ABSTRACT

PRESENTATION TYPE, PERCEIVED CREDIBLITY AND PERCEIVED VALIDITY: A DOCUMENT USABILITY ANALYSIS

by
Jason Langkamer-Smith

This descriptive research investigated usability measures reported by subjects who reviewed procedures formatted as decision tables and numbered lists taken from a microchip product specification document. The research subjects (n = 15) are employees of Agere Systems (headquartered in Allentown Pennsylvania, United States) where this researcher also worked as a technical writer. Subjects represented various national origins and were stratified into two groups of six Eastern and nine Western.

The independent variables, presentation type, perceived credibility, and perceived validity were studied for their interaction with the dependent variable, usability. The variable model was queried between the two groups. Three findings included the following:

1. Subjects from Western cultures reported higher scores for perceived credibility and perceived validity when reviewing procedures formatted as tables than those formatted as numbered lists ($t = 2.226$, $p = 0.027$).

2. Subjects from Eastern cultures reported higher scores than subjects from Western cultures on measures of perceived credibility when reviewing procedures formatted as both tables and numbered lists ($t = 2.822$, $p = 0.005$).

3. Subjects from Eastern cultures reported lower scores than subjects from Western cultures on measures of perceived validity when reviewing procedures formatted as both tables and numbered lists ($t = -2.120$, $p = 0.035$).

These are preliminary findings; the research was an exploratory effort to derive testable hypotheses for a future study designed to enroll larger populations under more strictly controlled experimental settings.

PRESENTATION TYPE, PERCEIVED CREDIBLITY AND PERCEIVED VALIDITY: A DOCUMENT USABILITY ANALYSIS

by
Jason Langkamer-Smith

A Thesis
Submitted to the Faculty of
New Jersey Institute of Technology
in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Professional and Technical Communication

Department of Humanities

January 2006

APPROVAL PAGE

PRESENTATION TYPE, PERCEIVED CREDIBLITY AND PERCEIVED VALIDITY: A DOCUMENT USABILITY ANALYSIS

Jason Langkamer-Smith

Dr. Norbert Elliot, Thesis Advisor — Date
Professor, Department of Humanities, NJIT

Dr. Nancy Steffen-Fluhr, Committee Member — Date
Associate Professor, Department of Humanities, NJIT

Dr. W. P. Beaton, Committee Member — Date
Professor, Department of Humanities, NJIT

BIOGRAPHICAL SKETCH

Author: Jason Langkamer-Smith

Degree: Master of Science

Date: January 2006

Undergraduate and Graduate Education:

- Master of Science in Professional and Technical Communication
  New Jersey Institute of Technology, Newark, NJ, 2006
- Bachelor of Arts in Journalism,
  Indiana University of Pennsylvania, Indiana, PA, 1993

Major: Professional and Technical Communication

To my wife, Andrea, and daughters, Hannah and Sophia

ACKNOWLEDGMENT

Many thanks to Dr. Norbert Elliot for helping me develop this challenging and fascinating research. I look forward to pursuing further research on topics suggested by this first effort. Dr. Elliot provided constant support and guidance. I would like to thank my committee members who gave valuable time and offered keen insight: Dr. Pat Beaton and Dr. Nancy Steffen-Fluhr. You helped focus my topic and sharpen the results. Many of my fellow distance-learning graduate students in the PTC program deserve recognition for their support. I also wish to thank my supervisor at Agere Systems, Tom Snyder, for his support over the years.

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Objectives

This research investigates the usability measures reported by subjects reviewing procedures formatted as decision tables and numbered lists. Presentation type, perceived credibility and perceived validity are the predictor variables of usability. Subjects (n = 15) are stratified into two groups, Eastern and Western, based on their place of birth and the geographical location of the university where they obtained higher education.

The subjects all have electrical engineering backgrounds and are employees of Agere Systems, where this researcher also works as a technical writer. The content of the survey instrument was derived from a microchip design specification, with which the subjects are familiar. Within the specification, task-oriented procedures are sometimes formatted as tables, while other times they are formatted as numbered lists.

1.2 Background

This original idea for this research came from a request by a field applications engineer (FAE) based in Japan who wanted a supplemental document in addition to the regularly supplied microchip design specification. The FAE asked for the document to contain a complex table with extended descriptions and embedded subtables for each of the microchip's memory registers.

However, the specification's existing tables (of which there were some 350) seemed detailed enough. Why take them out of context to group them together into an even larger "supertable" (Tufte 179). It became a dense, chaotic blend of textual information and tables within tables. In this researcher's opinion, the effect seemed to decrease document usability. Even so, the FAE approved. Moreover, he requested another such document for the next-generation microchip.

The question raised by this background information is simple: why would someone want to strip down a 400-page reference document to see only 100 pages of tabularized data? Had the document's size simply grown too unwieldy? Perhaps a particular cultural preference drove the request. Or was it the singular eccentricity of an enthusiastic FAE?

The research questions are valid considering the increasing volume of complexly tabularized information documented in the global semiconductor industry. Similar engineering specifications were examined and found to be comparable to the documents under investigation for this research. The research topic appears to hold relevance for all semiconductor manufacturers.

CHAPTER 2

LITERATURE REVIEW

2.1 Lee Brasseur

Tables have a long history from ancient Sumerians to Ptolemy and Gutenberg. They originated about 4,000 years ago (Brasseur 103). In the West before the Renaissance, tables became politicized. The grid was a way of "organizing information on a page and its initial design seems to have been tied into the idea of establishing hierarchy reflecting the dominate ideology at the time" (104). For example, in Medieval manuscripts, religious figures often appeared on a page pointing to a column of text. The reader could infer that block of information held greater importance, perhaps divine significance. Even an illiterate person might observe the urgent relationship between the column of text and the illustration of a burning heretic pointing to it. The layout itself contained an unwritten statement about law and order. It inferred a hierarchy between God and man, or between ruling church officials and common serfs. All of it, however, was based on an underlying gridded form, upon which each page was developed. Gutenberg's 42-line Bible of 1455 used a simple line-based grid to position double columns of text. See Figure 2.1.

