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THE EFFECT OF WEB SURVEY DESIGN FEATURES ON USER RESPONSE

BY

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The undersigned certify that they have read and recommend to the Athabasca University Governing Council for acceptance a thesis THE EFFECT OF WEB SURVEY DESIGN FEATURES ON USER RESPONSE submitted by INGRID GUTTEK in partial fulfillment of the requirements for the degree of MASTER OF DISTANCE EDUCATION.

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DEDICATION

This thesis is dedicated to my mother, Ewaldine, whose support, understanding, and patience, became my driving force to complete this program, and to my late aunt, Elsa, who encouraged me to engage in self-betterment and to reach for my highest dreams.

ABSTRACT

The purpose of this study was to determine the effect of two web survey designs on the response time of novice and of expert computer users. This thesis replicated two studies: (1) Dillman, Tortora, Conradt, and Bowker (1998), an investigation of plain versus fancy web survey design on response rates, and (2) Bowker and Dillman (2000), a study of the effect of left versus right screen alignment in web surveys on user preference. The sample (N = 40) consisted of Masters of Distance Education (MDE) students of Athabasca University during the academic year of 2001 - 2002. The design was a 2 x 2 (type by ability) factorial post-test only design. A pre-test served as a selection method to classify the "novice" and "expert" computer user. Forty subjects were assigned to two groups. While the experimental group was assigned a fancy survey with sophisticated alternative attributes, the control group was assigned a plain survey with a traditional design. A post-test comprised of subjective indicators was designed to evaluate user preference on the survey attributes. A two-way ANOVA analysis was carried out and, although there was no significant main effect of the ability factor, there was a significant effect of the type factor and a significant interaction. Possible explanations for this interaction were drawn from the results of the objective and subjective indicators. Implications and recommendations for future research were made.

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CHAPTER 1

INTRODUCTION

The web survey is becoming an increasingly popular mode of data collection for a number of reasons, including cost-effectiveness, convenience sampling, and the ease of distribution and collection. As the Internet gains popularity as a pervasive means of communication, "the Web and other new electronic technologies soon might become prime survey vehicles due to 'fast access, reliable, verifiable delivery, and ease of feedback' " (James, Wotring, & Forrest's study, as cited in Kaye & Johnson, 1999, p. 324). On the other hand, variables such as computer ability, modem speed, browser compatibility, and technical difficulties contribute to the perplexity of this mode and its effect on user response and preference. Still, computer programmers and designers are exploring sophisticated software and the memory expansion needed to design increasingly complex web surveys. These designs implement alternative features such as Hypertext Markup Language (HTML), multiple colors, motion, dynamic html, animation, Java-applets, and sound tracks to stimulate user response.

Statement of the Problem

Newly designed systems offer quick transmission times and display rates to handle complicated tasks (Schneiderman, 2002), as well as enhanced browser performance contributing to an efficient user interface. However, if web survey programmers and designers focus on the improvement and advancement of design features, but overlook their effect on the user, a gap in sophisticated design creation and user-capability will undoubtedly

continue to exist (Dillman, Tortora, Conradt & Bowker, 1998). Hence, the purpose of the design should be to meet user needs rather than focus on program sophistication (Norman & Draper, 1986). There is little empirical research of the impact of web survey design on the response time of the computer novice and expert. This type of research is valuable in determining the type of design that addresses the user's needs and assists in bridging the gap between sophisticated design and user proficiency.

Statement of the Purpose

This study addresses the above problem by replicating two research studies (Dillman et al., 1998a; Bowker & Dillman, 2000) that examine the effect of some of the alternative features on response rates and user preference. The purpose of this study was to determine the effect of web survey design on the response time of novice and expert computer users. The investigation focused on whether a sophisticated or a simple design was more efficient for either the novice or expert. The objective measure was response time and the subjective measure was evaluation on user preference.

Research Questions

The following research questions were addressed:

(1) What is the effect of survey type on the response time for novice and expert users?

(2) What were the perceptions of a subset of the total sample with respect to the certain features of the two types of survey design?

Limitations of the Study

The sample for the study (N = 40) of graduate distance education students was a convenience sample and does not allow for generalization. Also, it may be difficult to generalize the criteria used to determine two distinct populations (novice and expert) in future studies, since unique criteria will need to be derived to address the skills of various samples. Further limitations are discussed in Chapter 5.

Definition of Terms

Human-computer Interaction. Human-computer interaction (HCI) involves interface design and is interdisciplinary in nature (Marchionini, 1991). A chief concern of HCI research is computer science and systems design that involves the process of design, implementation and evaluation of user-computer interaction (Dix, Finlay, Abowd, & Beale, 1998; Marchionini, 1991). The literature points to the goal of HCI as "natural," efficient, direct, easy to use (Bowker & Dillman, 2000; Schneiderman, 2002), and transparent (Maass, 1983; Marchionini, 1991).

User Interface. User interface involves interaction between the user and the computer. The interface includes physical (e.g. keyboard, mouse) and conceptual components, including selection methods (e.g. command languages, menus) and representation schemes (e.g. screen layout), (Marchionini, 1991).

Ease of Use. Ease of use refers to the degree of difficulty that the user encounters when interacting with the interface. This comfort level may be defined differently for the novice and experienced user. That is, what may be beneficial to the novice may be unnecessary for the expert. For example, providing informative screen displays that are

essential to the novice may be disruptive and may slow down the expert's response time. This implies a trade-off of information vs. time (Norman & Draper, 1986). Consequently, HCI enhances the ease of use: "...by reducing the amount of energy or effort expended in interacting with a computer...to make the computer experience less onerous..." (Bowker & Dillman, 2000, p. 4).

CGI. Common Gateway Interface allows interaction between the computer user or client and the host operating system through the Internet via Hypertext Transfer Protocol (HTTP). A CGI program outputs and displays data in real-time.

Clutter. Unclear and full screen display that may lead to information overload.

Download Time. The amount of time required for the browser to load information.

HTML. Hypertext Mark-up Language. A programming language and interactive online documentation technique that links web pages.

ISP. Internet Service Provider. A service that provides Internet access including e-mail, technical support, a web browser, and web space and design to the computer user.

JavaScript. A scripting language developed by Netscape that enables web programmers and designers to use special features and dynamic content to enhance web sites. This script is user-friendly, is interactive with HTML coding, and is compatible with all browsers that utilize a graphical interface including Netscape and Microsoft.

Measurement Error. "The result of inaccurate answers to questions that stem from poor question wording, poor interviewing, survey mode effects, and/or the answering behavior of the respondent" (Dillman, Tortora, & Bowker, 1998, p. 2).

Non-response Error: "The result of not getting some people in the sample to respond to the survey request who, had they done so, would have provided a different distribution of answers than those who did respond to the survey" (Dillman et al., 1998b, p. 2).

Response Time. The instant the subject begins reading the questionnaire item to the instant the subject submits his or her response to the item.

Saturation. "The degree of pure color in the sample, measured by the amount of redness, blueness, greenness, and so forth" (Pett & Wilson, 1996, p. 19).

Transmission Time. The time the subject submits a response to the time each questionnaire item is downloaded.

Transparency. "Transparency is the degree to which the logical user interface conforms with the user's prior knowledge or human intuition" (Maass, 1983, p. 19). It implies that the interface should not interfere with the user's actions or progress (Marchionini, 1991).

Organization of the Thesis

Chapter 1 is an introductory discussion of the effect of web survey design on user response. The significance of this study is discussed followed by the research questions, limitations, and definition of terms relevant to the study. Chapter 2 discusses a review of literature and research related to the problem, while Chapter 3 outlines the methodology, the sample selection, research design, instrumentation, control and research procedures, and data analysis. Chapter 4 reports the results of the data analyses, while Chapter 5 compares the findings with the replicated studies, discusses the conclusions, further limitations, and implications for distance research, and provides recommendations for further research.

CHAPTER 2

LITERATURE REVIEW

Historical Overview of the Theory and Research Literature

In the 1980's, researchers focused on improving screen design by manipulating text attributes, such as line length, character size, and font type (Hannafin & Hooper, 1989; Heines, 1984). These study types addressed the need to improve reading speed and comprehension. In the late 1990's, the web survey gained attention due to its low design and implementation costs, speed of delivery and return (Gaddis, 1998; Thach, 1995) and easy access to various populations (Kaye & Johnson, 1999). Remarkably, "because of the Internet's exponential growth, its impact on traditional means of communication" and "its dynamic nature," the web survey has been "gaining interest from academia and industry researchers" (Kaye & Johnson, 1999, p. 324). However, some researchers argue that web survey design studies that alleviate bias and stimulate response rates are still in their infancy (Solomon, 2001).

Thach (1995) cited Kiesler and Sproull's research of 1986 that described the population of electronic surveys as well educated and technologically refined. This implies that web survey design primarily meets the needs of the computer "expert," who is more likely to have access and the ability to interact with more complex design in electronic surveys than the novice would. Still, Thach (1995) noted that due to the swift development of technology and plunging computer and online costs, e-mail access would reach diverse populations in the future. Solomon (2001) conformed that web acceptance and Internet skills

would be developed over time, while Gaddis (1998) stated that as the population of Internet users develops (1998 estimate: 70 million), the web survey's potential audience would expand. Apparently, e-mail surveys were the dominant method of electronic data collection the past few years (Solomon, 2001; Supovitz, 1999). However, web-based surveying data collection has been attracting attention, due to the growing acceptance of the Internet. This encourages further research in the testing of web survey design principles on user response.

Research Literature Specific to the Problem

As mentioned in Chapter One, this investigation replicated two studies. The first replicated study, conducted by Dillman et al. (1998a) compared alternative features to a traditional style. The authors contended that although web survey questionnaires with fancy features aim to attract subjects, they might also disrupt harmonious user-interface interaction and decrease response rates. The author's plain versus fancy survey study used a sample of purchasers of computer products. The "Gallup Organization" telephoned these subjects and asked them demographic questions, such as age, use of the Internet, etc., and subsequently gave screened subjects an ID number to gain access to a web survey located at the Gallup website via telephone and a follow-up e-mail. The organisation sent an e-mail reminder to non-respondents within one week followed by two additional e-mail reminders. Dillman et al.'s (1998a) hypothesis was that the use of advanced features would result in lower completion rates than plain features. Variable measures included completion rates, last page completed, pages displayed, total boxes checked, open-ended questions, and duration (i.e., the total time to complete the questionnaire).

Bowker and Dillman's (2000) left versus right alignment study used a survey that consisted of seventeen environmental issue questions and the evaluation of the survey experience to determine the effect of each type (left, right). The authors randomly assigned respondents to either Treatment 1 (traditional left alignment) or Treatment 2 (alternative right alignment). Although both treatments included colors and graphics, the authors did not state the color type or graphic size. The investigators gave graduate seminar respondents, who recruited other members and acquaintances, a uniquely assigned code to gain access to the survey. The survey examined (1) objective indicators: differences in item distribution, item nonresponse, and duration, and (2) subjective indicators: ease of use, confusion about what to do, perception of the design and layout, comfort level and computer experience.

