address] Participant: "doesn't actually do anything, so it's not THAT easy at least" (20:00)					
	<i>example of confidence: when ask at 21:30 if can see a copy in the "sent" mail, he goes straight to sent mail and then says "no you can't", not something like "i don't know how or I don't know if this is it", but he is confident that it is not in the sent mail because he just checked the facts.</i>					
	[looking for copy to sent mail] Participant: "over here there is an option that has save copy to sent folder which is kind of silly because if I'm sending something, why wouldn't I want to save it?...but, actually if I had space issues I might not, but that's back in olden times!" (22:50)					
	Participant: "why is everything so small when you have such a big screen? It's like wasting space" (24:33) [DESIGN and ATTITUDE					
	Participant: "whoa, it took the attention away from my window because it wanted to reload more ads... the main window was grabbing focus when it was loading these ads" (24:50)					
	[Frustration level is about 6 (26:00) when windows are not allowing him to manipulate them easily due to the ads popping up.] me: "it's cool to me that you figured out immediately what was wrong" "I did some web developing so I'm a bit familiar with these" (27:05) [then explains why it's de-signed wrong]					

## Appendix AA - Observation Notes: Rebecca

**Table 79: Rebecca Detail Summary**

Date	Saturday 07/14/12 1330 PM
Motivation	Intrinsic Motivation Style
Summary	Age 65, not digital native, self rate for competency 5, 9 to peers, more than 25 years experience, external regulation =4.0, Interest/enjoyment =5.57, Perceived Choice =4.29
Setting for Familiar	dining room in a home, hot, 85 degrees, air conditioned, bright overhead light, dining room table, distractions include box fan
Familiar System	using dell 2010 laptop windows 7 in great condition, gmail
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one there, one student quietly came in and left, cool air conditioning, overhead lights on
Unfamiliar System	using Linux fedora desktop, ok condition

**Table 80: Rebecca Familiar and Unfamiliar Transcripts**

time	REBECCA [action] "quote" (time on video) analysis					
	<b>Rebecca: Familiar System</b>					
	<i>GENERAL: matter of fact, up beat, not unhappy or annoyed, just sort of marching through it in a I'm doing this chore way. Not chatty, not feeling much of anything. Figures it all out without much trouble. really just marches a long. Is comfortable with having multiple ways to do things. Has no fear of trying stuff.</i>					
nt	[3:38 knew spam and likes the recipe]					
nt	[4:59 never sent herself email]					
nt	[6:45 knew contacts and groups already]					
nt	[10:30 when asked what she finds hard about gmail, commented on add new contact being hard to notice and also deleting people from contacts, found her way through it easily]					

time	<i>REBECCA [action] "quote" (time on video) analysis</i>	stumble	fall	quit	resist	persist
b 21:10 e 21:49	[21:10 example of ability to be resourceful, is doing moving gmail into folder and it doesn't move, she notices and asks why not, then notices that she is in the same folder moving it to] Participant: "they didn't go there, did they." (20:58) Participant: "hmm, they're not going" (21:06) Participant: "because they're not read maybe? I don't know." (21:09) Participant: "Oh! you know what. I'm in the subscriptions mail box, duh" (21:18) [Then realizes her first one didn't move and notices she has option to move to folder now that email is checked (21:49)]	1				
b 24:13 e 24:46	[looking for email just put in folder] me "would you know how to search for it?" Participant: "no, I wouldn't know how to search for it" (24:13) Participant: "oh, I would do this...no that's not it...no I don't want to do that...see if that works, oh there it is, ok" (24:46) [looking for gets it right away. ]	1				
nt	[Then she archives it and we look for it again and can't find it, tried a couple of things.] "I don't know. I don't know, how would I do that? I have no idea." (26:19) me stopping the test: "I think that's enough for now [for the test]" [participant keeps trying stuff] Participant: "I must have deleted it. Ok, Ok, we're done. I don't care anyway" (26:51)					
	<b>Rebecca: Unfamiliar System</b>					
	[I ask if she can go to the internet, does it right away, within a few seconds]					
nt	[Didn't go to gmail, forgot her password CLASSIC]					
b 5:55 e 6:23	[5:55 in gmx, wants to copy the preset "from" hcking@gmx.com and paste it into the "to" field but gmx won't allow copying from that field.] (6:23)	1				
nt	(9:12) [I tell her to google obscurecompany, this is a bad idea. this is first observation I do and never ask participant to do that again]					
nt	[11:17 Participant: "urghhh... It wouldn't let me do what I wanted to do" me: "which was?" "which was find where I was before on obscure email" [trying to find obscurecompany because I told her to google it, bad directions]					