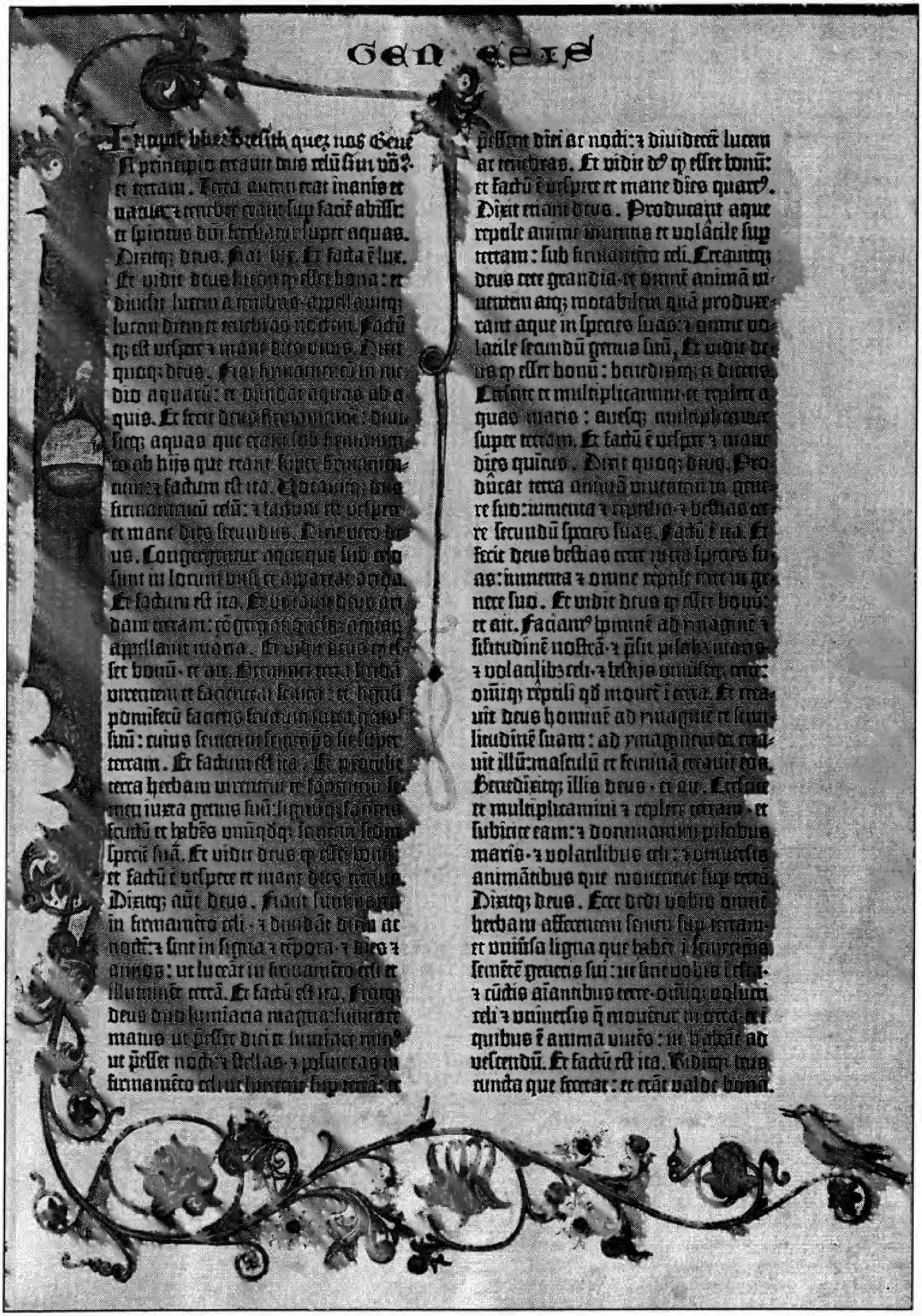

Figure 2.1 Page from Gutenberg's 42-line bible.

During the Renaissance, as society began to develop a more secular understanding of reality, the grid helped establish hierarchy through ordered comparison of symbolic or numerical information. It reflected a culture's view of the place of the individual in a natural world. A grid became a way to organize the world onto a page. But it was more than a simple organizational tool. The conceiver of an ordered grid often sought to gain territory or political power. According to Daru, "gridding is a means of mastering geographical space, and controlling those occupying it" (197).

The grid has evolved into our current understanding of the tabular form, which is characterized by these attributes, according to Brasseur: 1) a matrix with rows and columns; 2) a title placed above or below the table; 3) row and column headings; and 4) grid lines (101). The modern table is a scientific instrument. It is an objective lens for more clearly viewing the world and its complexities. Like the lens of a microscope, a table can be adjusted to focus in on areas of interest. Jacques Bertin defined this kind of table as a "re-orderable matrix" (256). The re-ordering characteristics of a table contribute immensely to its capability for clarity. A table condenses large amounts of data into a more visual arrangement that can be carefully analyzed, a process Bertin describes as "permutation." Bertin gives the example "Typology of Ionic Capitals" to illustrate this.

The Ionic capital is an architectural element. It is the head or crowning feature of a column or pilaster. See Figure 2.2.

Figure 2.2 Example of Ionic capital.

Bertin showed how eighty-two samples of capitals were studied to develop a single table summarizing all the major criterion. The table was developed by Ph.D. student D. Theodorescu in 1973 to investigate the essential aspects of Ionic capitals. Before his research, various classifications had emerged, but none was accepted as most accurate or correct. Theodorescu gathered it all together into one table, and then studied the similarities to discover the "most representative indicators" of an Ionic capital (Bertin 256).

The research yielded a table of 82 columns (the actual Ionic capitals investigated) by 78 rows (the "indicators" or characteristics of each capital) with approximately 40 different subcategories among the rows and four subcategories among the columns. The row headings, or stub, appear along the right side with the data points in the center-left. To give the reader a feel for the complexity of this design, the actual table has been shrunk to fit this page and reproduced in Figure 2.3.

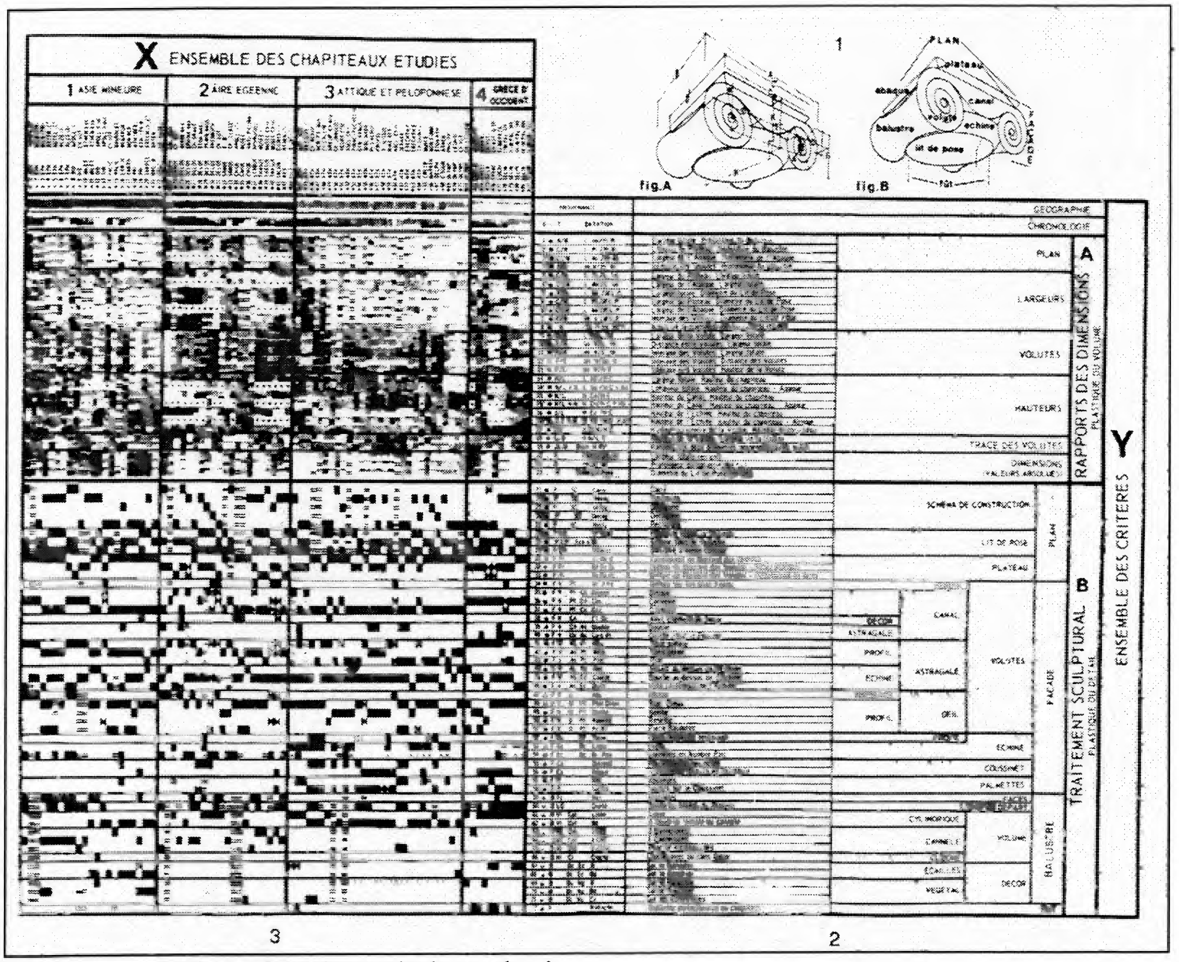

Figure 2.3 Table of Ionic capital typologies.