Both studies focused on the influence of traditional and alternative web survey design on user response time. Bowker and Dillman (2000) noted that human computer interaction (HCI) literature and studies in survey methodology called for the further examination of alternative methods of information display. Furthermore, the researchers indicated that their sample consisted of the computer experienced and that results might be different for the computer novice. Hence, they recommended further examination of testing the effect of left and right alignment on novices and experts.

Critique of the Validity of Appropriate Research Literature

Survey methodology, human-computer interaction (HCI), and screen and web design principles and guidelines clearly support the direction and development of studies in web survey design and user response. Since web design principles appear limited (Barron,

Tompkins, & Tai, 1996), the literature stresses the need for researchers to re-visit screen design guidelines and to develop and re-evaluate sound web survey design principles. The literature articulates the findings of the effects of specific attributes that shape these principles. While Faiola and DeBloois (1988) reviewed screen layout, grid systems, typography, color, and basic design guidelines, Hannafin and Hooper (1989) discussed the evaluation of screen design decisions. Further, various authors have discussed color research and guidelines in appropriate color use (Chapman, 1993; Faiola & DeBloois, 1988; Heines, 1984; Misanchuck & Schwier, 1995; Murch, 1983).

Summary of What is Known and Unknown about the Thesis Topic

While computer programmers actively develop complex web survey design, researchers scramble to adapt to web survey methodology (Dillman & Bowker, 2001), "...a promising method that does not compromise data quality," has advantages to its traditional counterpart, and "presents a series of technical and design challenges" (Supovitz, 1999, p. 251). Interestingly, the literature points to a paradigm shift where the integration of web design principles and traditional survey methodology contributes to the development of valid web survey design principles. Gaddis (1998) contended that this integration might improve the quality of web survey design and data collection.

Further, Dillman et al. (1998b) developed eleven principles for constructing respondent-friendly web surveys that focused on an equal chance of response by addressing the skills of the subjects and the type of computer equipment they used. The authors stressed how these principles, based on the traditional paper survey design, need to be empirically tested due to the visual differences and complexity of web survey design.

An ongoing concern for researchers conducting electronic studies has been to carefully address and control confounding variables in web survey studies, in particular technical clarity, to strengthen data validity (Furlong, 1997; Solomon, 2001). Kaye and Johnson (1999), who created and posted a survey to the web to examine the uses of the web for political information, recommended that the researcher carefully control length, download time, browser compatibility, instructions, and ease of use and navigation to ensure that web-based questionnaires effectively compete with traditional surveys. Similarly, Smith (1997) conducted a study to contrast e-mail and web survey administration techniques, in which case one survey was sent via e-mail while another was displayed on the web. The investigator found that the collected data lacked validity and warranted low response due to barriers such as form re-submission and browser incompatibility. Hence, Smith (1997) stressed the need for researchers to address privacy, unwanted participants, and browser configuration. Further, Matz (1999), who conducted a comparative study of examining differences in survey administration on paper and the web, emphasized the need to explore technical difficulties and design issues in future studies to ensure success in data gathering.

Contribution to the Literature

Although rapid submission, low cost, and convenient data gathering are some of the benefits of web surveys, much of the research literature has failed to examine what constitutes efficiency and usefulness, crucial to effective user response and completion rates. Hannafin and Hooper (1989) mentioned that screen design might be influenced by variables such as ability and prior knowledge; hence, screen design techniques that may be appropriate for the expert, may not be suitable for the novice. Kim and Eastman (1999), who conducted

an experiment on node size in a hypermedia system, stated: "The impact of learning effects upon the magnitude of the difference in performance indicates that experiments...using novice users inexperienced with a particular system may be misleading with respect to possible application to more experienced users" (p. 535). Further, Bowker and Dillman (2000) explained that "the complexity of computer use in general will contribute negatively to the cognitive processes that afford effective participation--particularly for those who may have little or no experience with computers" (p. 3). Consequently, this study was designed to examine the effects (including efficiency and usefulness) of simple and complex web survey design on both the novice and expert by measuring response time and user preference.

Szul and Berry (1996) contended that "research on the use of color in improving the usability of a screen display has...provided conflicting results" (p. 752). The authors stated that while some studies stressed the positive impact of color, others emphasized its negative effect on performance. The authors concluded that this dispute stressed the need for research in screen text color configuration that addresses the user's characteristics and ability. This study focused on this need by testing the attribute, "color," on both the novice and expert.

Chapter Summary

This chapter provided an historical overview of the theory and research literature and an outline of the research literature specific to the problem. It then described a critique of the validity of appropriate research literature and summarized the degree of knowledge in the literature of the research topic. Finally, it clarified the contribution of the study topic to the literature.

CHAPTER 3

METHODOLOGY

Chapter Overview

This chapter introduces the replicated studies' methodologies and describes any adapted or altered procedures. Next, the sample, recruitment method, research design, and instrumentation are described followed by the description of numerous control procedures implemented to address confounding variables. Next, the research procedures describe the subjects' tasks and the study's duration. Finally, the data analysis includes the pre-test and post-test measures, the tests used to examine the ability and type factors, and the treatment of the data.

Research Sample

The investigator generated a convenience sample that consisted of 40 Masters of Distance Education (MDE) students of Athabasca University, Alberta. Athabasca University is an Open University, offering numerous degree programs and courses, including the Master of Distance Education (MDE) program specializing in the fields of distance education and training. Volunteers were derived from a pool of 329 MDE students. The subjects were selected by the use of a pre-test and divided into two groups, "novice" or "expert."

Subject Recruitment. The Athabasca University's Research Ethics Board granted approval to the study proposal. Subsequently, the Director of the Centre for Distance Education sent out an e-mail to all MDE students that explained the purpose of the study, the time required to execute the experimental task, and the related steps to participate (see

Appendix G). The Director asked the students to contact the examiner if they were willing to participate, and posted the corresponding request to the Athabasca University Centre for Distance Education web site's annual newsletter.

Research Design

Factorial Design. This quasi-experimental study used a 2 x 2 factorial post-test only design. This design was comprised of two factors: survey type x computer ability. Factor one consisted of two levels: (1) fancy and (2) plain, while Factor two represented two levels: (1) novice and (2) expert. A pre-test was integrated with this design to classify the "novices" and the "experts." As in Dillman et al's (1998a) study, the treatment consisted of a fancy survey (color, tables, graphics, and right alignment) while the second level, having none of these attributes, was designated as the "plain" survey.

Attributes. To further replicate Dillman et al.'s (1998a) study, the "fancy" survey used bright alternating bands of color to provide contrast between the black print and colored background for each questionnaire item. Questions were stated in black with a white background and the colors alternated from black letters with a pink background to black letters with a purple background, demonstrating "a constantly changing figure/ground format" (Dillman et al., 1998a, p. 3). Tables were used to align the questions and answer categories to the extreme right of the computer screen, while textual graphics were used to display section headings. The textual graphic consisted of purple and pink with an additional layer of purple to enhance the text. This followed the design guideline to use color conservatively and limit the number of colors (Schneiderman, 2002). The size of the graphic was rather small (4-5 kilobytes) and served as a section heading that only occurred at six intervals (Item numbers 1,

5, 9, 13, 17, and 21). Conversely, the "plain" survey was left aligned, did not contain tables or graphics, and had black letters on a white background, known as "a common figure/ground format" (Dillman et al., 1998a, p. 3).

Independent Variables. The two independent variables of the study were (1) ability level (novice, expert) and (2) survey type (plain, fancy). As mentioned in Chapter 2, the former variable was derived from Bowker and Dillman 's (2000) study, while the latter variable was adopted from Dillman et al.'s (1998a) study.

Dependent Variable. Both replicated studies measured the amount of time it took to complete the survey. This variable was used in this study to test the attributes and to determine which survey type (plain or fancy) resulted in a quicker response. However, to achieve greater accuracy, the response time of each questionnaire item was recorded. Response time was defined as the instant the subject began reading each questionnaire item to the instant the subject submitted a response to each item. Items were measured in hundredths of a second.

Experimental and Control Group Treatment. Forty subjects were assigned to two groups: (1) Experimental and (2) Control. The 2 x 2 factorial design generated the following four groups:

1. Expert plain (control non-treatment)
2. Expert fancy (experimental treatment)
3. Novice plain (control non-treatment)
4. Novice fancy (experimental treatment)

Instrumentation

The researcher designed and programmed the web survey using the programs Hypertext Mark-up Language (HTML), JavaScript, and Common Gateway Interface (CGI) script. The web survey consisted of the following components (1) Pre-test (questionnaire) (2) Survey or questionnaire (3) Post-test (questionnaire). The items were primarily composed of the Likert-type with the following response options: "Strongly agree," "Somewhat agree," "Somewhat disagree," "Strongly disagree," and "Undecided," as well as only one open-ended item. The questions were displayed in radio type, and were presented in checkbox type as well as drop-down format in the last section only. An Internet service host, "Tripod," that had the capability to run Common Gateway Interface (CGI) scripts, was used. A CGI script was implemented where, as the subject clicked on "submit," the data was sent to the host, which then forwarded the data to the researcher's e-mail address.

Pre-Test. The researcher controlled Factor 2 (novice, expert) by measuring the subjects' computer knowledge and experience. The pre-test was used to classify the subjects into two distinct populations: "novices" or "experts" and was based on the following criteria (Appendix A): (1) Computer Background (2) Performance Tasks, and (3) Skills Range.

The computer background component consisted of twelve questions that addressed the following key attributes of the novice and expert:

- The amount of hours the subject utilized the computer and Internet.
- The method(s) that the subject sought technical support and computer training.
- The ability to solve technical problems, to acquire computer skills independently, and to give computer instruction.

The second section, "performance tasks," was designed to measure the competencies of the following computer applications: word processing, spreadsheets, computer-mediated conferencing (CMC), and file integration. These competencies were presented in checkbox format that enabled the subject to select each applicable skill. The third and final section, "skills range," consisted of the following computer skills that ranged from basic to advanced: the use of directories, managing databases, HTML and Java programming, converting files, and configuring browsers. The second and third sections were comprised of 75 items that measured distinct computer competencies and skills.

Survey. Each of the two survey types (fancy, plain) was comprised of identical 24 Likert-type statements with the only difference of attributes versus non-attributes. This was similar to Bowker and Dillman's (2000) study where each treatment survey (left, right), contained the same set of questions, as well as Dillman et al.'s (1998a) study, where the plain and fancy surveys were identical with exception to the design features. In this study, each survey item had a distinct submit button and was displayed on a separate computer screen.

As mentioned in Chapter 2, Dillman et al. (1998b) outlined eleven principles of respondent-friendly web surveys. The first principle referred to the clarity of the web survey's welcome screen that should be designed to efficiently direct subjects to the survey content. To address this principle, the survey's welcome screen had clear and concise instructions on how to complete the survey (Appendix B). Dillman et al.'s fifth principle concerned the need to provide specific instructions addressing computer actions dependent on the user's experience. To apply this principle, the survey provided optional directions on how to configure the browser to enable JavaScript (Appendix B).