## Appendix BB - Observation Notes: Roger

**Table 81: Roger Detail Summary**

Date	Tuesday 07/17/12 1100 AM
Motivation	Intrinsic Motivation Style
Summary	Age 23, digital native, self rate for competency 11, 16-25 years (whole life) experience, external regulation =2.0, Interest/enjoyment =6.14, Perceived Choice =5.29
Setting for Familiar	Rekhi grad student office, warm but Air conditioned, lights on, daytime, office mate present but quiet (distraction)
Familiar System	using Linux Fedora desktop, condition is usable, worn keyboard, gmail
Setting for Unfamiliar	same office
Unfamiliar System	using windows 7 laptop, Sony Vaio, brand new

**Table 82: Roger Familiar and Unfamiliar Transcripts**

time	ROGER [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Roger: Familiar System</b>					
	<i>In general: just did everything easily and quickly</i>					
	[When asked, says just knows to check from left to right top and left side to find the commands, and they were right there.]					
b 6:14 e 6:32	[6:14 find address book, found it at 6:32]					
b 6:48 e 6:58	[direct to make group list, (6:48) He asked me to clarify if I wanted him to make server system group list or a group email list in gmail] 6:58 made new group]					
b 7:16 e 7:36	(7:16) [looking to add people (7:36 added them)]					
b 7:59 e 8:12	(7:59) [ask to send to group, (8:12) did send]					
b 8:24 e 8:38	(8:24)[ direct to save draft, did it at (8:38)]					
	Participant: "It auto completes, which is even better." (9:02)					
	(10:47) [he uses tasks and comments on how it is a "crappy" interface]					

time	ROGER [action] “quote” (time on video) analysis	stumble	fall	quit	resist	persist
	[hindsight, should have given him more tasks and tried harder to stump him ]					
	<b>Roger: Unfamiliar System</b>					
	[in obscure company webmail has such typing avoidance that prefers to click reply and then change everything. I let him do the workaround.]					
	found browser no problem					
	going to gmx (2:57) and login went smoothly					
	(3:50) not sure why not in inbox when first enter, but went to inbox right away					
	knew to hit “check mail’ to refresh without prompting					
	when attaching, Participant: “It kept the box up, that’s kind of weird” (6:45)					
	(11:29) trying to resize windows so can see side by side					
	(13:06) Participant [in obscure company] “I don’t even know, why would anyone use this. This is some way to try to get me to buy something”					
	(14:07) comments on how can’t control the view or scroll so the view is good, looking for option or way to control the view of reading email					
	(16:30) Participant suggests could click name to write new email, but that doesn’t work in this email, so does reply and change everything for typing avoidance					
	(18:20) got confirmation page with an ad, Participant: “Ok, this is a weird page I’m at, but OK”					
	(18:56) points out how shows multiple accounts at top of inbox					
	[ (19:46) Found a bug that mail didn’t come and didn’t show sent, so then he did “compose”]					

## Appendix CC - Observation Notes: Walter

**Table 83: Walter Detail Summary**

Date	Friday 07/20/12 1345 PM
Motivation	Extrinsic Motivation Style
Summary	Age 74, not digital native, self rate for competency 2, 6-15 years experience, external regulation = 5.75, Interest/enjoyment =2.71, Perceived Choice =1.71
Setting for Familiar	home bedroom office upstairs in a home, shuttered natural light in forested setting, hot day but air conditioned comfortable, overhead and desktop lights on, large traditional wooden desk with many book shelves around room and piles of books everywhere, very "den" like setting.
Familiar System	using macbook pro lion os, worn, 10 months old, gmail on mac desktop app
Setting for Unfamiliar	Rekhi 112 Linux computer lab on Sat 7/28/12, bright sun (distractions), window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