The table allowed for careful comparison and ultimately a breakthrough methodology for accurately categorizing Ionic capitals. Perhaps we would be less likely to see such a table in print today. The data would probably reside in an electronic database, or in a series of spreadsheets. The Ionic capitals table itself is a type of database, with all its elements exposed for scrutiny. Interestingly, it was constructed entirely without numerical data.

In the upper half of the data points area, each cell is filled in with a single block of gray, on a scale of nine different shades. These shades represent the measured ratios or dimensions of a capital. In the lower half of the data points area, 50 yes-no indicators are recorded about each capital, (e.g., balustre, plateau, canal, etc.) Cells for these indicators appear four different ways: filled in to indicate "yes" (the presence of a characteristic), left empty to indicate "no" (the absence of a characteristic), marked "=" to indicate missing data, or marked "▶◀" to indicate doubtful data.

Even without numerical data, the Ionic capitals table is a powerful instrument. But more often, data tables contain numbers. Brasseur notes that a table is designed for inspection and close reading of text and numerical data (102). A table that displays numerical data is especially persuasive. Because a table displays mathematical content, its nature is to convey a higher form of truth, particularly in cultures where numbers represent data found through careful study using the scientific method. There is an underlying "ethos" associated with tables, whereby the reader must trust that the researcher has first used time-tested methods accepted by the scientific community. Numbers comprise the language of mathematics, which is an objective discipline. A table of numbers, therefore, "takes on a distanced representation from the circumstances in which it occurred and may be more persuasive in many circles because of the ethos associated with anything that is mathematically rendered"(110).

Brasseur is suggesting that, "in certain circles," a table—in and of itself—indicates a higher standard of truth or credibility. The very choice to include a table within the flow of text allows an author to make an implied statement about the importance and credibility of his findings. The reader can assume the data shown in the table is both credible and important (otherwise it would not merit its own table). Is this true for tables that contain non-numerical data, such as a logic table used to display steps of a procedure? And if so, does the implication manifest itself across cultures? The questions of credibility and culture have been recently investigated by Spyridakis and Freeman.

2.2 Jan Spyridakis and Krisandra Freeman

Spyridakis and Freeman provided evidence that certain cues contained within the flow of a text will affect reader judgments of the credibility of information. They conducted a 2 × 2 × 2, between subjects, factorial design experiment. (246). One of their findings showed that the presence of a street address on a webpage containing medical information will either increase or decrease credibility, depending on the reader background. In this case, the street address is an external "cue" guiding reader impression of credibility. "In some cases it will increase credibility, and in other cases it may decrease credibility" (258).

Like a street address on a webpage, a table in a technical document may act as a powerful "cue" to help orient readers and determine their perceptions of information credibility. On a webpage, the reader is wondering how to validate the information she is reading. In a scientific document, a reader is wondering, "how valid is this data?" Just as a street address may impart credibility to a webpage, a table may provide an implicit message of credibility to a technical document. It says the information can be verified by data, which itself was derived using the scientific method.

They reported that credibility "is a perceived quality; it doesn't reside in an object, a person, or a piece of information" (240). In their research, credible refers to a perception of credibility rather than a direct measure of actual quality. Credibility is a complex construct that has been associatively defined with various measures, such as follows: believability, trust, and perceived reliability (Self); trustworthiness and expertise (Hovland and Weiss); honesty (Priester and Petty); accountability, objectivity, and character (Swenson, Constantinides, and Gurak).

Spyridakis and Freeman developed an instrument for measuring perceived credibility. Based on extant studies, they derived the following variables for perceived credibility: *accurate*, *biased*, *credible*, *expert*, and *trustworthy*. Two of these variables have been adopted in this research: *accurate*, and *credible*. A third, *dependability*, has been added based on various studies (Shenton, Guba, Lincoln).

CHAPTER 3

RESEARCH DESIGN

3.1 Process

The research enrolled 15 participants with various cultural backgrounds (both Eastern and Western) in a study measuring the usability of two different layout formats: tables and numbered lists. The survey instrument was developed with four real-world procedures taken from a microchip product specification document. All subjects were familiar with the document, but perhaps not with the specific examples. Each of the four procedures was followed by six survey questions that measured usability.

The survey also included eight questions to gather statistical information about each participant, a one-page consent form, a single page of instructions, and room for open-ended comments. The entire survey (12-pages) was developed as a read-only Microsoft® Word® document with clickable check boxes and text boxes in which subjects typed their responses. It was administered electronically as an email attachment in two rounds: a pilot study and a final release. As there were no revisions made after the pilot study, both sets of results are grouped together in this research. The entire survey is included as Appendix A of this document.

After surveys were returned, subjects were stratified into Eastern or Western groups based on their answers to questions 20 (geographical location of the university where they received higher education) and 23 (place of birth). The study population (n = 15) was thus stratified into two groups of Eastern (n = 6) and Western (n = 9).

This grouping does not fully measure culture, which is a complex construct. The grouping is, instead, a surrogate for the culture variable. According to Lenartowicz and

Roth, "to quantify or measure culture, business researchers often use values models, assessing the importance of various values to members of a cultural group. Within this approach, a number of different instruments have been developed" (24). To measure workplace culture, for example, a researcher might employ the Values Survey Module (1994) by Geert Hofstede. Because of the practical realities of this research, however, administering such a survey was not possible. Thus a simple surrogate variable was used instead of a more complex construct.

Subjects read two procedures formatted as tables, and two formatted as numbered lists. Each described a series of microchip operation commands. Subjects were not required to actually carry out the steps in each procedure, only read them. The procedures formatted as tables were titled "Procedure to Recover from Deep Coma Mode," and "Procedure to Write an RRO Field to the Disk." The procedures formatted as numbered lists were titled "Procedure to Enter Deep Coma Mode," and "Procedure to Read an RRO Field from the Disk." For example, the first procedure formatted as a numbered list began as follows:

The following procedure describes how to enter DEEP COMA mode:

1. IDLE mode is the starting point.
   - Set SLEEP = 1.
   - Set SLEEP3V = 1.

   Chip is in IDLE mode.

Figure 3.1 Example of numbered list procedure.

The first procedure formatted as a table began as follows:

Table 1. Procedure for Recovering from DEEP COMA Mode

Step	Action	Mode	Notes
1	Set POWERON_V3 = 1.	SLEEP	This generates a chip reset. As a result, this will also reset RG_LVL != 31 (to its default), and power up the 1.2 V digital. Therefore, the chip does not transition into COMA mode when it exits DEEP COMA mode.

Figure 3.2 Example of table procedure.

3.1.1 Questions to Test Perceived Credibility

Subjects rated the perceived credibility of each procedure. Perceived credibility was captured in three measures, accurate, credible, and dependable, on a five-point Likert scale. For example, the credibility questions following the Procedure for Recovering from DEEP COMA Mode appeared as follows:

5. The procedure to recover from DEEP COMA mode is:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Accurate	1 ■	2 ■	3 ■	4 ■	5 ■
Credible	1 ■	2 ■	3 ■	4 ■	5 ■
Dependable	1 ■	2 ■	3 ■	4 ■	5 ■

Figure 3.3 Credibility measures.

3.1.2 Questions to Test Perceived Validity

Three questions for each procedure tested perceived validity. Perceived validity was captured in three measures, performance, comprehension, and format, on a five-point Likert scale. The item measuring performance was this: "How easy or difficult would it be to perform the steps in the procedure (for example, on a bench setup)? The item measuring comprehension was this: "Was the information in the procedure easy or difficult to understand?" Both included the following scale: Very Easy, Easy, Neither Easy Nor Difficult, Difficult, Very Difficult. The "format" item was this: "The format (look and feel) of the procedure was:" It included the following scale: Very Good, Good, Neither Good Nor Bad, Bad, Very Bad.