Post-Test. Bowker and Dillman (2000) used subjective indicators to evaluate the usefulness of the two survey formats (left, right). Similarly, this study used a post-test to examine the effectiveness of the attributes: alignment, color, graphics, and tables, and to evaluate user preference of the plain and fancy surveys. The post-test immediately followed the survey and was comprised of 4-7 Likert-type questions and one open-ended question. The first four questions were identical for both the plain and fancy surveys; however, the fancy survey included three exclusive questions necessary to derive a more detailed report of the attributes' effect on user response (Appendix F).

Pilot Test. Matz (1999) thoughtfully advised to sufficiently pilot the web survey instrument in future studies to assure success in data gathering. Therefore, before launching the survey, the researcher pilot-tested the survey on six former MDE graduates and made adjustments to better the survey format according to the gathered feedback.

First, Section II of the pre-test was originally in a Yes-No drop-down box style, with one question addressing each competency. Dillman et al.'s (1998b)'s eleventh principle stressed caution in using the check-all-that-apply question, since subjects may select too many choices or not read all of the choices. However, the authors mentioned that it has been suggested that a Yes-No format for each item would lengthen the duration of answering questions. This pilot study confirmed this latter notion. Reports showed that the questions were too lengthy, repetitive, and required extensive mouse movement. Hence, Section II was changed to a checkbox style, where the subject only needed to click each applicable choice once (Appendix A).

Second, the original pre-test did not include any CMC competencies. It was reported that CMC skills should be addressed. Therefore, CMC competencies were added to the category, "performance tasks" (Appendix A, Section II).

Third, initially, questions regarding what method the subject used to seek technical support were prompted (Appendix A, Section I, questions 3-5). It was suggested that questions regarding what method the subject used to pursue computer training should be noted to better shape the characteristics of the novice and expert. Thus, these questions were developed and added (Section I, questions 8-10).

Fourth, it was reported that the colors used in the fancy survey were too harsh and lacked contrast due to the purple appearing as a dark pink. The original shade of pink (HMTL code #FF33FF) was quite sharp while the purple shade (HTML code #CCOOFF) was close to the red component of the Red-Green-Blue (RGB) color space. Due to this report, the pink was changed to a lighter, softer shade (HTML code #FF99FF) and the purple to a slightly darker, yet softer shade (HTML code #9966FF) closer to the Violet component (between Red and Blue) of the RGB color space.

Fifth, initially, the plain and fancy survey categories, were "Strongly Agree," "Agree," "Undecided," "Disagree," and "Strongly Disagree." It was suggested that the category, "Undecided" be placed at the end rather than the middle of the list of choices. Since it was not clear as to why this would be a better format, the researcher further investigated this recommendation and found that Dillman confirmed this notion. Dillman (2000) accentuated an experiment by Willits and Janota (1996), who compared the item's "undecided" category placed in the middle and at the end of the answer categories. When placed in the middle, subjects were more inclined to chose the "undecided" category, while when placed at the end,

users were more apt to choose one of the opinion categories (Dillman, 2000). Consequently, this study carefully placed the "undecided" category at the end of the list of choices. Also, the researcher noted that Dillman's principles and studies used the word "somewhat" for the second and third categories. Hence, she adjusted the categories to "Strongly agree," "Somewhat agree," "Somewhat disagree," "Strongly disagree," and "Undecided."

Finally, the pilot subjects were not informed that their response time was being recorded. Instead they were expected to focus on the topic, "Survey Types." This replicated Bowker and Dillman's (2000) use of the topic, environmental issues as a strategy of "keeping respondents focused on the content and not on the alignment of the questionnaire itself" (p. 7). This study implemented this strategy to avoid influence on speed of response and to evade bias tendencies to meet the expectations of the researcher. Since there were reports that the purpose of the study was to compare survey types and there was no indication that the subjects were aware that they were being timed, the original instructions that informed the subjects to complete the survey as efficiently as possible, were not altered (Appendix B).

The researcher successfully gathered the response time data. There were no reports of browser incompatibility or failure to follow the instructions to enable JavaScript. The pilot subjects completed either the plain or fancy survey within 3 - 5 minutes. Hence, it was concluded that 10 - 15 minutes was sufficient time to read the covering letter, e-mails, and complete the pre-test and the survey.

Control Procedures

Dillman et al. (1998a) found that it took less time for respondents to complete the plain survey than the fancy survey. The researchers mentioned that the cause of this difference was unknown but speculated that it might have been due to download and transmission time, browser inconsistencies, the alternative format, or the use of color. This study further explored these factors by using subjective indicators that focused on user preference and implemented control procedures that addressed organization and navigation.

According to Bowker and Dillman (2000), key contributing factors to item nonresponse that might lead to measurement error, were (1) inadequate information organization and (2) poor navigational flow. To assure adequate information organization, the questionnaire, entitled, "Survey Types," was carefully divided into 6 sections of 4 questions each (Appendix C and E). While each of the four survey types: mail, telephone, e-mail, and web were subsequently introduced in the first four sections, all survey types were compared in the final two sections. Each questionnaire item consisted of a limited and short line length to ease reading comprehension (Barron et al., 1996; Heines, 1984). Notably, Dillman et al.'s (1998b) fourth principle clarified the need to limit line length to prevent line extension across the screen and to permit the user to read prose more evenly and to receive "the same word stimulus" (p. 9). Hence, in this study, each survey item was comprised of 18 syllables with an equal rhythmic pattern to (1) promote a consistent pattern to control reading speed and to (2) assure that subjects utilizing small screen sizes, such as laptops, were able to differentiate between left and right justification. As previously mentioned, instructions were provided to verify that the user's browser, in particular the novice, was set to JavaScript enabled. This

was crucial to accurately record the response time for each survey item and activate the alert messages. The pre-test and survey recorded the browser types and versions that the majority of subjects were currently using. All subjects either utilized Internet Explorer (IE) 5.0 or higher or Netscape 4.0 or higher with exception to one participant, who used IE 4.0. Special instructions were e-mailed to this participant prior to taking the survey to assure the instructions posted on the web site were free from unnecessary clutter.

To enhance navigational flow, the investigator implemented six control procedures:

(1) Minimal scroll bar and mouse movement.

(2) The use of identification (ID) numbers.

(3) The prevention of submitting blank entries.

(4) The prevention of re-submitting responses.

(5) Browser compatibility.

(6) Download time.

Although there were various scripts that were able to carry out the above control procedures, careful consideration was taken to use only JavaScript and CGI, highly compatible with both the Netscape and Internet Explorer browsers.

First, to ensure ease of navigation, only one item and one "submit" button per computer screen was used to eliminate navigation to the scroll bar located at the right-hand side of the screen. Bowker and Dillman (2000) stated that their findings could be affected by more advanced devices than a scroll bar, such as the mouse wheel, enabling an equal amount of effort to navigate to the left or right. Consequently, in this study, respondents had no need to use the mouse wheel and the amount of effort needed to navigate the left or right answer categories were equal and thus tightly controlled.

Second, the researcher assigned two distinct identification (ID) numbers for (1) the pre-test and (2) the survey, to participants. Both replicated studies utilized an ID number (Dillman et al., 1998a) or assigned code (Bowker & Dillman, 2000) to gain access to the survey. In this study, the researcher e-mailed an ID number and the web survey's address (Uniform Resource Locator) to the subject. In this manner, the participant could click on the provided link and immediately enter the ID number to the survey or draw reference to the e-mail should he or she wish to access the pre-test or survey at a later time. To ensure privacy, the examiner carefully sent the ID number and URL to each subject's e-mail address "rather than...one message to all participants" (Matz, 1999, p. 17).

Solomon (2001) stressed that two steps be taken to prohibit survey access from outside participants and protect data validity: (1) password protection should be implemented and (2) a user ID should be assigned to identify sample participants. Although this research survey did not incorporate password protection, it took the latter step. Since the assigned ID numbers were exclusive, intruders were easily recognized by the use of a false ID. There were two incidences of outside attempts to access the survey. However, the examiner noted the foreign IDs and discarded the submitted data.

Third, the researcher implemented JavaScript to prevent the submission of blank entries and the exclusion of vital information (ID number, current browser type and version). Error indicators instantly provided messages to enforce certainty and clarity (Morland, 1983), and to "assist the user in recovery and future avoidance" (Marchionini, 1991, Principles for Interface Design section, para. 5). For example, if the subject attempted to click the "submit" button, or press the "return" or "enter" key, without typing the required information, JavaScript alerted the subject with the message, "You must enter your ID#," or "You must

enter your Browser Type," or "You must enter your Browser Version." Hence, the respondent could only proceed once the information was entered. This reassured the examiner that she would receive the information required to identify the user and record the browser type and version the subject was currently using. The subject was expected to respond to all statements to prevent blank answers. If the subject attempted to proceed to a subsequent survey item without submitting a response, a JavaScript pop-up alert button prompted the user with the message: "You must select the best answer." The timer immediately stopped recording when this message appeared and resumed the instant the user clicked the "OK" button to return to the answer categories.

Fourth, the investigator prevented the re-submission of responses. HCI literature contends that the interface should have an undo feature to allow for the altering of actions (Dix et al., 1998; Schneiderman, 2002). Although the survey permitted the undoing of answers before submission to ensure comfort, reading subsequent questions after submission was disallowed, since subjects may then have been influenced to change and re-submit answers. Castelli, Colazzo and Molinari's study as well as Hammond's study indicated that hypermedia users became disoriented and lost in hyperspace due to lack of continuity (as cited in Ross, 1998, Measures for Individualized Instruction section, para. 4). Similarly, if subjects would have been permitted to navigate backwards to change answers, they may have been in danger of "getting lost" in cyberspace by the excessive use of the "Back" button. Hence, the researcher disabled the use of the "Back" button to discourage the subject from changing and re-submitting responses and to promote continuity and flow.

Solomon (2001) warned that data validity might be threatened by multiple submissions of the same respondent. To further prevent re-submission, the survey alerted the

subject with brief pop-up messages. When the respondent clicked on "submit" for each item, the response was sent to the host and subsequently the researcher. If the user clicked "submit" a second time, the following alert pop-up message appeared: "You have already submitted your answer to this statement. The next page is loading. Click the OK button to continue." Since it is likely that the participant had experienced a downloading delay of the subsequent questionnaire item, this message informed the user that their response has already been submitted and that they would be able to respond to the subsequent item, once they clicked the "OK" button. In this case, the survey was programmed to stop recording the time concurrently as the user clicked on "submit" and to resume recording the time after the subject clicked on "OK" and the subsequent screen downloaded. If the user clicked "submit" more than once, only the initial response time was submitted and recorded. To further prevent re-submission, a "thank you" note was inserted at the end of the questionnaire to assure the user that the survey was complete (Kaye & Johnson, 1999).