**Table 84: Walter Familiar and Unfamiliar Transcripts**

time	WALTER [action] "quote" (time on video) <i>analysis</i>	stumble	fall	quit	resist	persist
	<b>Walter: Familiar System</b>					
nt	[during the confirm proficiency, asked him about feelings (16:30) Participant: "Discounting the fact that, um, I'm not doing things automatically, I'm thinking about it, because you asked me, so I have to say, "whoa whoa wait a minute" ... so there's a little extra processing involved. It's about 5 and I'll tell you why. It's because I'm a lousy typist and I hate being a lousy typist and I hate having to go back over anything I type and look for the missing letters or the scrambled letters or whatever my fingers did wrong. The stress only occurs when I'm typing." (17:20)					
b 18:15 e 22:39	[18:15, ask him to make an email list for a group] Participant: "this has something to do with email and I've never done it before so I'll look along the email line" (18:45) [goes to help 20:19] [goes to address book(22:39)]	1	1			4
b 22:39 e 22:41	[starts looking for groups, (22:39), finds new group pretty quickly (22:41)					

time	WALTER [action] "quote" (time on video) analysis	stumble	fall	quit		
b 22:43 e 32:20	(22:43) need to put people in the group] [tries new smart group 28:59] 32:00 Participant: "So I haven't done it yet. So, I've tried twice and couldn't do it, so I'm going to leave it for a while. And just try going, what I would do if I wanted to pursue it right now, do you want me to continue pursuing it?" me: "No" Participant: "I'll go back to the, uh, address book help file." (32:20) [told him to not continue - I stopped the task]	1	1	1		10
nt	[asked about his stress, he said] "No problem, Zero." "So it doesn't bother you to give it up?" "Hell no. I mean it's not something I HAVE to do right now. And if I wanted to email a certain group of people in that particular case, all I'd have to do is remember all their names and just type them in and see which of them completed automatically and just send to those" (32:52)					
b 33:30 e 34:38	[33:30 in browser, ask him to go to gmail, goes to the search box in browser] Participant: "I didn't know you could go to gmail, so the first place to look is in the little down arrow in the search, what to search in box, field. Which right now says "google" because that's where I was last". (33:42)... "it obviously isn't in the search engine list" (33:59) [then googled "gmail", finds it at 34:38 ]	1	1			
b 34:45 e 40:30	(34:45) [is at gmail signin, then didn't know password, went to be reminded of password (40:30)]	1	1			6
nt	[didn't know was allowed to send an empty content email]					
nt	[43:47 had never seen gmail webmail, only had seen on desktop app]					
nt	[45:00 can't tell what emails hasn't read yet.]					
b 45:28 e 45:51	(45:28) [ask him to reply to email, (45:45) wanted to use Command R to reply but didn't work. found reply at 45:51]	1				
nt	[taught him how to use auto correct with right click (2 finger tap on mac) 46:00]					
	<b>Walter: Unfamiliar System</b>					
nt	<i>2:20 long story about being forced to use password on desktop mail after we worked together and wanted to find the answer for himself so found some Indians in India who offered him a nice service to clean his computer regularly and they fixed his password right away and he's happy to have this nice service now.</i>					