See the Appendix for the complete survey including all procedures and questions.

3.2 Sampling Plan

This researcher works for Agere Systems with about 20 applications engineers who regularly use the document under investigation. The study contacted all 20 subjects. Some of the engineers live and work in China, India, Russia, Singapore, and South Korea, while others were born abroad, but now live and work in North America.

This purposive or judgment sampling population represents an important group of key informants. Applications engineers, more than most other Agere Systems employees, work closely with customers. They may even maintain offices inside customer facilities, working side-by-side with customer engineers to explain and troubleshoot microchip operations. Short of actually contacting a random sample of customers (which was not permissible), this researcher chose applications engineers as trusted informants. The sampling plan assumed that an engineer who lives and works in Japan, for example, would closely reflect the culture and preferences of the customers he interacts with on a daily basis, and who also use the microchip product specification being investigated. A customer-focused sampling plan was undertaken to ultimately investigate ways to improve the documentation using customer opinions and ideas.

3.2.1 Cultural Stratification

Culture remains one of the most difficult and significant research subjects today. In the technical communications realm, Qiuye has found that Chinese readers often appreciate contextual and technical information provided in visual or graphic formats (553). If the table is thought of as a type of visual design element (Brasseur 103), then is it perceived more favorably in Eastern cultures? Or, as Brasseur suggests, is the table perceived more favorably in Western cultures where its long tradition among scientific circles has surrounded it with a well-respected ethos?

According to Scollon and Scollon, two major aspects of culture which are most significant for understanding systems of discourse include ideology and socialization (127). To measure workplace culture, for example, a researcher might employ the Values Survey Module (1994) by Geert Hofstede, which is a 26-item questionnaire developed for comparing culturally determined values of people from two or more countries or regions. It allows scores to be computed on five dimensions of national or regional culture, on the basis of four questions per dimension. Because of the practical realities of this research, however, administering such a survey was not possible. Thus simple demographic variables were used instead of a more complex construct. The measures chosen (place of birth, nationality, primary and secondary education) are all facets of culture, but not major dimensions.

The current research asked subjects to report where they obtained their education, how many years of education they obtained, their current nationality, and their nationality at birth, if different. See Appendix A for a complete list. Subjects were stratified into two groups, Eastern and Western, based on their answers to these demographic questions.

3.3 Variables

This research was a descriptive study that resulted in base-line data about the variable model. The data and design generated information for further study. The variable model is outlined in Figure 3.4.

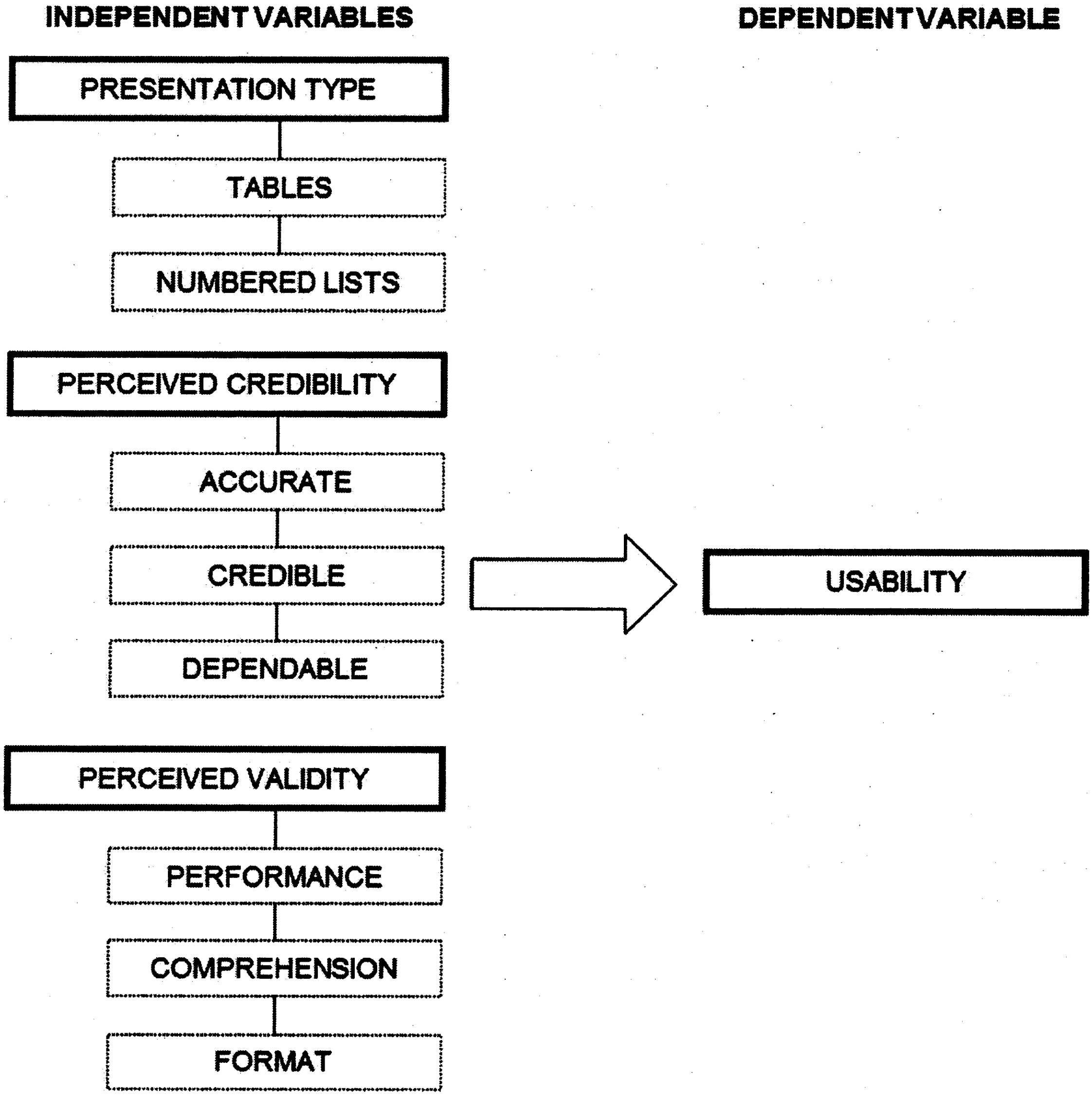

Figure 3.4 Research variables.

3.3.1 Independent Variable Presentation Type

The presentation type variable includes two levels: tables and numbered lists. They represented the two types of formatting choices apparent in the microchip product specification. A numbered list is, traditionally, the most common method used to format a procedure (Killingsworth 437). However, the microchip product specification included numerous examples of procedures formatted as tables. These types of tables, which contain instructions rather than numerical data, are referred to as logic or decision tables in the literature (Brasseur 105, Horn, Farkas). These two formatting choices, numbered lists and tables, represented two equally valid selections to the community of authors who wrote the microchip product specification. Most of the authors were design engineers who developed the chip's circuitry, and then subsequently documented their work. Some wrote original content while others edited existing text often dating back more than ten years or six microchip generations. All, however, used electronic word processing software to complete their authoring tasks. The software allowed for both numbered-list and table formatting choices. Therefore, both were equally available selections.

While the choice of selecting one or the other formatting option was equally valid, the resulting consequence to the reader's perception of usability was unclear. Would the reader feel more comfortable with the annotated steps of a logic table, or with instructions set forth in a numbered list? These two formatting choices represent stylistic preferences so common as to be taken for granted by most writers and content providers. Yet researchers have not overlooked the two. Numerous studies have investigated the impact of tables vs. lists on usability (Coll & Coll 1994), performance (Gonzalez, Cleotilde, & Golenbock), decision making (Jarvenpaa & Dickson), reaction (Peterson), judgment (Sanfey & Hastie, Umanath & Vessey), and recall (Umanath & Scamell).