Fifth, the researcher did not detect a difference in color, graphics, or fonts between IE 4.0 or higher and Netscape 4.0 or higher. The font used was Times New Roman, highly compatible with most computer and browser types. Further, the investigator carefully addressed the compatibility of HTML and JavaScript by using only common JavasScript codes such as "getTime," "date," and "setTime" that are compliant with IE 3.0 or higher and Netscape 4.0 or higher. This conformed to the minimum browser requirements of Athabasca University's Master of Distance Education (MDE) program in the academic year of 2001 - 2002 (IE 5.0 and Netscape 4.5).

Hence, the survey addressed the Least Compliant Browser (LCB) principle that Bowker and Dillman (2000) defined as follows:

> In short, the LCB approach seeks to reduce survey measurement and nonresponse error by "designing the web questionnaire for the lowest anticipated browser level" such that the likelihood of distributing an equal visual stimulus to all participants is maximized (measurement) and that access is not impeded by incompatible programming (nonresponse) (p. 7).

Finally, since download time varies among browsers and modem speeds, care was taken to program the time to begin recording the instant each item downloaded. Windows Explorer recorded the file size of only 3 kilobytes (KB) for each questionnaire item for both the plain and fancy surveys. The minimum modem requirement for Athabasca University's Master of Distance Education (MDE) students during the academic year of 2001 - 2002 was 33.6 KB. The download time for a 28.8-KB modem or faster was zero seconds. Hence, it was expected that each subject instantly downloaded each questionnaire item (3-KB). However, the textual graphics used for the six section headings of the fancy survey measured 4 - 5 kilobytes each. This was slightly larger than each questionnaire item and when combined with the question and answer categories totalled 7 - 8 KB. In this case, a 33.6-KB to 64-KB modem, required only one second to download, whereas a 128-KB modem or higher took zero seconds to download. Hence, it was suspected that subjects with a minimum modem requirement downloaded the graphic one second after the question and answer categories instantly downloaded. However, because the subject began reading the instantly downloaded questionnaire item (zero seconds), before each heading downloaded (one second), it was anticipated that graphics would not effect response time.

Also, since slightly more than half of the sample population had e-mail addresses indicating the use of a high speed Internet, it appeared the graphic download delay might only have affected a small portion of the population. Further, the total file size of the plain survey was 72 KB, while the total file size (with graphics) of the fancy survey was 98 KB. These files were much smaller and closer in size than Dillman et al.'s (1998a) survey (plain, 317 KB: fancy, 959 KB) consisting of 173 pages, with many implemented skip sections.

Research Procedures

The duration of the data collection was two to three weeks. First, the pre-test was assigned to the subjects, but no specific date was given to complete it. As in Dillman et al's (1998a) study, an e-mail notice was sent to each subject followed by a reminder to complete the survey. After four days, this e-mail reminder that described a four-day deadline, was sent to those subjects who had not yet completed the pre-test. After all data were collected, the researcher calculated the scores and entered them into a spreadsheet. Of a pool of 52 subjects, who completed the pre-test, 40 were ranked as either a "novice" or an "expert," while the remaining subjects were not ranked.

Second, the researcher assigned an ID number to 40 participants, 20 of which to the control group (plain survey) and 20 to the experimental group (fancy survey). Of the 20 novices and 20 experts, 10 of each ability type were assigned to the plain survey and to the fancy survey. The remaining subjects were given a simulated ID number and were assigned to either the plain or fancy survey. This was done so that the participants would not suspect how they were ranked or why they may have been excluded from completing the survey.

The subject was to complete the survey with no set deadline. After four days, an e-mail reminder, specifying a four-day deadline, was sent to those subjects who had not yet completed the survey. Data was collected and entered in SPSS.

Data Analysis

Pre-Test. The pre-test was used as a selection tool to classify the "novices" and "experts." The low and high scores of the pool of subjects were used as the primary criteria, while the criteria of questions 1 -12 (Appendix A, Section I) were used as a secondary means to select the novices and experts. First, the 20 low and the 20 high scores were extracted from the pool of 52 subjects. Next, the 12 remaining mid-ranged scores were divided in half (low, high). The 6 low scores were grouped with the next 6 low scores (total 12). Similarly, the 6 high scores were grouped with the next 6 high scores (total 12). Only 6 novices and 6 experts of each group were chosen not only based on the score but also on the following criteria:

- The expert was expected to access the computer and Internet and seek a variety of methods for technical and computer training more than the novice would.
- The expert was expected to be more capable of solving technical difficulties and of learning independently as well assisting others in technical problem solving and computer skills training than the novice would be.

Questionnaire Data. Descriptive statistics addressed the two factors, ability and type, and the number of subjects per factor. A two-way analysis of variance (ANOVA) between-subjects test was performed to determine the effects of the two levels (novice, expert; fancy, plain) of the two factors (ability, type), while a line graph depicted any reports of interaction.

Post-Test. The responses to each Likert-type question and to the open-ended question that addressed the tested attributes of alignment, graphics, color, and tables were reported in percentages.

Treatment of the Data. The data were not collected anonymously. The researcher was aware of the individuals' e-mail address and tracked the subjects by assigning them an ID number. The responses of the subjects remained confidential. All data has been reported in aggregate form. The researcher sent a covering letter that outlined the purpose of the study, its components, the type of participant sought, and the time of commitment via electronic mail to students that agreed to stand as subjects (Appendix H).

Chapter Summary

This chapter outlined the methods that were replicated and altered from the two studies. Following this, the sample, recruitment method, research design, instrumentation, and control procedures were described. The chapter concluded with research procedures and a description of the data analyses.

CHAPTER 4

RESULTS

Introduction

The purpose of this thesis study was to determine the effect of web survey design on the response time of novice and expert computer users. The design was a 2 x 2 (type by ability) factorial post-test only design. A pre-test served as a selection method to classify the novice and expert computer user. Forty subjects were assigned to either a control group (plain survey) or treatment group (fancy survey). A post-test assessed user preference of the survey attributes. The results were expected to show whether or not a sophisticated or a simple design was more efficient for either the novice or expert. This depended on an objective measure (response time) and on subjective measures (evaluation on user preference).

Pre-Test

The pre-test allowed for a maximum score of 75. One point was awarded for each competency skill acquired (Appendix A, Section II) and one to five points for the performance skill level (Section III). From the pool of 52 subjects, who completed the pre-test, the 20 low scores (10 - 37) and 20 high scores (62 - 74) were drawn to primarily classify the novices and the experts. As mentioned in Chapter 3, novices and experts were further selected from the mid-ranged scores (low, high) based on the criteria of questions 1 -12 (Appendix A, Section I). These criteria of the selected 20 novices and 20 experts were then analyzed. It was found that the expert utilized the computer and accessed the Internet considerably more hours per week than the novice did (see Table 1).

Table 1

Pre-test Criteria: Questions 1 - 2

Computer hours Per Week	Expert n = 20 n (%)	Novice n = 20 n (%)	Internet hours Per Week	Expert n = 20 n (%)	Novice n = 20 n (%)
Under 20	1 (05.0)	11 (55.0)	Under 20	4 (20.0)	15 (75.0)
20 - 40	4 (20.0)	9 (45.0)	20 - 40	12 (60.0)	5 (25.0)
41 - 60	8 (40.0)	0 (00.0)	41 - 60	2 (10.0)	0 (00.0)
Over 60	7 (35.0)	0 (00.0)	Over 60	2 (10.0)	0 (00.0)

Additionally, novices required more technical support from an expert and failed to access CMC or the FAQ for assistance as frequently as the expert did (questions 3 - 5, Table 2). A possible reason for this is that the novice may have lacked the awareness of options available to seek technical support or preferred more traditional methods than the web.

Table 2

Pre-test Criteria: Questions 3 - 12

Questions	Novice n = 20 n (%)		Expert n = 20 n (%)	
	Yes	No	Yes	No
(3) Have you sought technical support from an expert?	18 (90)	2 (10)	15 (75)	5 (25)
(4) Have you sought technical support via computer-mediated communications?	6 (30)	14 (70)	10 (50)	10 (50)
(5) Have you sought technical support from a FAQ list?	16 (80)	4 (20)	18 (90)	2 (10)
(6) Have you addressed and corrected distinct technical errors independently?	6 (30)	14 (70)	18 (90)	2 (10)
(7) Have you assisted others in correcting distinct technical errors?	4 (20)	16 (80)	17 (85)	3 (15)
(8) Have you received computer training from an expert?	13 (65)	7 (35)	8 (40)	12 (60)
(9) Have you pursued computer training via computer-mediated communications?	2 (10)	18 (90)	3 (15)	17 (85)
(10) Have you pursued computer training via on-line tutorials?	7 (35)	13 (65)	14 (70)	6 (30)
(11) Have you achieved distinct computer skills independently?	17 (85)	3 (15)	20 (100)	0 (00)
(12) Have you instructed or assisted peers or students in achieving distinct computer skills?	13 (65)	7 (35)	19 (95)	1 (05)

Interestingly, more novices than experts received computer training from an expert (question 8, Table 2). This implies that the expert was more capable of developing computer skills independently than the novice was. Further, the expert possessed the ability to correct technical problems, develop computer skills autonomously and assist others in technical and computer skills (question 6-7 and 11-12, Table 2). Conversely, the novice lacked the ability to address technical problems, and although was quite capable of achieving computer skills independently, did not access on-line tutorials as much as the expert did, and lacked the capability to assist others in acquiring technical and computer skills (questions 6-7 and 10-12, Table 2). Consequently, the expert was more competent in learning independently and in computer instruction than the novice was.

Research Questions

Table 3 displays the number of participants of the "ability" (novice, expert) and "type" factor (plain, fancy), while Table 4 outlines the mean response time scores of the "ability x type" factors.

Table 3

Between the Subjects Factors

Ability[a]	Type[b]
Novice	Plain
Expert	Fancy

[a] n = 20 for each ability level.

[b] n = 20 for each survey type.

Table 4

Descriptive Statistics

Ability	Type	Mean	Standard Deviation	N
Expert	Fancy	7.8680	1.1837	10
	Plain	13.0160	5.5539	10
	Total	10.4420	4.7169	20
Novice	Fancy	10.5486	3.1834	10
	Plain	9.9059	2.1567	10
	Total	10.2273	2.6669	20
Total	Fancy	9.2083	2.7120	20
	Plain	11.4609	4.4000	20
	Total	10.3346	3.7837	40

Note. Mean values indicate response time measured in hundredths of a second.

A two-way analysis of variance (ANOVA) test was performed to determine the effects on response time. Table 5 shows the results of this analysis.