<b>time</b>	<b>WALTER [action] "quote" (time on video) analysis</b>					
nt	[Asked if he'd even done Linux] Participant: "No! It's scary [in mock scared voice] cuz it's freeware. And anybody can change it." (4:32) me: "Only for themselves, they can't change it for anybody else", "Oh, is that a fact? Oh I didn't realize... I didn't know that" (4:48)					
nt	[distraction: notices the bridge to the library out the window and asks about the bridge and the library (5:10)]					
b 5:13 e 6:08	[5:13 looking for internet, methodically looked across the top looking for web browser and finds in applications (6:08)]	1				
b 6:26 e 6:57	(6:26) [ask him to go to gmail] Participant: "Well, the thing to do is to presumably do through, us, the, whatever this is called in the top line where the URL is" (6:47) [Did go straight to gmail.com in address bar (6:57) and when it opened, was logged in as me] "So I did get to gmail, didn't I? Can I have a lollipop" (7:30)	1				
b 7:40 e see below	[7:40 entered username and password, failed first time, changed "b" to lower case in username (wouldn't matter, is case insensitive)] Participant: "I'm trying all the passwords I have, or know, realizing this is probably stupid because, um, because, why would this system know any of my passwords, or know my name at all because I've never been here before in my life. So that is silly, so I'm gonna try "guest" because I've heard that that sometimes works." (8:55) [continued]	1	1			
	[still trying username and password in gmail] [9:05 puts "guest" into password, but still has typo in his username. Gmail gives him a "prove you're a human" thing and he tries it. Keeps trying through three "scrambles", saying them aloud: 2nd as Italian, 3rd as Russian. Doesn't work.] Participant: "Oh shit." (10:41) [Prompt him to tell what he's feeling.] "I'm frustrated because it doesn't accept "guest" as a password" (10:45) Prompt him to tell how frustrated on 1 to 10. "Three." [continued]					

time	WALTER [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
e 13:10	[still trying username and password in gmail] [Tried a 4th time, again saying out loud. Tried to offer to help, but he said] "No, I'm going to try one more thing here." (11:45). [Tried the question mark which took him to a reset password page. I told him he's using the wrong username. Teach him that he's in a new tab, can't use the back button. Found previous tab, saw his name and seemed to forget what his username would be. Prompted him to pretend he was at a store telling the clerk his email address.] "Oh yeah! Gmail! Of course." (12:48) [corrected username typo, but wanted to still use "guest" as password.] Participant: "Let's try "guest" again" (13:05) me, in annoyed voice, "No! You have a password. You've been using it, remember? The [help guys] helped you.... Good!" (13:10) [finally is logged in at 7:40]					5
nt	Participant: "It's not whether this system knows my password, I realize that now, it's whether I'm actually at gmail and they know my password and my everything." (13:32) me: "So tell me, was that a revelation? Did you just learn something?" (13:36) "Oh yeah! I just learned that wherever you are, wherever you go, there you are.... [laughing] You are not IN an unfamiliar building, confronting an unbelievably unfamiliar system, with all the scariness of being surrounded by REAL fully paid, fully trained, card carrying life member geeks, and all their systems. It's JUST GMAIL. Of course, I should have known that, but for some reason I got spooked by the surroundings. I got intimidated by my high level of geekitude surroundings" (14:38)					
nt	[14:38 to 19:02 is discussion of him explaining client and slow charter email and more]					
b 18:48 e 20:50	(18:48) [I direct him to tell me how he can tell an email is unread in gmail webmail. He doesn't usually use gmail webmail. He reads me the ads thinking that will be an answer, but no, they are ads. (19:59)] [I say I can see it in plain sight (an unread email). He says] "Don't tell me" (20:16). [I ask how frustrated he is, one to ten. He answers] "Four, I'm getting anxious because I'm feeling STUPID because I can't see something that's in plain sight as you told me" (20:30) [looking in folders] (20:50) Participant: "I give up."	1	1	1		
nt	[Then teach him about email being bolder when unread and he's confused because he remembers sending it to me, but gmail webmail made it into a conversation and that is new to him.]					
	[Sees reply right away, sees discard right away. ]					