3.3.2 Independent Variable Perceived Credibility

Spyridakis and Freeman developed an instrument for measuring perceived credibility of online health information sources. Based on extant studies, they selected the following variables to measure the construct of perceived credibility: accurate, biased, credible, expert, and trustworthy. Two of these variables have been adopted in this research: accurate, and credible.

A third variable, dependability, has been added based on the results of Berlo, Lemert, and Mertz (1969) who first investigated the criteria actually used by receivers in evaluating message-source credibility. They asked respondents to evaluate 18 information sources (e.g., magazines, newspapers, etc.) on 83 separate scales. Each scale used an adjectival pair such as "Honest-Dishonest," "Unbiased-Biased," or "Objective-Subjective." A four-factor solution was found to reveal the major dimensions of perceived credibility: Safety, Qualification, Dynamism, and Sociability. The adjectival pair "Dependable-Undependable" loaded on the strongest dimension of Safety. It was selected (along with accurate and credible) for the current research.

3.3.3 Independent Variable Perceived Validity

To further quantify the dependent variable, perceived usability, three additional measures were used: performance, comprehension, and format. These measures were adopted from suggestions by Dumas and Redish. Since the subjects in this research all use the microchip product specification in their daily work environment, they have all "had an opportunity to gain some perspective about their impressions of its usability" (211). Therefore, it is useful to include structured questions about the overall ease of use or difficulty for each procedure. The measures of perceived validity were included to capture these impressions, which is defined here as performance, comprehension and format.

3.3.4 Dependent Variable Usability

The dependent variable, usability, is quantified by eight measures, two for presentation type (tables and numbered lists), three for perceived credibility (accurate, credible, dependable) and three for perceived validity (performance, comprehension, format).

3.4 Hypotheses

The Berlo et al. study suggested further research to test the concept of perceived credibility across cultures. "Research in progress is testing the cultural generalizability of the concept, and investigating the possible cultural values that affect the structure of source evaluations" (576). The hypothesis that follows takes into account the effects of presentation type, perceived credibility, and perceived validity on usability:

H0: There is no difference among the predictor variables (presentation type, perceived credibility and perceived validity) and the dependent variable (usability) that can be identified by Eastern and Western cultural groups.

H1: There is a difference among the predictor variables (presentation type, perceived credibility and perceived validity) and the dependent variable (usability) that can be identified by Eastern and Western cultural groups.

H1 tests whether subjects will report any measurable differences in the usability of one procedure presentation type (e.g., table) over another, (e.g., numbered list) as quantified by the predictor variables (accurate, credible, dependable, performance, comprehension, format). This variance, if detected, will be examined for statistically significant differences in means using two-tailed t-tests between Eastern and Western groups.

CHAPTER 4

RESULTS

Results of the study suggested three research hypothesis:

1. Will subjects from Western cultures report higher scores for perceived credibility and perceived validity when reviewing procedures formatted as tables than those formatted as numbered lists?

2. Will subjects from Eastern cultures report higher scores than subjects from Western cultures on measures of perceived credibility when reviewing procedures formatted as both tables and numbered lists?

3. Will subjects from Eastern cultures report lower scores than subjects from Western cultures on measures of perceived validity when reviewing procedures formatted as both tables and numbered lists?

4.1 Demographics

The study gathered demographic information about job type, age, education, and nationality. Of the 20 subjects contacted, fifteen responded. One did not complete the questions measuring perceived credibility, but did complete all other questions. Twelve males and three females took part in the study. The average age range was 35 to 39. The average number of years of formal education was 15. Eight subjects received their formal education at a Western university, while six received formal education from an Eastern university. Two respondents indicated they received an education from both Eastern and Western universities. Both were born and raised in China. Therefore, those respondents were grouped with others from Eastern cultures.

Eight subjects reported U.S./American citizenship. Two reported Singapore citizenship and the remaining four subjects reported citizenship from the following: Korea, Russia, China, and India.

4.2 Presentation Type

Table 4.1 summarizes the means of all data for the presentation type variable.

Table 4.1 Means for Culture and Presentation Type (n = 15)

	Eastern	*Western*
Tables	3.042	3.118
Numbered Lists	2.986	2.804

The means in Table 4.1 represent the measures reported for both perceived credibility and perceived validity. For example, the first value (3.042) represents the mean score for subjects from the Eastern group of all variables for the presentation type tables. It is derived from six measures, three from perceived credibility (accurate, credible, dependable), and three for perceived validity (comprehension, performance, format). In reading Table 4.1, we will first examine the rows (Tables and Numbered Lists) by reading across. We will then examine the columns (Eastern and Western) by reading down.

In examining the row for tables (3.042 vs. 3.118), we see that Eastern subjects reported lower scores than Western subjects. But the difference in means is not significant ($t = -0.465$, $p = 0.642$). In examining the row for numbered lists (2.986 vs. 2.804), we see that subjects from the Eastern group reported higher scores than subjects from the Western group. But again, the difference in means is not significant ($t = 1.100$, $p = 0.273$).

In examining the column for Eastern (3.042 vs. 2.986), we see subjects reported a higher score for tables than for numbered lists. But the difference in means is not significant (t = 0.290, p = 0.772). In examining the column Western (3.118 vs. 2.804), we see subjects reported a higher score for tables than for numbered lists. The difference in means is significant (t = 2.226, p = 0.027). This is the first significant result of the study, and suggests a specific research hypothesis: "Will subjects from Western cultures report higher scores for perceived credibility and perceived validity when reviewing procedures formatted as tables than those formatted as numbered lists?"

4.3 Perceived Credibility

Table 4.2 summarizes the means of all data for the perceived credibility measures.

Table 4.2 Means for Culture and Perceived Credibility (n = 14)

	Eastern	*Western*
Accurate	3.958	3.438
Credible	3.875	3.594
Dependable	3.709	3.500
Mean	**3.847**	**3.511**

The means in Table 4.2 represent the measures reported for perceived credibility for both presentation types, tables and numbered lists. For example, the mean value in the last row of the first column (3.847) represents the score for subjects from the Eastern group of the accurate, credible and dependable variables for both presentation types, tables and numbered lists. In reading Table 4.2, it is necessary to examine only the last row, "Mean," by reading across.

In examining the row for mean scores for the perceived credibility variable (3.847 vs. 3.511), we see that subjects from the Eastern group reported higher scores than subjects from the Western group. The difference in means is statistically significant (t = 2.822, p = 0.005). This suggests a second research hypothesis: "Will subjects from Eastern cultures report higher scores than subjects from Western cultures on measures of perceived credibility when reviewing procedures formatted as both tables and numbered lists?"

4.4 Perceived Validity

Table 4.3 summarizes the means of all data for the perceived validity variable.

Table 4.3 Means for Culture and Perceived Validity (n = 15)

	Eastern	*Western*
Performance	2.334	2.528
Comprehension	2.250	2.556
Format	1.959	2.334
Mean	**2.181**	**2.472**

The means in Table 4.3 represent the measures reported for perceived validity for both presentation types, tables and numbered lists. For example, the mean value in the last row of the first column (2.181) represents the score for subjects from the Eastern group of the performance, comprehension, and format variables for both presentation types, tables and numbered lists. In reading Table 4.3, it is necessary to examine only the last row, "Mean," by reading across.

In examining the row for mean scores for the perceived validity variable (2.181 vs. 2.472), we see that subjects from the Eastern group reported lower scores than subjects from the Western group. The difference in means is statistically significant ($t = -2.120$, $p = 0.035$). This suggests a third research hypothesis: "Will subjects from Eastern cultures report lower scores than subjects from Western cultures on measures of perceived validity when reviewing procedures formatted as both tables and numbered lists?"