Table 5

Tests of Between-subjects Effects

Source	df	F	p
	Between subjects		
Model	4	93.706	.000
Ability (A)	1	.039	.844
Type (T)	1	4.316	.045
A X T	1	7.130	.011
error	36	(11.758)	

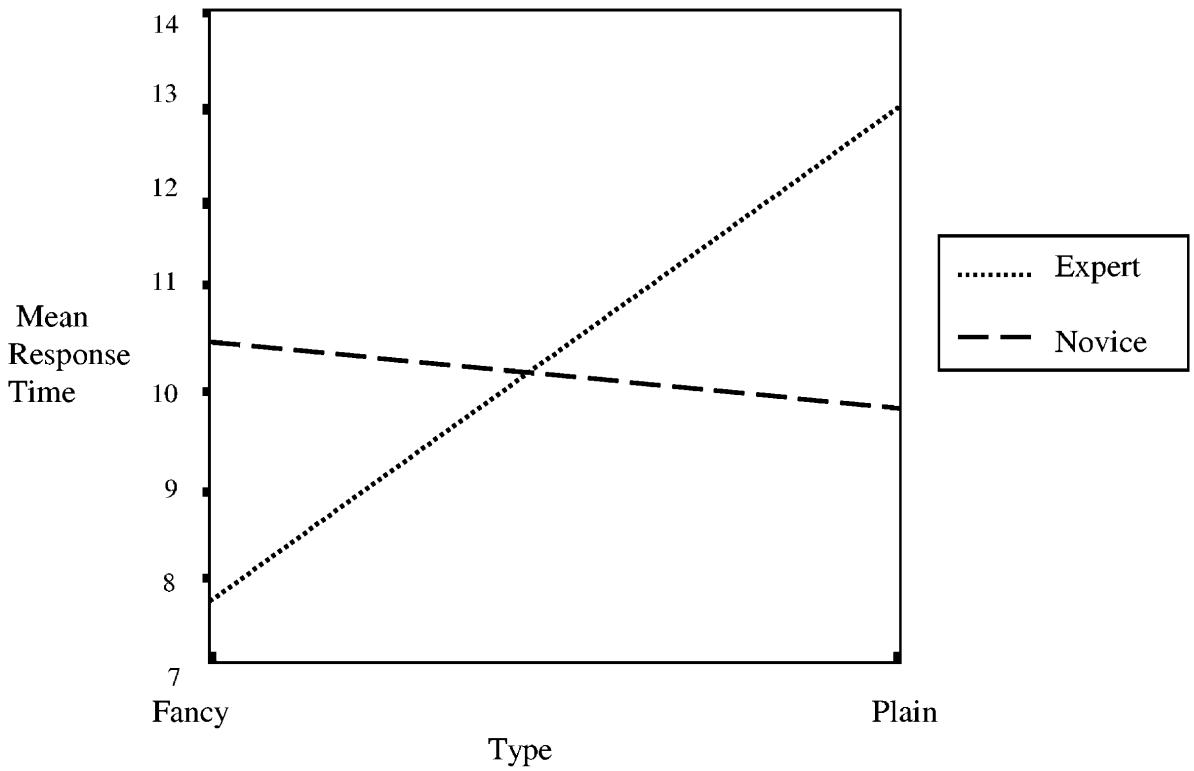
Note. Values enclosed in parentheses represent mean square errors.

The first research question asked, "What is the effect of survey type on the response time for novice and expert users?" Table 5 shows that there was no significant difference between the novices and experts ($F = .039$, $p > .05$). The second research question asked, "What were the perceptions of a subset of the total sample with respect to the certain features of the two types of survey design?" Table 5 indicates that there was a significant difference between the two survey types, plain, and fancy ($F = 4.316$, $p < .05$).

Interaction

Table 5 shows that the "ability x type" factors was significant at the .05 level ($F = 7.130$, $p < .05$). This indicates that an interaction occurred between "ability" (novice, expert) and "type" (plain, fancy). Figure 1 depicts a line graph of the interaction effects between these two factors. Note that the two lines portray a strong converse interaction between the factors.

Figure 1. Graph: Ability x Type



The interaction of the line graph indicates that the experts responded more rapidly to the fancy survey than to the plain survey, while the novices responded more rapidly to the plain survey than to the fancy survey. Hence, objective measures showed that there was a significant interaction between the ability (novice, expert) and type (plain, fancy). The subjective indicators to follow provided possible explanations as to why this interaction occurred. Alternative explanations are discussed in Chapter 5.

Subjective Indicators

All 40 participants of the sample completed the post-test. While Table 6 outlines the number of responses (questions 1 - 4) by each of the four groups (plain and fancy), Table 7 reports the additional responses made by the fancy groups (questions 5 - 7).

Table 6

Post-test Results: Questions 1 - 4

Questions	Novice Plain n = 10 n (%)	Expert Plain n = 10 n (%)	Novice Fancy n = 10 n (%)	Expert Fancy n = 10 n (%)
(1) How easy or difficult was it for you to complete the questionnaire?				
Very easy	8 (80)	5 (50)	6 (60)	9 (90)
Somewhat easy	2 (20)	2 (20)	3 (30)	1 (10)
Somewhat difficult		3 (30)	1 (10)	
Very difficult				
*No comment				
(2) How did you perceive the choice of color of the questionnaire?				
Very good	5 (50)	3 (30)	4 (40)	5 (50)
Somewhat good	3 (30)	4 (40)	4 (40)	3 (30)
Somewhat bad	1 (10)	2 (20)	2 (20)	2 (20)
Very bad	1 (10)			
*No comment		1 (10)		
(3) How did you find the structure of the section headings?				
Very good	7 (70)	2 (20)	4 (40)	6 (60)
Somewhat good	3 (30)	7 (70)	5 (50)	2 (20)
Somewhat bad			1 (10)	2 (20)
Very bad				
*No comment		1 (10)		
(4) How did you perceive the text alignment of the statements and responses?				
Very good	9 (90)	4 (40)	5 (50)	7 (70)
Somewhat good	1 (10)	5 (50)	4 (40)	2 (20)
Somewhat bad				1 (10)
Very bad				
*No comment		1 (10)	1 (10)	

*No comment indicates that the subject did not choose any of the answer categories.

Table 7

Post-test Results: Questions 5 - 7

Questions	Novice Fancy n = 10 n (%)	Expert Fancy n = 10 n (%)
(5) How do you rate the color used to contrast between each questionnaire item?		
Very good	3 (30)	6 (60)
Somewhat good	3 (30)	3 (30)
Somewhat bad	2 (20)	1 (10)
Very bad	1 (10)	
*No comment	1 (10)	
(6) How do you rate the color used to distinguish between the statement and answer categories of each questionnaire item?		
Very good	4 (40)	7 (70)
Somewhat good	6 (60)	3 (30)
Somewhat bad		
Very bad		
*No comment		
(7) How do you rate the tables used to distinguish between the statement and answer categories of each questionnaire item?		
Very good	3 (30)	8 (80)
Somewhat good	7 (70)	1 (10)
Somewhat bad		
Very bad		
*No comment		1 (10)

*No comment indicates that the subject did not choose any of the answer categories.

Question 5 (Appendix D) and question 8 (Appendix F) prompted the subjects to comment on what they favored or disliked about the questionnaire design. Key remarks focused on the attributes: navigation, graphics, alignment, and the use of color. Table 8 shows the number of favorable and unfavorable comments made toward each attribute.

Table 8

Post-test Comments

Attributes	Novice Plain	Expert Plain	Novice Fancy	Expert Fancy
Navigation:				
Favor	2	2	2	5
Disfavor	2	1	0	2
Graphics:				
Favor	0	0	0	0
Disfavor	0	0	1	4
Alignment:				
Favor	0	0	0	3
Disfavor	1	0	2	2
Color:				
Favor	0	1	2	5
Disfavor	2	2	5	1

Note. Values indicate the number of comments made.

Ease of Use. All participants of the novice plain and expert fancy groups, while only 70% of the expert plain group reported that the survey was either easy or somewhat easy to use (question 1, Table 6). Strikingly, the novices found the plain survey easiest, while the experts found the fancy survey easiest to use. This corroborates the findings in the literature that stress that interaction with the interface should be "natural," efficient, direct, easy to use (Bowker & Dillman, 2000; Schneiderman, 2002), and transparent (Maass, 1983; Marchionini, 1991). Consequently, it appears that, when the survey was easy to use, the response time was rapid.

Ease of Navigation. Three participants (one novice plain, one expert plain, and one expert fancy) addressed the need to correct or change answers after submission (see Table 8). This stands in opposition to the argument of allowing the user to undo answers before submission yet preventing any corrections after submission as raised in Chapter 3.

Two fancy participants (one novice, one expert), indicated that the navigational layout (i.e., placement of questions, titles, and "submit" button) was consistent. This suggests that the fancy survey layout addressed the Consistency Principle, in which "selection methods, positioning of important text and buttons, text fonts and styles, and window layout and management should be consistent in all parts of an interface" (Marchionini, 1991, Principles for Interface Design section, para. 3). Interestingly, six respondents of the two groups with the higher response time means (see Table 4) stated that they favored the display of one question item per screen (two novice plain, two expert fancy) and preferred separate submission and transmission time between each item (novice plain, expert fancy). This somewhat contradicts the HCI literature which emphasizes that extended transmission time might lead to frustration and error (Schneiderman, 2002). Additionally, an expert, who

completed the fancy survey, stated that the design was "very clear" and did not present a "lot of clutter or extra material." Because the expert fancy group had the faster response time mean, this report supports the claim that clutter may decrease response speed and may be overwhelming even to the expert (Schneiderman, 2002).

Graphics. The majority of the plain groups reported the structure of the section headings as "very good" or "somewhat good" (question 3, Table 6). On the other hand, a small portion of the fancy groups (expert: 20%; novice: 10%) reported the graphics as "somewhat bad." Specifically, a novice stated that he or she disfavored the graphics and an expert noted that section headings were "difficult to read," while yet another expert reported that section headings were not needed (see Table 8). Heines (1984) suggested that if adjacent colors used to highlight text and graphics clashed or were too hot (e.g. pink or magenta), interference in readability might result. Although pink is a hot color, pink and purple are effective, compatible pair colors (Faiola & DeBloois, 1988); hence, it is debatable whether the use of these colors with textual graphics contributed to the above negative reports. Further, there were two incidences where expert fancy participants encountered interference with the reading of the text due to the occasional inharmonious downloading time of the section headings with the statement and answer categories. This indicates that the one second delay of the textual graphic download may have had an effect on reading comprehension and possibly response time.

Alignment. It was found that the majority of the participants reported alignment as either very good or somewhat good (question 4, Table 6). Interestingly, while three experts stated that they favored right alignment, four respondents (two novice fancy, two expert fancy) reported the contrary (see Table 8). Two of these latter participants (expert fancy)

stated that right-alignment was "strange" and "surprising," respectively, while a novice plain user did not like the left alignment. Thus, there was no consensus for either left or right alignment by the novices or experts. One possible conclusion for this was that, while left alignment may be favored due to its ubiquity, right alignment may or may not be preferred dependent on either its visual appeal or its unfamiliarity (Bowker & Dillman, 2000).

Strikingly, three respondents (two expert fancy, one novice plain) recommended center alignment as an improvement. A possible reason for this is that items aligned at the extreme left or right of the screen create a great deal of empty space visible on either side of the screen. Hence, center alignment that balances space, may be more visually appealing: "The unused areas should be used to separate logical groups, rather than having all the unused area on one side of the display" (Brown, Burkleo, Mangelsdorf, Olsen, & Williams, 1981, as cited in Reilly & Roach, 1986, p. 39). Another possible reason is that it may require less effort to navigate answer categories in the center, rather than the extreme left or right of the screen.