time	WALTER [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
b 22:45 e 23:18	(22:45) Has to look for forward, gets it at 23:18 ]	1				
b 23:30 e 25:30	[Has to look for "send" button, 23:30] "Oh god, look at all these windows, with their multiple top lines" (23:50) [can't find send, it is not in plain sight because of size of email the top and bottom "send" buttons have both been pushed out of view. Finds "send" at 25:30 when does outer scroll bar by accident (embedded scroll bars are a problem)]	1	1			
	[went to gmx OK, saw where to login right away but had to stop him from scrolling through all the ads and making fun of the ads					
b 28:10 e 30:39	[ask him to do the login (28:10), then had typos in login until got it straight at 30:39, two minutes]	1	1			
nt	[Ask to go to inbox, and he insists he is, but he isn't because no messages are showing, but turns out that gmx is broken, successfully in inbox at 33:20]					
	[reads one, reply, all ok]					
b 34:16 e 34:30	(34:16) [small delay looking for attachments but finds it OK at 34:30. Then wonders if the attachments he sees are ones he has received? like he has at home? Or ones he can attach.					
nt	[Then looks around for something to attach and is surprised to not see the attachment in the mail before sending, participant Wilma also mentioned this, is it a MAC thing? ) 36:00]					
	[can add attachment and can send, then read and see attachment, finds compose OK]					
nt	[goofing around trying to do german sounds UUUT while he types an email body until 42:00]					
nt	(43:44) [directed to go to obscurecompany, problems with almost knocking over camera, 43:51 starts to go to obscurecompany, discussion if obscurecompany looks sketchy. ] Participant: "I have to get this position again because it's the only way my eyes work because they're getting tired already" (43:19)					
b 46:48 e 48:30	[at 46:48 starts to do login, at 48:30 in logged in and starts reading the ads]	1	1			
	[go to inbox and read one, does fine]					
b 49:37 e 49:50	(49:37) [tell to compose, finds it methodically as third icon in top left row (49:50)]					

<b>time</b>	<b>WALTER [action] “quote” (time on video) analysis</b>	<b>stumble</b>	<b>fall</b>	<b>quit</b>	<b>resist</b>	<b>persist</b>
b 49:52 e 53:00	(49:52) [then fumbling around because discarded what was writing, and then can't find it, confused about reply vs. compose, then started over, done by 53:00]	1	1			3
	[saw right away where to remove attachment! on the far right. He says he saw it because it's in blue! (54:05)]					
nt	(54:10) [ sent it ( 54:16 ) but it didn't respond to his send click so email is broken from 54:16 to 58:00]					

## Appendix DD - Observation Notes: Wilma

**Table 85: Wilma Detail Summary**

Date	Tuesday 07/24/12 1000 AM
Motivation	Intrinsic Motivation Style
Summary	Age 87, not digital native, self rate for competency 3, 16-25 years experience, external regulation =3.75, Interest/enjoyment =5.0, Perceived Choice =4.71
Setting for Familiar	in corner of kitchen in a home, husband comes through and talks at one point (distraction), at counter/desk beside refrigerator in beautiful elegant sophisticated arty modern home with tons of daylight, very clean and in perfect shape, sunny and warm but not hot, clear sunny hot day outside
Familiar System	using elderly mac desktop in great shape, probably 10 years old, mac mail in desktop app with aol.com email
Setting for Unfamiliar	Rekhi 112 Linux computer lab, no one else in lab so no distractions, window shade down, cool air conditioning, overhead lights on
Unfamiliar System	using Linux Fedora desktop, ok condition

**Table 86: Wilma Familiar and Unfamiliar Transcripts**

time	WILMA [action] “quote” (time on video) analysis	stumble	fall	quit	resist	persist
	<b>Wilma: Familiar System</b>					
nt	<i>low enough competence to not know how to attach a file to an email low enough competence to never have opened a document in ms word with file   open (only find file in files and open it that way can't see attached pic as pic, then thinks not attached generally: not exploring but quick to find mixed no hesitation to find attach and to find applications in Linux and lotus, but says "I don't know how" at least twice. Is this a self deprecation, an announcement, or a quitting. Doesn't seem like a quitting.</i>					
nt	<i>Has age related vision and tiredness issues (turns out has macular degeneration which makes her almost blind)</i>					
nt	<i>Very novice, also seemed quite tired and slow in general on unfamiliar system</i>					
nt	[3:45 looking at mail and not in chronological order]					
nt	[5:22 doesn't look at trash normally, asking her to tell me what she does normally: forwarding, does forwarding ok ]					