4.5 Sources of Error

This study's sampling plan was limited by the number of responses (n = 15). While an n of 30 or less is ideal for t-tests (Bernard 546), an n of 15 may be too low for accurate statistical inference. The research was offered as a more descriptive analysis. As such, it might be described as a hypothesis-generating study for the benefit of similar future research designed to enroll larger populations under more strictly controlled experimental settings.

CHAPTER 5

CONCLUSIONS

Within the limits of the study, the present research concludes there was a link among the predictor variables (presentation type, perceived credibility, and perceived validity) and the dependent variable (usability) that was evident when subjects were stratified into culturally based groups of Eastern and Western. Items were measured on a five-point Likert scale with 1 indicating the lowest score and 5 indicating the highest score. Two-tailed t-tests revealed statistically significant differences in means between subjects from the Eastern and Western groups. These differences occurred for the presentation type variable, and both the perceived credibility variable and perceived validity variables. The research was an exploratory effort to derive testable hypotheses in a different study. Three such hypotheses are as follows:

1. Will subjects from Western cultures report higher scores for perceived credibility and perceived validity when reviewing procedures formatted as tables than those formatted as numbered lists?

2. Will subjects from Eastern cultures report higher scores than subjects from Western cultures on measures of perceived credibility when reviewing procedures formatted as both tables and numbered lists?

3. Will subjects from Eastern cultures report lower scores than subjects from Western cultures on measures of perceived validity when reviewing procedures formatted as both tables and numbered lists?

These variations present an intriguing question. The findings may indeed be culturally determined. But they may also be based on the particular information content properties of the microchip product specifications from which the survey examples were taken. Coll and Coll (1994) note there is no one, best-fit format for all subjects. What is needed, instead, is a more complex, multi-factor approach to experiments like this in which researchers test for various effects. Consider the task type, for example. Or factor in the education specialty of each subject, or perhaps the information complexity of each task (84). Such experimentation is beyond the scope of this study, which (particularly because of its low n) was designed more as a hypothesis-generating investigation.

The most general conclusion is clear: usability is a real phenomenon, and as such, technical communicators must be aware of it in all its various dimensions—including cultural determinants. Culture is certainly a useful dimension in predicting document usability. Therefore, when developing documentation, be cognizant of your audience background, and take care to use thoughtful design choices. Be aware that readers from different cultures bring with them different expectations and preferences. Do not use a complex table when a simple numbered list will do, or conversely, consider expanding a numbered list into a multi-column "logic-decision" table if your readers need more detailed explanations (Brasseur 105). Each discrete design choice will compound across the whole document to have an overall effect on usability. These design choices, therefore, must be made with foresight and audience awareness.

Document designers must become more aware of reader backgrounds, preferences, and culture. While some readers may feel comfortable with the format of numbered lists, others may see tables as a more accurate presentation type. But these preferences are likely localized to a specific group using a specific document. To deliver the most usability, the reader-context must be understood before design elements are chosen.

APPENDIX

RESEARCH SURVEY

This appendix contains the complete research survey administered to participants.

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY	Tables, Credibility and Culture: A Quantitative Study
NAME OF INVESTIGATOR	Jason Langkamer-Smith
NAME OF CO-INVESTIGATOR(S)	Norbert Elliot, Ph.D., New Jersey Institute of Technology
RESEARCH STUDY INVITATION	We invite you to participate in a research study of document design and usability.
PURPOSE	The study results may be used to improve document usability at Agere Systems.
PROPER AWARENESS	This consent form gives you general information about the research study.
DURATION	Your participation in this study will last approximately 45 minutes.
PROCEDURES	You will read procedures and complete 30 survey questions.
SUBJECTS	You are one of about 20 subjects to participate in this study.
RISKS/DISCOMFORTS	There are no physical or emotional risks/or discomforts.
BENEFITS	There is no direct benefit from your participation in this study. Your responses may be used to help improve the usability of Agere documentation.
CONFIDENTIALITY	Any personal information, such as your name, is strictly confidential. You will remain anonymous when the study results are tabulated.
RIGHT TO REFUSE OR WITHDRAW	Your participation is voluntary. You can refuse to participate at any time.

CONTACTS

Jason Langkamer-Smith
Applications Support Specialist
Agere Systems
1110 American Parkway NE
Lehigh Valley Central Campus
12D-229C
Allentown, PA 18109
610-712-8622
610-712-4649 – fax
langkamersmith@agere.com

Norbert Elliot, Ph.D.
Professor of English
Dept. of Humanities & Social Sciences
New Jersey Institute of Technology
University Heights
Newark, NJ 07102
(973) 596-6487
elliot@adm.njit.edu

SIGNATURES

I have read this entire form and I understand it completely. I agree to participate in this research study.

Enter your name for consent purposes only.

You will remain anonymous when the study results are tabulated.

______

Enter the Date

______

Instructions

On the following pages you will find procedures from an Agere read channel product specification. You are not required to perform the steps, only to read the material.

Read the first procedure, and then answer the survey questions following it. Read the next procedure, and then answer the survey questions following it. Continue until you have read each procedure and answered all the survey questions.

On the last two pages, you will find survey questions for statistical purposes. All information is confidential.

This is an interactive survey, so you can answer questions by clicking in the form fields. You can type in text fields where required.

If you prefer, you can print the survey, and then answer the questions by hand.

Select only one answer per question.

The study should take less than 30 minutes to complete. When you are finished, save this document and email it to Jason Langkamer-Smith at the following address: langkamersmith@agere.com

You may also fax your results to 610-712-4649
If you fax your results, please contact Jason by email or phone: 610-712-8622

Thanks for your cooperation.

Go to the next page to begin.

Procedure to
Enter DEEP COMA Mode

DEEP COMA Mode Introduction
With the crystal driver powered down (ENREFCK = 0), the DEEP COMA mode feature allows an extremely low, in the order of several μA, leakage current for the overall read channel. By setting the POWER_ON pin to 0, the leakage current path from the 3 V supply is completely cut off to the read channel, except for the 3 V SIF and the crystal driver. Additionally, the supply comparators and their bandgap circuitry are also powered down.

The following procedure describes how to enter DEEP COMA mode:

1. IDLE mode is the starting point.
   - Set SLEEP = 1.
   - Set SLEEP3V = 1.
     Chip is in IDLE mode.

2. Put chip in SLEEP mode.
   - Set PD_AFE = 1.
     Chip is in SLEEP mode.

3. Put chip in COMA mode.
   - Set RG_LVL[4:0] = 31.
     This asserts COMA mode.
   - *For an SoC only*: Set SOCRGLV[4:0] = 31.

4. Put chip in DEEP COMA mode.
   - Set POWERON_V3 = 0.
     Chip is in DEEP COMA mode. This overrides the weak pullup.

Survey questions for
Procedure to Enter DEEP COMA Mode

1. The procedure to enter DEEP COMA mode is:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
Accurate	☐	☐	☐	☐	☐
	1	2	3	4	5
Credible	☐	☐	☐	☐	☐
	1	2	3	4	5
Dependable	☐	☐	☐	☐	☐

2. How easy or difficult would it be to perform the steps in the procedure (for example, on a bench setup)?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1	2	3	4	5
☐	☐	☐	☐	☐

3. Was the information in the procedure easy or difficult to understand?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1	2	3	4	5
☐	☐	☐	☐	☐

4. The format (look and feel) of the procedure was:

Very Good	Good	Neither Good Nor Bad	Bad	Very Bad
1	2	3	4	5
☐	☐	☐	☐	☐

Procedure to
Recover from DEEP COMA Mode

The following procedure describes how to recover from DEEP COMA mode.