Use of Color. Although the majority of the groups reported the choice of color as "very good" or "somewhat good," there were reports of "somewhat bad" and "very bad" (question 2, Table 6). Four plain respondents (two novices, two experts) mentioned that the survey could use more color. Interestingly, a novice fancy participant stated that he or she disfavored color with text, as it didn't "reflect" traditional print (see Table 8). This latter report confirms the notion that the novice might find familiar or traditional style print easier to complete than an unfamiliar or alternative screen format (Bowker & Dillman, 2000).

Although four participants (one expert plain, three expert fancy) applauded the use of color, one of which (expert fancy) reported that the color appeared transparent and did not

interfere with the task at hand, three fancy survey participants (two novices, one expert) indicated that the color was too bright. A possible conclusion may be drawn from this latter report. Color may increase response speed (Chapman, 1993), especially when stimulated by high degrees of saturation (Faiola & DeBloois, 1998), in particular, of reds and yellows (Chapman, 1993). Paradoxically, background colors that are too bright and highly saturated, may interfere with the clarity of text (Faiola & DeBloois, 1988) thus slow down response speed. As mentioned in Chapter 3, the researcher lowered the degree of saturation of the fancy colors (pink, purple) to address the pilot reports of harsh color. Ironically, it appeared that the degree of saturation and level of brightness used may either have increased response speed or may have hindered reading comprehension thus response time.

Further, Murch (1983) suggested de-saturating red, blue, and purple to reduce the time needed to refocus. As previously mentioned, pink, near the red component of the RGB color space, was slightly de-saturated to alleviate a harsh display. Still, there were reports of the colors being too bright; thus, it appears that, if the pink and purple would have been further de-saturated, then the time required to refocus may have been reduced.

Color Contrast. When respondents were asked how they would rank the use of color as contrast between each questionnaire item, more experts than novices (90% vs. 60%) reported a ranking of very good or somewhat good. However, two novices and one expert reported that this feature was somewhat bad, while one novice indicated that it was very bad (question 5, Table 7). When the fancy groups were asked how they would rate the use of color to distinguish between the statement and answer categories of each item (question 6, Table 7), all participants assigned a rating of very good or somewhat good. However, more experts than novices (70% vs. 40%) reported that this feature was very good.

Specifically, while a novice reported the use of color contrast as "distracting" and "somewhat annoying," an expert mentioned that contrasting color "helped to positively confirm submission." Further, while a novice reported that more contrast was needed between the statement and answer categories, an expert stated that this color contrast was "easy to distinguish" (see Table 8). A possible conclusion for this controversy concerns low versus high contrast. As mentioned in Chapter 3, alternating bands of pink and purple were used to contrast between questionnaire items and contrast was used to distinguish the statements and the answer categories. While the black text on the pink background created a high contrast, the black text on the purple background created a low contrast. Typically, a high contrast between text and a colored background stimulates a high degree of readability (Barron et al., 1996; Faiola & DeBloois, 1988) and vice versa. Hence, it appears that the alternating high and low contrast may have either enhanced or hindered readability as reflected by the reports of the novices and experts.

Use of Tables. All respondents of the treatment group rated the tables used to distinguish between the statement and answer categories of each questionnaire item, as either very good or somewhat good (question 7, Table 7). Strikingly, the experts rated this feature as "very good" considerably higher than the novices did (80% vs. 30%). There were no further reports addressing this feature.

Post-test Summary

Overall, there were slightly more favorable comments about the attributes of navigation, alignment, and color that were incorporated into the fancy survey than the plain

survey. Somewhat surprisingly, the experts reported more favorable comments toward the fancy survey than the novices did toward the fancy and plain surveys (see Table 8).

The following is a list of the possible reasons for the significant "ability x type" interaction:

- When the survey was easy to use, the response time was rapid;
- The prevention of altering answers after submission may have hindered response time;
- The screen display of one question item per screen may have stimulated a faster response time;
- Clarity as opposed to clutter may have increased response speed;
- Consistency of the layout may have enhanced navigational flow;
- Textual graphics may have hindered readability due to the use of color and the delay in downloading;
- Alignment may have either increased or decreased response speed depending on the familiarity of the traditional format or the unfamiliarity or visual preference of the alternative format;
- The degree of saturation used may have either increased or decreased response speed depending on whether it hindered readability;
- Alternating high and low contrasting color may have either enhanced or hindered readability thus response time;
- The use of tables may have stimulated a faster response time.

Chapter Summary

The results of the two-way ANOVA showed that there was no significant difference between the two abilities, novice and expert, but there was a significant difference between the two survey types, plain, and fancy. Further, a significant interaction between the two variables, "ability x type", indicated that the experts responded more rapidly to the fancy survey than to the plain survey, while the novices responded more rapidly to the plain survey than to the fancy survey. Subjective indicators generated possible explanations for this interaction as a result of examining reports addressing alignment, tables, color, and graphics. Further conclusions and recommendations are made in Chapter 5.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Chapter Overview

This chapter describes the results of each replicated study and compares them to the findings of this study. Next, conclusions as well as alternative explanations for the findings are discussed, followed by the limitations of the study. Finally, the implications for distance research are discussed and recommendations for further research are put forward.

Comparison of Results to Replicated Studies

Dillman et al. (1998a) hypothesized that a fancy design would have lower completion rates than a simple design. The researchers pointed out two main differences of the fancy survey: (1) it took more time to transmit and (2) it had an alternative visual appearance. The researchers found that more respondents completed the plain survey than the fancy survey and concluded that the use of sophisticated features contributed to the lowering of response rates. Speculations as to the cause of this result included transmission time and the alternative format.

The results of this study were somewhat inconsistent with Dillman et al's (1998a) study. Although the fancy survey took slightly longer to load than the plain survey due to the use of graphics, the response to the fancy survey was more rapid than to the plain survey. Overall, there were slightly more positive reports made toward the fancy survey than the plain survey. Further, because there were only two negative reports of transmission time, one

from each of the two groups having the faster response time means (expert fancy, novice plain), it appeared that transmission time had little impact on response time.

Bowker and Dillman (2000) explained that the computer expert might prefer a right justified format or alternative method because of its appeal and ease of navigation. Conversely, the researchers contended that experts might be uncomfortable with right alignment "especially since their expectations (i.e., for a left aligned format) of web use are more prevalent" (p. 13). Further, the authors suggested that right alignment might be inappropriate for the novice due to its unfamiliarity.

Bowker and Dillman (2000) reported the following key findings:

1. Objective indicators showed that the left-aligned format was completed slightly faster than the right-aligned format.
2. The right format was perceived more negatively than the left.
3. Respondents who utilized the web 4-8 hours per week found the left format difficult, while subjects who used the web 8 or more per week reported right alignment as difficult to use.
4. There was no significant difference between the ease of use of the left and right formats for both the high and low computer comfort levels.

Contrary to the first finding, this study showed that overall, the fancy survey (right-alignment) was completed faster than the plain survey (left-alignment). Specifically, novices completed the left-aligned (plain) survey faster than the experts, while the experts completed the right-aligned (fancy) survey more rapidly than the novices.

Similar to Bowker and Dillman's (2000) second finding, the results of this study found that overall, more negative comments were made toward right alignment than left alignment. Specifically, experts reported somewhat more positively toward right alignment than the novices did; conversely, the novices reported more positively toward left alignment than the experts did. As Bowker and Dillman (2000) contended, not only did the novices dislike right alignment, but also the experts reported this alternative feature as unfamiliar with remarks such as "strange" and "surprising." A reason for this may be that "even expert users often have the properties of casual users as they encounter new functionalities and as they attempt to carry out a new kind of task with their well-worn system" (Brown, 1986, p. 461). Although the experts may have found the right-aligned format disconcerting, the interaction between the factors indicates that they were able to adapt to unfamiliarity better than the novices could. Conversely, results showed that the novices were more comfortable, while the experts tended to regress, when responding to the traditional format.

In contrast to the third finding, more novices with little web exposure commented negatively toward right alignment than the experts with a high degree of web use did. Finally, to parallel the authors' fourth finding, there were only minor differences in the ease of use between the novices and experts with regard to left and right alignment.

Conclusions

It may be concluded that the attributes of color, tables, graphics, and right-alignment (fancy survey) contributed to a rapid response time for the experts and the attributes of neutral color and left-alignment only (plain survey) to a fast response time for the novices. Overall, there were reports of minor difficulties with the interaction of the attributes.

Although there were a small number of reports of harsh color, unfamiliarity of the right-hand alignment, and difficulty in reading the graphics, the experts favored these attributes somewhat more than the novices did.

According to Durrett and Trezona (1982), "material presented in color is generally processed faster than the same material presented in black-and-white" (as cited in Schwier & Misanchuk, 1995, p. 6). Hence, it may be concluded that although the use of color may have stimulated a faster response time of the expert, it appears to have had little or no effect on the response time of the novice. Conversely, a neutral color may have slowed the response time of the expert while the use of color may have had this same effect on the novice.

Two conclusions may be drawn from the reports made on the use of graphics:

(1) Unwanted graphic patterns and flaws in alignment should be avoided (Newman & Sproull, 1979, as cited in Reilly & Roach, 1986). Hence, the graphic could have been horizontally centred within the table to achieve symmetrical balance (Galitz, 1981, as cited in Reilly & Roach, 1986);

(2) Graphics increase transmission time. Therefore, they should be relevant in communicating messages (Barron et al., 1996) and easy to read. It is debatable as to whether or not textual graphics should be used sparingly or at all in web surveys.

Alternative Explanations for the Findings

Interestingly, the experts responded more rapidly to the fancy survey, yet responded more slowly to the plain survey than the novices did. A possible reason for this interaction is that the expert was either more comfortable with these attributes or adapted to these features with greater ease than the novice. One of the reasons for this is the likelihood that the expert

had more practice and continual use with various screen and web design features than the novice had. This leads to the concept of "automation" that compensates for any inadequacies in interface design, making it easier to use. Interestingly, Hutchins, Hollan, and Norman (1986) contend that "experienced users will sometimes argue that the interface they use directly satisfies their intentions, even when less skilled users complain of the complexity of the structures" (p. 106).

Two factors that influence the effect of brightness on user response, are age and visual deficiency. First, older users require higher brightness levels to perceive distinct colors (Chapman, 1993; Murch, 1983). The average age of the MDE students of the 2001 - 2002 academic year was 42. Although the exact ages of the sample population in this study were unknown, it may be concluded that the younger participants may have perceived bright colors more intensely than the older subjects did, which may explain the reports of the color being too bright.

Second, color sensitivity varies among individuals, in particular, those who are colorblind or have color-deficient vision (Murch, 1983). Interestingly, "around 8% of males and 1% of females suffer from colour blindness, most commonly being unable to discriminate between red and green" (Dix et al., 1998, p. 18). Consequently, these two factors (age, visual deficiency) warrant further research in web survey design.