time	WILMA [action] "quote" (time on video) analysis	stumble	fall	quit		
nt	[10:02 never sent mail to herself before]					
b 10:25 e 10:35	[in new task familiar environ: ask to attach at 10:25, went straight to attach (10:35)]					
b 10:40 e 11:28	(10:40) Participant: "Ooohhhh boy... I've never used this before, I'd suspect you'd come over here? yes?" [told her I'm not teaching just directing. (10:53) she's looking in files for something to attach] (11:21) Participant: "I have no clue" me: "Ohhh, you do..." Participant: "send now?" me: "bingo" but she was confused by not seeing picture of attached file: Participant: "But there's no picture there" (11:28) me: "It's attached" <i>might be a MAC thing</i>	1				
nt	[big sigh at 13:00, prompt for feeling?] "Well it's easy when YOU're sitting here, or when my kids are sitting here, but when I'm alone..." I ask why "Because you teach me things, well you didn't teach me, but you showed me new things" me: "I didn't show you." Participant: "Yeah, you did" me: "I encouraged you." (12:57)					
nt	13:00 (fam) me: "let's start again", Participant: "oh nooo" (softly)					
nt	13:28 I ask, "How are you feeling?" Participant: "Overwhelmed. No, I'm alright, but remind me to drink some water in a few minutes." (13:31)					
nt	[13:56 direct to write an email and offers to attach something] <i>ATTITUDE already incorporating what just learned</i>					
nt	(15:00), [easily sends the email] Participant: "oh, I want to send it, that's easy" to her is easy when before at 11:21 was "I have no clue" <i>She is adaptable</i>					
nt	[15:47 go read the sent mail (already knew)]					
nt	[17:00 go to address book (already knew)]					
nt	[19:00 using word]					
nt	[19:20 ask how she's feeling] "Nervous" (19:25)					
nt	[25:50 ask how she's feeling] "Fine, I'm actually learning something." me: "whoops, I'm not supposed to teach" (25:56) "Well that's because I'm so smart I just picked up from your innuendos" (26:10)					
b 26:20 e 27:15	[direct her to copy and paste 26:20, <i>NOVICE doesn't know what a return or line break or paragraph break is.</i> Direct her to paste, effects of age.] Participant: "I forgot I was pasting" (27:15)	1				
nt	[can do formatting in word]					

time	WILMA [action] "quote" (time on video) analysis					
nt	[31:16 ask her to show me how she would google something, suggest she shrink her word but has never heard of that. Always get's rid of it instead.]					
nt	[33:38 fam: direct to close the browser sub window with the little x in corner] "I don't know how" me: "I can see it" then can't navigate mouse easily on "x" and has pop ups in the way, lots of direction.					
nt	[then test is over and I find stuff for her the rest of the familiar tape]					
	<b>Wilma: Unfamiliar System</b>					
nt	[didn't have her do webmail]					
b 1:20 e 2:15	[in new task: unfam environ (1:09) direct her to open lotus symphony] Participant: "I'm looking, is the computer ON?" (1:20 start clock here) Tell her computer is on and we talk about what the program is that she's looking for. She finds "application" right away. I reassure her that she can't break the computer. ] "I'm not very quick at this (1:59)...I don't see too well" (2:12) [ She found lotus at 2:15, pretty much went right to it.]	1				
nt	[prompt for her feeling.] Participant: "fine. [pause] I like interesting stuff, as long as I have a helper here..." (2:26 )					
	[went straight to create document, typing, then bold and italics all no problem]					
b 5:05 e 6:34	[5:05 ask to save and she took a while. Looking all over for something that says "save", 6:34 give her tip that can click on menus in upper left without hurting anything, then finds save right away]	1	1			
b 7:08 e 8:31	[typing file name in save dialog is unfamiliar for her] "you must think I'm awfully slow" (7:08) [I deny this] Participant: "I'm thinking it.... I can't even spell my name .... I'm a little nervous." (7:45) then pauses looking to see what to do with save dialog. me: "How would you finish saving, do you think." "I have no idea." (8:02) at 8:31 saw the button on bottom right	1	1			
	[Had her copy and paste, went easily, then asked] "Can you save it again?" "[big sigh] Oh, you're a hard taskmaster." (9:46) [me laughing] Went straight to save.					
nt	[I point out that no dialog to name it because she already named it, she says] "But it didn't go off either." (10:29) thought when save it would go away as in "close", but that is <i>MISUNDERSTANDING</i> because that is close, not save. ?? in old mac is it save and close together??					