Table 1. Procedure for Recovering from DEEP COMA Mode

Step	Action	Mode	Notes
1	Set POWERON_V3 = 1.	SLEEP	This generates a chip reset. As a result, this will also reset RG_LVL != 31 (to its default), and power up the 1.2 V digital. Therefore, the chip does not transition into COMA mode when it exits DEEP COMA mode.
2	■ Set PD_AFE = 0. ■ Set SLEEP3V = 0. ■ If GPIO = 0, set SLEEP = 0. ■ Optional: ■ If GPIO = 1, set SLEEP = 0.	IDLE	Chip is in IDLE mode. In step 1 above, SLEEP will be reset either HI or LOW based on the state of GPIO0. Therefore, at that time, setting SLEEP = 0 is not necessary if GPIO0 = 1 during the powerup reset sequence.
3	■ Write all SIF bits as desired for normal operation.	IDLE	—
4	■ Do a full calibration.	CAL	Chip is in CAL mode. Full calibration is required when recovering from DEEP COMA mode.
5	■ Do a servo event.	SERVO	Chip is in SERVO mode. A servo event is required, even if it is a dummy event. This will latch in the calibration factors.
6	■ Do READ, WRITE, or true SERVO events.	READ/ WRITE/ SERVO	Chip is in READ/WRITE/SERVO mode. READ, WRITE, or true SERVO events can be done at this point.
7	■ Go back to IDLE.	IDLE	—

Survey questions for
Procedure to Recover from DEEP COMA Mode

5. The procedure to recover from DEEP COMA mode is:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Accurate	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Credible	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Dependable	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

6. How easy or difficult would it be to perform the steps in the procedure (for example, on a bench setup)?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

7. Was the information in the procedure easy or difficult to understand?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

8. The format (look and feel) of the procedure was:

Very Good	Good	Neither Good Nor Bad	Bad	Very Bad
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Procedure to
Write an RRO Field to the Disk

The following steps must be followed when writing an RRO field to the disk. These steps ensure that the read channel can only write in one servo wedge before receiving another instruction from the controller.

Table 2. Steps for Writing an RRO Field

Step	Function
1a	Set RRO_SP[7:0] to account for the latencies of the write and read head from the beginning of the last burst.
1b	Set RRO_MD = 1.
1c	Set RRO_POL to the correct polarity.
1d	Set RRO_PAD[2:0] to allow the preamp to switch to write mode.
1e	Set RRO_LEN[5:0] to control the length of the RRO field.
1f	Set RRO_PAR[1:0] to add even/odd or no parity bit to the RRO field.
1g	Set RRO_TOG to control the polarity of the disk after the RRO field.
1h	Set PECLPDN = 0 to keep WRD, WRDB powered up.
1i	Set WRPO_SRC = 0 to allow the channel to control the WRPO pin.
2	Write to RRO_WD1 register, (<= 16 RRO bits) or, write to RRO_WD1 and RRO_WD0 registers, (>16 RRO bits)
3	Assert servo gate.
4	Detect sync mark with high quality.
5	Read channel will now take over the functionality of the WRPO pin. An internal signal OK2WRITE will be asserted. Note: Any input from the WRGATE pin will now be ignored.
6	Read channel will assert the WRPO line to the preamp after the RRO_SP[7:0] spacer.
7	Read channel will write the pad, sync mark, data, parity bit, and toggle bit. The RRO field will be written at 4T/bit. (Toggle bit is 1T wide).
8	Read channel will deassert the WRPO line.
9	Deassert servo gate and give back functionality of WRPO pin to the controller after the RRO field is written.
10	If SAM is not detected with high quality or the servo gate is prematurely deasserted, the RRO write will be aborted and RRO_ABRT will be set high. (RRO_ABRT will be cleared at the next rising edge of servo).
11	Go to step two, to write RRO field for next servo wedge.

Survey questions for
Procedure to Write an RRO Field to the Disk

9. The procedure to write an RRO field to the disk is:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Accurate	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Credible	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Dependable	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

10. How easy or difficult would it be to perform the steps in the procedure (for example, on a bench setup)?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

11. Was the information in the procedure easy or difficult to understand?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

12. The format (look-and-feel) of the procedure was:

Very Good	Good	Neither Good Nor Bad	Bad	Very Bad
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Procedure to
Read an RRO Field from the Disk

The following steps must be followed when reading an RRO field from the disk:

1. Set RRO_SP[7:0] to account for the latencies of the read head from the beginning of the start of the next to last burst. For example, if 4 bursts A,B,C,D, then spacer starts at beginning of burst C.
   - Set RRO_MD = 2 to read RRO data.
   - Set RRO_POL to the correct polarity.
   - Set RRO_LEN[5:0] to control the length of the RRO field.
   - Set RRO_PAR[1:0] to the correct polarity of the parity bit or 0 if there is no parity.
2. Assert servo gate.
3. The read channel will begin searching for the RRO sync mark after the spacer (RRO_SP[7:0] + 1) × 2T. The RRO sync mark search will last for programmable duration as defined by RRO_WCTL[2:0].
4. If the RRO sync mark is found, the SIF bit RRO_SM[1:0] will be set to 3 (high quality). If the sync mark is not found within the specified window, RRO_SM will be set to 1.
5. After the RRO sync mark is found (or forced), the read channel will read RRO_LEN[5:0] + 1 RRO data bits and 1 parity bit. The data will be right justified so that the LSB will be stored in RRO_D00. Note: This is different than when writing the RRO field.
6. If the servo gate is deasserted before the read channel is finished reading the RRO field, the SIF bit RRO_ABRT will be set high.
7. If parity is not achieved, the SIF bit RRO_PERR will be set high.
8. If RRO_PERR = 1 and RRO_HIGH = 1, then set RRO_D[1:0][15:0] = 0xFF.
9. Read RRO_D[1:0][15:0], RRO_SM[1:0], RRO_ABRT, and RRO_PERR out the serial interface after servo gate has fallen.
10. Go to step 2 to read the RRO field in the next servo wedge.

Survey Questions for
Procedure to Read an RRO Field from the Disk

13. The procedure to read an RRO field from the disk is:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
Accurate	☐	☐	☐	☐	☐
	1	2	3	4	5
Credible	☐	☐	☐	☐	☐
	1	2	3	4	5
Dependable	☐	☐	☐	☐	☐

14. How easy or difficult would it be to perform the steps in the procedure (for example, on a bench setup)?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1	2	3	4	5
☐	☐	☐	☐	☐

15. Was the information in the procedure easy or difficult to understand?

Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
1	2	3	4	5
☐	☐	☐	☐	☐

16. The format (look and feel) of the procedure was:

Very Good	Good	Neither Good Nor Bad	Bad	Very Bad
1	2	3	4	5
☐	☐	☐	☐	☐

Survey Questions for Statistical Purposes

17. Are you:

1. ☐ male
2. ☐ female

18. How old are you?

1. ☐ Under 20
2. ☐ 20-24
3. ☐ 25-29
4. ☐ 30-34
5. ☐ 35-39
6. ☐ 40-49
7. ☐ 50-59
8. ☐ 60 or over

19. How many years of formal education (or their equivalent) did you complete (starting with primary school)?

1. ☐ 10 years or less
2. ☐ 11 years
3. ☐ 12 years
4. ☐ 13 years
5. ☐ 14 years
6. ☐ 15 years
7. ☐ 16 years
8. ☐ 17 years
9. ☐ 18 years or over

20. Did you obtain your education from:

1. ☐ A school in the West (for example, in the United States or Europe).
2. ☐ A school in the East (for example, in Japan or India).
3. Somewhere else:

21. What is your job title?

22. What is your nationality?

23. What was your nationality at birth (if different)?

24. Your comments (optional):

Thank you very much for your cooperation!
Please save your completed survey and return it to Jason Langkamer-Smith

langkamersmith@agere.com
FAX: 610-712-4649

REFERENCES

Benbasat, Izak, Albert S. Dexter, and Peter Todd. "An Experimental Program Investigating Color-Enhanced and Graphical Information Presentation: An Integration of the Findings." Communications of the ACM 29.11 (1986): 1094-1105.