Limitations

The finding of a significant interaction of the "ability x type" factors encourages further research with larger and more diverse samples. It should be noted, however, that since there are numerous uncontrollable variables that can affect response time (e.g., distractions,

technical difficulties), this finding should be interpreted with caution. Additionally, the attributes were not tested separately; therefore, it is somewhat unclear as to which and to what degree they effected response time.

Other limitations included the restricted programming skills of the researcher. Perhaps more demographic questions such as the subject's age, culture, gender, and visual deficiency could have been probed to gather more specific data. However, to ensure that the respondent completed multiple entries and that the host submitted the data to the researcher successfully, more advanced programming would have been required. Additionally, it was difficult to find an Internet host that offered a Common Gateway Interface (CGI) service at a reasonable cost and that was willing to take on the responsibility of confidentiality and ethics involved in data gathering. Hence, anonymity in this study was limited because of the need to e-mail and interact with subjects, which may have lead to bias tendencies to please the researcher or respond in a way that was expected of them. Anonymity could have been better achieved via a cgi-bin, where data would have been sent to a directory or stored in a web location and the participants' e-mail addresses would have been unknown to the researcher. Further, it would have been ideal to program the survey to automatically calculate pre-test scores and to provide instant feedback to the user directing him or her to the survey in one setting as opposed to delayed feedback with the use of e-mail. More advanced programming such as CGI and Perl might have allowed for these design features.

Implications for Distance Research

This study contributed to the development of effective techniques for online representative sampling and addressed the need to implement appropriate web survey design

features to meet the needs of the novice and expert user. Moreover, it raised the importance of not only exploring the interaction between the user and interface, but also the social interaction between the groups: "interaction between user and computer does not take place in a vacuum" (Dix et al., 1998, p. 139). In future studies, a factorial design and ANOVA analyses may be implemented to determine whether a significant interaction has occurred and subjective indicators may be used to determine the cause for any such interaction.

This study showed that determining the efficiency of a web survey design on the response of the novice and expert may strengthen data validity and conceivably contribute to the evaluation and development of web survey design principles.

Recommendations for Further Research

Since the results of this study showed a statistically significant interaction of the factors (ability x type), there is reason to examine further the effect of web survey design on the response times of novices and experts. Because the results of the subjective indicators provided additional reports of each tested attribute, the variable, user preference, would be beneficial in replicative studies. However, to obtain more specific results, further testing of each distinct attribute is needed. Additionally, variables that complement speed, such as accuracy, measurement error, and non-response error, may be explored in future studies. Recommendations for further research of the effect of web survey design on user response time are listed below:

Control Procedures. First, it is highly recommended that critical control procedures be carefully implemented in future studies utilizing web surveys. This study utilized a number of control procedures including the use of ID numbers, the prevention of submitting blank

entries and re-submitting responses, minimal scroll bar and mouse movement, download time, and browser compatibility and configuration. Although ID numbers enabled the researcher to accurately identify subjects and detect outside participates, it is concurred that extra measures of preventing the intrusion of outside participation, such as password protection be taken (Solomon, 2001) to prevent measurement error and to strengthen data validity.

Alignment. Second, the attribute, alignment, warrants further empirical research in web survey design and user response. Testing response time and ease of navigation of not only the left and right, but also center alignment, as reported by participants as a possible alternative, may be useful. Interestingly, these reports corroborate Bowker and Dillman's (2000) suggestion of implementing a third treatment, center alignment that the researchers referred to as a limitation, to future studies.

Graphics. Third, similar to that of alignment, the placement of graphics could be tested (left, right, center) on user response. An alternative to textual graphics is text attributes (e.g., font size, face, and color) that take up less space, download faster, and may be easier to read. Hence, web survey studies that compare text attributes with textual graphics, may help to determine the effect of these attributes on the novice and the expert. The variables of readability, and download and response time, would be of particular interest in this study type.

Use of Color. Fourth, there has been a need for more and improved studies in screen design color (Misanchuk & Schwier, 1995). Remarkably, the results of past research of screen color effect on computer use efficiency were inconclusive (Szul & Berry, 1996). Studies in brightness and color saturation as well as "the use of color in improving the

usability of a screen display" have produced "contradictory results;" this conflict stresses "the need for more systematic investigation of the factor of screen text color configuration, particularly with regard to the characteristics of the particular user and user's experience..." (Szul & Berry, 1996, p. 752). Hence, this study's findings recommend further research in color tone (soft, hot), saturation (low, high), levels of brightness (light, dark), background colors, and various paired colors (compatible, clash) in web survey studies addressing user response and preference.

User Needs and Skills. Finally, although ease of use is vital, the user's needs and skills should not be overlooked. Norman and Draper (1986) state that "user-centered design emphasizes that the purpose of the system is to serve the user, not to use a specific technology, not to be an elegant piece of programming" (p. 61). Consequently, a sophisticated interface that may be difficult to use for the novice, may be too easy for the expert, and vice versa. A solution to this dilemma is that the interface design should address user characteristics by examining and adapting to the users' abilities and needs (Marchionini, 1991; Morland, 1983, Schneiderman, 2002).

As a final point, experiments in HCI and web survey design addressing the variables, novice and expert, contribute to more accurate results than experiments that exclude or limit skill level. It is recommended that these studies pre-determine factors such as computer ability and use, age, and visual difficulties to better describe the effect of web survey design on user response and determine any interaction that may occur between the groups. Consequently, this leads to the improvement of web survey design and principles and contributes to the narrowing of the gap in sophisticated design creation and user-capability to better meet the subject's needs.

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APPENDIX A

PRE-TEST

Completion of this pre-questionnaire will indicate your consent to participate. All information will be kept strictly confidential.

Before proceeding:

Enter your ID Number: [ ]

Enter the browser type and version you are using (e.g. Internet Explorer 5.0):

[ ]

Description

This pre-questionnaire consists of three sections, each of which is designed to measure your computer competency:

I. Computer Background
II. Performance Tasks
III. Skills Range

Directions

1. **Answer each question and statement accurately.**
2. **Complete all three sections.**
3. **Click the submit button.**

Section I: Computer Background

Select the best answer for each of the following questions:

1. How many hours do you utilize the computer each week?
- Under 20 hours
- 20 - 40 hours
- 41 - 60 hours
- More than 60 hours

2. How many hours do you utilize the Internet each week?
- Under 20 hours
- 20 - 40 hours
- 41 - 60 hours
- More than 60 hours

3. Have you sought technical support from an expert?
- Yes
- No

4. Have you sought technical support via computer-mediated communications?
- Yes
- No

5. Have you sought technical support from a Frequently Asked Questions (FAQ) list?
- Yes
- No

6. Have you addressed and corrected distinct technical errors (e. g. system freeze-up, lack of system memory, software, and browser incompatibility) independently?
- Yes
- No

7. Have you assisted others in correcting distinct technical errors (e.g. system freeze-up, lack of system memory, software, and browser incompatibility)?
- Yes
- No

(8) Have you received computer training from an expert?
- Yes
- No

(9) Have you pursued computer training via computer-mediated communications?
- Yes
- No

(10) Have you pursued computer training via on-line tutorials?
- Yes
- No

(11) Have you achieved distinct computer skills (e.g. word processing, spreadsheets, and programming) independently?
- Yes
- No

(12) Have you instructed or assisted peers or students in achieving distinct computer skills (e.g. word processing, spreadsheets, and programming)?
- Yes
- No

Section II. Performance Tasks

Check each of the following competencies that you are able to execute:

A. Word processing Competencies

- Change the font face, font size, and font color of text.
- Set left and right indents.
- Set left, center, and right paragraph alignments.
- Set left, right, center, and decimal tabs.
- Set left, right, top, and bottom margins.
- Set the paper size of a document to portrait or landscape.
- Create a header and footer.
- Insert a page number, date, and time into a header and footer.
- Create a border in a header and footer.
- Create a table.
- Add borders and shading to a table.
- Sort a table.
- Record a macro.
- Run a macro.
- Edit a macro using visual basic.
- Modify an existing template to create a new template.
- Save a document as a template.

B. Spreadsheet Competencies

- Create a spreadsheet.
- Select a range of worksheet cells.
- Erase a cell after entering data into that cell.
- Enter formulae according to the order of operations.
- Enter formulae using the function SUM.
- Use the mathematical functions: SUMIF, Absolute, or ROUND.
- Use three or more of the statistical functions: AVERAGE, MIN, MAX, COUNT, MEDIAN, MODE, or STDEV (standard deviation).
- Use two or more of the logical functions: IF, AND, OR, NOT.
- Use two or more of the financial functions: the Future Value function (FV), the Payment function (PMT), the Straight-Line Depreciation function (SLN), or the Declining Balance function (DB).
- Apply and change the font face, size, and color to an active cell and range of cells.
- Format numbers in currency, percent, and comma style and adjust the number of decimal places.
- Add top, bottom, left, and right borders to a worksheet cell and range of cells.
- Format the chart and plot area, the data series, and the legend of a chart.
- Use trendlines in charts to analyze problems of prediction.
- Format drawing objects to enhance the appearance of a chart.
- Create, edit, move, and resize a data map.

C. CMC (Computer-mediated Communications) Competencies

- Download incoming and send outgoing e-mail attachments.
- Reply to multiple recipients simultaneously.
- Forward an e-mail message to a recipient.
- Subscribe to a newsgroup.
- Download and search newsgroup messages.
- Post a message to a newsgroup.
- Subscribe to a Listserv.
- Post a message to a Listserv.
- Post a message to a WebBoard.
- Search for specific text or content of the WebBoard message index.
- Utilize a MOO (MUD Object Oriented) and MUD (Multi-User Dimension).

D. File Integration Competencies

- Insert a spreadsheet file to a word processing file.
- Insert a JPG and GIF file to a document window.
- Send a saved document to a mail recipient from a document window.
- Open an HTML file to an Internet browser.
- Open a JPG and GIF file to an Internet browser.
- Import a BMP, GIF, and TIFF image to a PDF document.

Section III. Skills Range

Choose the level of skill, ranging from 1-5, which best applies to your computer competency for each of the following components:

A. Using directories:

1 Create a new directory.
2 Copy files to a newly created directory.
3 Move and copy files to a newly created directory.
4 Move, copy files to, rename and delete a newly created directory.
5 Create subdirectories for a newly created directory.
I don't work with directories.

B. Managing databases:

1 Create a database.
2 Create a database and filter a table to select records.
3 Filter a table and create a query of a database.
4 Filter a table and create a query and a form of a database.
5 Filter a table, and create a query, a form, and a report of a database.
I don't manage databases.

C. Configuring browsers:

1 Set general preferences including appearance and history.
2 Set general and e-mail preferences.
3 Set general, e-mail, and newsgroups preferences.
4 Set general, e-mail, newsgroups, JavaScript, and cookies preferences.
5 Set general, e-mail, newsgroups, JavaScript, cookies, proxies, multimedia, and security preferences.
I don't configure my browser or set preferences.