time	WILMA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
b 10:48 e 11:37	[10:48 looking for "x" like in mac to close, tell her it's on right instead and she can't find it, just vision issue, (11:30) found it.] "It's a little small for people with poor vision." (11:37) [find out later she is technically blind with macular degeneration]	1				
b11:40 e 12:55	11:40 me: "Do you think you could find the internet?" "Again?" me: "That was a word processing thing we were just in." <i>MISUNDERSTANDING</i> Participant: "Oh.... Firefox?" (11:45) [looking at desktop (12:20) gave hint that it's an application.] Participant: "Where did I see application... I forgot where I saw it... Now my eyes are acting up." 12:55 [finds internet, knows firefox from using computers at the library]	1	1			
nt	me: "Do you know how to go to the address of a website?" Participant: "I don't know how to get to google." (14:25) me: "How would you do it at home? With a bookmark? A little thing to click on?" "No, I never use my bookmarks" [voice sounds very tired and slow and low] (14:35)					
nt	[me starting to get concerned that the test is too much for her and not wanting to hurt her. I teach/direct her how to go to google in the address bar. It doesn't work.] "I did it wrong." me: "No, you didn't. It didn't work." (15:14) her: "Do you ever get frustrated?" me, adamantly, "Yes" (15:18)					
nt	[prompt for rating of her feelings of frustration] "I'm ten." (15:35) [15:56 we get to google] me: "Aaahh, phew! Do you feel better?" Participant: "Yeah. ... I don't know what I'm doing here." (15:59) [confusion, age, tiredness, or just wondering?] me: "You can google anything you want." (16:03) <i>Attitude of researcher: I assume google is like a candy bar, lovely and easy and nice, but it's not for novice users maybe</i>					
nt	[Right away chooses to google something, so no hesitation. 17:07 I look for a movie documentary for her. Found it on youtube.] me: "I'm going to conclude the test." Participant: "Good!" me: "You watch tv there while I do wrapping up the gear." (18:40) [she seems glad to watch the documentary]					
	<b>Wilma: Extra Interview (weeks later)</b>					
	me: "You were hesitant, I felt like maybe you got tired?" Wilma: "I'm sure I did" me: "Do you remember at all?" Wilma: "Well I found when we got up there it had been a long time, a couple of hours, and I was tired because it didn't come quickly to me" (2:29)					

time	WILMA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	me: "Do you feel like you do exploring on the computer?" Wilma: "To a limit, yes. If I have things installed for me that I know how to get to. For instance, my son put in youtube last week when he was here. And I've been all over that place. I love it. And I hadn't had that before that I could find easily. Now it's on there and I just push it where the letters say youtube and I'm on and it's wonderful" (3:10)					
	Wilma: "Now I'm curious about twitter. I've been on facebook, but I got off of that because I don't feel secure." (3:22)					
	Wilma: "So yes, I'm motivated to explore more" (3:32)					
	me: "What are your attitudes about learning?" Wilma: "I don't know. If I want to know something, then I learn it, but if I don't have access to somebody, for instance, you tonight, or my kids, who are thousands of miles away, then I don't pursue it. I don't learn more even though I would like to" (4:15)					
	me: "How do you feel about life long learning?" Wilma: "Well I think that it's very important. VERY. Why stop just because you get older. You should start learning more. There's so much out there you don't know. You can't just give up. Besides, it keeps your mind youthful, more youthful let's say. I think." (5:10)					
	me: "So what kinds of things do you do to be learning all the time?" Wilma: "Well, I try to communicate with all my grandchildren. Now the youngest ones, 8 and 10, are on, and I write [email] to them. I've learned skype so I can talk to my granddaughters at college... I love to see what they're doing. Don't always approve of it, but I like to find out." (5:51)					
	me prompting: "Other ways you do life long learning?" Wilma: "Music. You can never get enough music. You always hear pieces you never heard before."					
	Wilma: "I've never had a real lesson. Just a catalog, a book, to follow, with students correct your mistakes as you go along. Never taken a course on computer." (9:10) me: "Is teaching yourself comfortable for you?" Wilma: "No, it's hard. But that's the only way I have time to do it. It's difficult." (9:30)					
	Wilma: "I learn by trial and error. For instance, I type my husband's business letters and sometimes it comes up in the right format and sometimes it doesn't. And that wastes a lot of my time. But I don't know where to go to... well now I have you. But nobody up here in the U.P. knew Mac for years since I've been up here." (9:58)					