Berlo, David K., James Lemert, and Robert Mertz. "Dimensions for Evaluating the Acceptability of Message Sources." Public Opinion Quarterly 33.4 (1969): 563-576.

Bernard, H. Russell. Social Research Methods: Qualitative and Quantitative Approaches. Thousand Oaks: Sage Publications, Inc., 2000.

Bertin, Jacques. Semiology of Graphics: Diagrams, Networks, Maps. W. J. Berg (trans.) Madison: University of Wisconsin Press, 1983.

Brasseur, Lee. Visualizing Technical Information: A Cultural Critique. Amityville, NY: Baywood, 2003.

Buehler, Mary Fran. "Table Design—When the Writer/Editor Communicates Graphically." Anthology Series, Publication Production. Ed. Anthony H. Firman. Arlington, VA: Society for Technical Communication, 1993: 82-86.

Coll, Joan H., Richard Coll. "Tables and Graphs: A Classification Scheme for Display Presentation Variables and a Framework for Research in this Area." Information Processing and Management 29 (1993): 745-750.

Coll, Richard A., Joan H. Coll, and Ganesh Thakur. "Graphs and Tables: A Four Factor Experiment." Communications of the ACM 37.4 (1994): 77-86.

Coll, Richard, Arun Thyagarajan, and Samir Chopra. "An Experimental Study Comparing the Effectiveness of Computer Graphics Data Versus Computer Tabular Data." IEEE Transactions on Systems, Man, and Cybernetics 21 (1991): 897-900.

Daru, M. "The Culture of Quantitative Graphicacy." Information Design Journal 5.3 (1989): 191-208.

DeRycker, Teun. "Analyzing Tables, Graphs, and Charts: A Four-Step Approach." Business Communication Quarterly 64.4 (2001): 72-82.

Dickson, Gary W., Gerardine DeSanctis, and D. J. McBride. "Understanding the Effectiveness of Computer Graphics for Decision Support: A Cumulative Experimental Approach." Communications of the ACM 29.1 (1986): 40-47.

Farkas, David K. "Explicit Structure in Print and On-Screen Documents." Technical Communication Quarterly 14.1 (2005): 9-30.

Freeman, Krisandra S., and Jan H. Spyridakis. "An Examination of the Factors That Affect the Credibility of Online Health Information." Technical Communication 51.2 (2004): 239-263.

Frewer, L. J., C. Howard, D. Hedderley, and R. Shepherd. "What Determines Trust in Information about Food Related Risks? Underlying Psychological Constructs." Risk Analysis 16 (1996): 473–486.

———. "The Elaboration Likelihood Model and Communication about Food Risks." Risk Analysis 17 (1997):759–770.

Gelman, Andrew, Cristian Pasarica, and Rahul Dodhia. "Statistical Computing and Graphics—Let's Practice What We Preach: Turning Tables into Graphs." The American Statistician 56.2 (2002): 121-130.

Gonzalez, Cleotilde, and Janice Golenbock. "Impact of Numerical and Graphical Formats on Dynamic Decision Making Performance: An Eye-Tracking Study." Proceedings of the Latin American Conference on Human-Computer Interaction. Eds. Clarisse Sieckenius de Souza, and Alfredo Sánchez. New York: ACM Press, 2003: 231-234.

Gross, Alan G. "Primer on Tables and Figures." Journal of Technical Writing and Communication. 13.1 (1983): 33-35.

Guba, E.G. "Criteria for Assessing the Trustworthiness of Naturalistic Inquiries." Educational Communication and Technology Journal 29 (1981): 75–91.

Hink, Jessica K., Jason K. Eustace, and Michael S. Wogalter. "Do Grables Enable the Extraction of Quantitative Information Better Than Pure Graphs or Tables?" International Journal of Industrial Ergonomics 22 (1998): 439-447.

Horn, Robert E. Participant's Manual for Developing Procedures, Policies, and Documentation. Waltham, MA: Information Mapping, Inc., 1991.

Hovland, C. I., and W. Weiss. "The Influence of Source Credibility on Communication Effectiveness." Public Opinion Quarterly 15 (1951): 635–650.

Jarvenpaa, Sirkka L., and Gary W. Dickson. "Graphics and Managerial Decision Making: Research Based Guidelines." Communications of the ACM 31.6 (1988): 764-774.

Killingsworth, M. Jimmie. Information in Action: A Guide to Technical Communication. Boston: Allyn and Bacon, 1996.

Lincoln, Y.S. and E.G. Guba. Naturalistic Inquiry. Beverly Hills: Sage, 1985.

Mann, Gerald A. "Planning and Editing Tables and Charts." STC Annual Conference Proceedings. Arlington, VA: Society for Technical Communication, 1996: 554-557.

Peterson, Becky K. "Tables and Graphs Improve Reader Performance and Reader Reaction." The Journal of Business Communication 20.2 (1983): 47-55.

Priester, J. R., and R. E. Petty. "Source Attributions and Persuasion: Perceived Honesty as a Determinant of Source Honesty." Personality and Social Psychology Bulletin 21 (1995): 637–654.

Qiuye, Wang. "A Cross-cultural Comparison of the Use of Graphics in Scientific and Technical Communication." Technical Communication 47.4 (2000): 553-560.

Self, C. C.. Credibility in an Integrated Approach to Communication Theory and Research. Eds. M. B. Salwen and D. W. Stacks. Mahwah, NJ: Lawrence Erlbaum Associates, 1996.

Sanfey, Alan, and Reid Hastie. "Does Evidence Presentation Format Affect Judgment? An Experimental Evaluation of Displays of Data for Judgments." Psychological Science 9.2 (1998): 99-103.

Schriver, Karen. Dynamics in Document Design. New York: John Wiley & Sons, Inc., 1997.

Scollon, Ron and Suzanne Wong Scollon. Intercultural Communication. Oxford: Blackwell, 1995.

Shenton, Andrew K. "Strategies for Ensuring Trustworthiness in Qualitative Research Projects." Education for Information 22 (2004): 63–75

Swenson, J., H. Constantinides, and L. Gurak. "Audience-drive Web Design: An Application to Medical Web Sites." Technical Communication 49.3 2002: 340–352.

Tufte, Edward R. The Visual Display of Quantitative Information. Cheshire, Conn: Graphics Press, 2001.

Tullis, Tom and Stan Fleischman. "Tabular Data: Finding the Best Format." Intercom June (2004): 12-14.

Umanath, Narayan S., and Iris Vessey. "Multiattribute Data Presentation and Human Judgement: A Cognitive Fit Perspective." Decision Sciences 25.5, 6 (1994): 795-824.

Umanath, Narayan S., Richard W. Scamell, and Sidhartha R. Das. "An Examination of Two Screen/Report Design Variables in an Information Recall Context." Decision Sciences 21.1 (1990): 216-240.

Umanath, Narayan S., and Richard W. Scamell. "An Experimental Evaluation of the Impact of Data Display Format on Recall Performance." Communications of the ACM 31.5 (1988): 562-570.

Vessey, Iris. "Cognitive Fit: A Theory-Based Analysis of the Graphs Versus Tables Literature." Decision Sciences 22.2 (1991): 219-240.

Wright, Patricia. "Writing to be Understood: Why Use Sentences?" Applied Ergonomics 2 (1971): 207-209.

Wright, Patricia, and Kathryn Fox. "Presenting Information in Tables." Applied Ergonomics, 1 (1970): 234-242.