D. Converting files:

1 Convert a word processing file to an HTML file.
2 Convert a word processing and spreadsheet file to an HTML file.
3 Convert a word processing, spreadsheet, and PDF file to an HTML file.
4 Convert a word processing file to an HTML and PDF file.
5 Convert a word processing and spreadsheet file to an HTML and PDF file.
I don't convert files.

E. Programming with HTML and Javascript:

1 Create and compose HTML files.
2 Insert ready-made JavaScript to HTML files.
3 Create and compose HTML and JavaScript files.
4 Upload your composed HTML and JavaScript files to a web site using an ISP.
5 Upload your composed HTML and JavaScript files to a web site using an ISP and FTP.
I am unable to program with HTML and JavaScript.

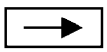
APPENDIX B

PLAIN AND FANCY SURVEY INSTRUCTIONS

Questionnaire

Topic: Survey Types

IMPORTANT: To successfully complete this questionnaire, your browser must be set to JavaScript enabled. If you require instructions to set your browser, please click on instructions.

If your browser is set to JavaScript enabled, click the arrow to proceed to the questionnaire. 

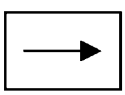
Instructions to enable JavaScript:

If you are using Internet Explorer 5.x, or 6.0:

1. Click "Tools" on the menu (top) bar and select "Internet Options." The Internet Options dialog box will pop up.
2. Select the "Security" tab.
3 Click the "Custom level" button at the bottom right. The Security settings dialog box will pop up.
4. Scroll down. Under the "Scripting" category, click the "Enable" radio button for these three descriptions:
   - Active Scripting
   - Allow paste options via script
   - Scripting of Java applets
5. Click OK twice to close.

If you are using Netscape 4.x or 6.x:

1. Click "Edit" on the menu (top) bar and select "Preferences."
2. Click on the "Advanced" category.
3. In Netscape 4.x, check the box, "Enable JavaScript."
   In Netscape 6.x, check the box "Enable JavaScript for Netscape."
4. Click OK.

CLICK the ARROW to return to the questionnaire. 

Questionnaire

Topic: Survey Types

Completion of this questionnaire will indicate your consent to participate. All information will be kept strictly confidential.

Perform the following tasks:

Enter your ID#: [ ]

Enter the browser type you are currently using (e.g. Internet Explorer): [ ]

Enter the browser version you are currently using (e.g. 5.0): [ ]

Click the submit button.

[Submit]

If you require assistance, please e-mail me at: igau@home.com

Questionnaire

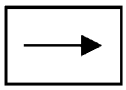
Topic: Survey Types

The main components of this questionnaire are the survey types: mail, telephone, e-mail, and web. It consists of 6 sections of 4 statements each for a total of 24 statements.

Directions

To complete this questionnaire successfully:

- **Select the best answer to each statement.**
- **Press the submit button ONLY ONCE for each item.**
- **Submit the 24 items in sequence and as EFFICIENTLY as possible.**

Click the arrow to begin the questionnaire. 

If you require assistance, please e-mail me at: igau@home.com

APPENDIX C

PLAIN SURVEY

Section I: Mail Surveys

(1) Mail surveys are inexpensive and cost-efficient.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(2) Mail survey questions are permanent and limited.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(3) Reponses to mail surveys are distinctively slow.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(4) Mail surveys draw a limited amount of subjects.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

Section II: Telephone Surveys

(5) Telephone surveys lack security and privacy.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(6) Telephone surveys promote personal interaction.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(7) Telephone surveys are practical and convenient.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(8) Collecting data by telephone is cost-effective.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

Section III: E-mail Surveys

(9) E-mail surveys attract a vast amount of subjects
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(10) Participants quickly respond to e-mail surveys.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(11) E-mail surveys are difficult to administer.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(12) E-mail surveys are reliable and dependable.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

Section IV: Web Surveys.

(13) Only an expert programmer should design web surveys.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(14) Web surveys are economical and cost-efficient.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(15) Web surveys can readily be altered and updated.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(16) Web surveys eliminate long distance telephone costs.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

Section V: Comparing Survey Types.

(17) Mail surveys are more reliable than web surveys.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(18) Web surveys are simpler to conduct than mail surveys
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(19) Telephone surveys are more practical than web surveys.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

(20) Web surveys are more cost-efficient than mail surveys.
- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Undecided

Section VI: Survey Preference

(21) I actively participate in these types of surveys:

- Mail survey
- Telephone survey
- E-mail survey
- Web survey
- None of the above

(22) The survey type I prefer to participate in is:

- Mail survey
- Telephone survey
- E-mail survey
- Web survey
- Undecided

(23) The survey type I prefer to conduct or design is:

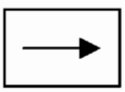
- Mail survey
- Telephone survey
- E-mail survey
- Web survey
- Undecided

(24) The most favorable and popular survey type is:

- Mail survey
- Telephone survey
- E-mail survey
- Web survey
- Undecided

You have completed all 24 statements.

Click the arrow button to proceed to the post-questionnaire.



APPENDIX D

POST-TEST: PLAIN

(1) How easy or difficult was it for you to complete the questionnaire?
- Very easy
- Somewhat easy
- Somewhat difficult
- Very difficult

(2) How did you perceive the choice of color of the questionnaire?
- Very good
- Somewhat good
- Somewhat bad
- Very bad

(3) How did you find the structure of the section headings?
- Very good
- Somewhat good
- Somewhat bad
- Very bad

(4) How did you perceive the text alignment of the statements and responses?
- Very good
- Somewhat good
- Somewhat bad
- Very bad

(5) Please comment on what you favored or disfavored about the questionnaire design:

APPENDIX E

FANCY SURVEY

Section I: Mail Surveys

(1) Mail surveys are inexpensive and cost-efficient.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(2) Mail survey questions are permanent and limited.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(3) Responses to mail surveys are distinctively slow.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(4) Mail surveys draw a limited amount of subjects.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

Section II: Telephone Surveys

(5) Telephone surveys lack security and privacy.

- Strongly agree ○
- Somewhat agree ○
- Somewhat disagree ○
- Strongly disagree ○
- Undecided ○

(6) Telephone surveys promote personal interaction.

- Strongly agree ○
- Somewhat agree ○
- Somewhat disagree ○
- Strongly disagree ○
- Undecided ○

(7) Telephone surveys are practical and convenient.

- Strongly agree ○
- Somewhat agree ○
- Somewhat disagree ○
- Strongly disagree ○
- Undecided ○

(8) Collecting data by telephone is cost-effective.

- Strongly agree ○
- Somewhat agree ○
- Somewhat disagree ○
- Strongly disagree ○
- Undecided ○

Section III: E-mail Surveys

(9) E-mail surveys attract a vast amount of subjects.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(10) Participants quickly respond to e-mail surveys.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(11) E-mail surveys are difficult to administer.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(12) E-mail surveys are reliable and dependable.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

Section IV: Web Surveys

(13) Only an expert programmer should design web surveys.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(14) Web surveys are economical and cost-efficient.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(15) Web surveys can readily be altered and updated.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(16) Web surveys eliminate long distance telephone costs.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

Section V: Comparing Survey Types

(17) Mail surveys are more reliable than web surveys.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(18) Web surveys are simpler to conduct than mail surveys.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(19) Telephone surveys are more practical than web surveys.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

(20) Web surveys are more cost-efficient than mail surveys.

- Strongly agree O
- Somewhat agree O
- Somewhat disagree O
- Strongly disagree O
- Undecided O

Section VI: Survey Preference

(21) I actively participate in these types of surveys:

- Mail survey ☐
- Telephone survey ☐
- E-mail survey ☐
- Web survey ☐
- None of the above ☐

(22) The survey type I prefer to participate in is:

- Mail survey O
- Telephone survey O
- E-mail survey O
- Web survey O
- Undecided O

(23) The survey type I prefer to conduct or design is:

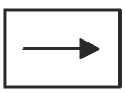
- Mail survey O
- Telephone survey O
- E-mail survey O
- Web survey O
- Undecided O

(24) The most favorable and popular survey type is:

- Mail survey O
- Telephone survey O
- E-mail survey O
- Web survey O
- Undecided O

You have completed all 24 statements.

Click the arrow button to proceed to the post-questionnaire.



APPENDIX F

POST-TEST: FANCY

(1) How easy or difficult was it for you to complete the questionnaire?
- Very easy
- Somewhat easy
- Somewhat difficult
- Very difficult

(2) How did you perceive the choice of color of the questionnaire?
- Very good
- Somewhat good
- Somewhat bad
- Very bad

(3) How did you find the structure of the section headings?
- Very good
- Somewhat good
- Somewhat bad
- Very bad

(4) How did you perceive the text alignment of the statements and responses?
- Very good
- Somewhat good
- Somewhat bad
- Very bad

(5) How do you rate the color used to contrast between each questionnaire item?
- Very good
- Somewhat good
- Somewhat bad
- Very bad

(6) How do you rate the color used to distinguish between the statement and answer categories of each questionnaire item?

- Very good
- Somewhat good
- Somewhat bad
- Very bad

(7) How do you rate the tables used to distinguish between the statement and answer categories of each questionnaire item?

- Very good
- Somewhat good
- Somewhat bad
- Very bad

(8) Please comment on what you favored or disfavored about the questionnaire design:

APPENDIX G

DIRECTOR'S E-MAIL MESSAGE TO ALL MDE STUDENTS.

Dear student:

A student in the MDE program (Ingrid Guttek) is looking for individuals to volunteer to participate in her research project, which she is undertaking to meet the thesis requirements of the program. The title of her study is "The Effect of Web Survey Design Features on User Response."

If you choose to participate, you will be asked to complete a survey, which will take approximately 15-20 minutes of your time.

If you are interested in volunteering to participate in the study, please contact Ingrid at <igau@home.com>.

Bob Spencer
Program Director
Master of Distance Education

APPENDIX H

COVERING LETTER: INFORMATION TO SUBJECTS

The Effect of Web Survey Design Features on User Response

Dear participant,

My name is Ingrid Guttek and I am an MDE student of Athabasca University. I wish to conduct a study to meet the thesis and dissertation requirements of the MDE program.

The purpose of this study is to determine the effect of web survey design on the response of novice and expert computer users. The completion of the survey study will take approximately 15 - 20 minutes of your time.

The study seeks novice and expert computer users. The novice user possesses moderate computer skills and prefers to learn from a more experienced user, while the expert user is highly skilful, adapts to a variety of computer tasks, and rectifies computer errors independently.

Your responses will remain strictly confidential. Any data reported may not identify any of the respondents and will be reported in aggregate form.

The data will be transferred from the researcher's e-mail directory to a word processor and then stored on diskettes and secured. Only the researcher will have access to the data. The data will be kept for a period of eight months or until the thesis is completed at which time the data will be deleted.

There are no known or expected risks associated with this study. Participation in this study is voluntary and you may withdraw from the study at any time.

Please direct all concerns or questions to the researcher.

Thank you in advance for agreeing to participate in this study.

Sincerely,

Ingrid Guttek
igau@home.com