time	WILMA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	me: "So you felt a necessity, it sounds like, to learn on your own." Wilma: "Well yes, especially since [husband] needed business letters typed. That was a necessity." me: "So there wasn't any possibility HE would learn it." Wilma: "No. [laughing] He can't even type. And he doesn't want to take the time to learn it, he'd rather be doing architecture and art. I don't mind doing it, I just hate wasting time." (10:48)					
	me: "Do you find that familiarity or using it [computers] with some level of frequency helps?" Wilma: "I find it's quite mysterious. For instance, he and I have both put in ink jets for years, this is the printer I'm talking about. And all of a sudden, the whole thing backfired the other day, yesterday. And I cannot get that printer to work to save my soul." (11:50)					
	Wilma: "I admire people like you." me: "Tell me, why?" Wilma: "Because it seems to come so easily. I don't know if it does. Does it?" me: "Well, it's familiarity and willingness to look stupid. That's a big thing for me. I'm willing to look stupid. At school I'm very stupid compared to my classmates." (13:01)					
	Wilma: "I can't even call for help. I don't like to call for help. It takes too much time. For me. I know kind of how to do it. It's frustrating to have to wait until they find out, from my explanation, what's wrong." me: "So communication is an issue." Wilma: "Yes, and I have two sons on either end of the country that I'm supposed to call, because they're both computer experts, but it's very hard long distance to find the answers." (13:55)					
	Wilma: "I don't use it as much as I ought to probably." me: "Why do you say ought to?" Wilma: "Well, it's sitting there and I'm sure there are much, many learning experiences on that computer, that I could be getting... but it's just too frustrating." (14:30)					
	me: "What made you get a computer in the first place?" Wilma: "Because I wanted to communicate with my kids on opposite ends of the country, with email, and I'll never forget the first answer I got from our son [name] in Seattle. he said, "Wow! Mom's on the web!". Me: "what year was that? In the '90's?" Wilma: "yep." (15:17)					

time	WILMA [action] "quote" (time on video) analysis	stumble	fall	quit	resist	persist
	<p>[has Macs all these years] "Yeah, I can go to the library and use their computers [windows] pretty well. It's not a problem." me: "But see that's your internal motivation I think." Wilma: "What." me: "That you're able to transfer your skills to an unfamiliar system, because that's what you showed in my observation. You transferred your skills fine but you got tired. See I chalk up the times where you didn't transfer skills fine as being age related, or your macular degeneration related. Do you see what I mean?" Wilma: "Yes, it is. Very much so. I get a headache after a while and can't see." (16:17)</p>					
	<p>me: "Were you always curious, would you say it's this a lifelong trait of teaching yourself?" Wilma: "I never thought about it. You just learn automatically because what you're learning is more than you knew before. And I learned music because my roommate took private singing lessons. But then, it was the war, and you learned a lot outside of what you learned in college. You went up the hospital and volunteered for people in the hospital 'cuz the nurses were gone to war. Down the street, was a dormitory which was configured like a ship. The floors were decks, the bathrooms were heads, and uh, so that was exploratory I think. If I hadn't volunteered for those things I wouldn't have learned it." (29:03)</p>					
	<p>me: "I'm just curious about your learning your whole life, because clearly you have an interest in exploring." Wilma: "I think I learned that from my dad. Because he was a newspaper editor and naturally curious, and naturally adventuresome and traveled, like travel, and liked politics, and listened to the radio a lot. So I was taught, just ingrained, to be curious." me: "And he didn't separate boys from girls, or girls don't do that, or anything. He encouraged you." Wilma: "No. He was not, he wasn't perfect, but he would learn to sometimes." me: "He would encourage learning." Wilma: "Yes. As did my grandparents." (30:01)</p>					

