

THESIS

THE EFFECTS OF USER EXPECTATIONS ON WEBSITE INFORMATION
COMPREHENSION AND SATISFACTION

Submitted by

Anna Harvilla

Department of Journalism and Technical Communication

In partial fulfillment of the requirements

For the Degree of Master of Science

Colorado State University

Fort Collins, Colorado

Summer 2014

Master's Committee:

Advisor: Jamie Switzer

Pete Seel

Lucy Troup

Copyright by Anna Harvilla 2014

All Rights Reserved

ABSTRACT

THE EFFECTS OF USER EXPECTATIONS ON WEBSITE INFORMATION COMPREHENSION AND SATISFACTION

The purpose of this qualitative study was to examine the role of users' expectations of a website information search in determining their comprehension of the information on a website and their satisfaction with the website. Interviews to determine their satisfaction with the website and think-aloud sessions were employed to gather data from participants, and open coding was used to analyze responses.

The findings of this study support the previous literature on scripts with respect to the usability of the Veterans Affairs website. The study found that scripts are present before users search for information on a website. Those scripts provide users with a strategy to find needed information efficiently, but when a website fails to conform to a user's script, users experience a more difficult search and lower satisfaction with the website. More research into the particular scripts that inform users website searching strategies will help to encourage better communication on websites. Adhering to the Plain Writing Act (2010) will improve communication on the Veterans Affairs website.

TABLE OF CONTENTS

Abstract.....	ii
Introduction.....	1
Literature Review	5
Methodology.....	28
Results.....	37
Discussion.....	55
Appendix A: Interview Question Guide.....	70
Appendix B: Website Information Search Scenario.....	71
Appendix C: Pre-Viewing Response Codebook.....	72
Appendix D: Think-Aloud Verbal Response Codebook.....	74
Appendix E: Think-Aloud Action Codebook.....	76
Appendix F: Post-Viewing Response Codebook	78

Introduction

The Veterans Affairs website is visited every day by many people in search of information about their healthcare and benefits. People need the information to help make informed decisions about their financial, educational, and health futures, yet the website has not been designed, nor the information it contains written, to clearly convey that information to the people who need it.

The website must conform to the Plain Writing Act of 2010 (Plain Writing Act of 2010: Pub. L. No. 111-274 , 2010). The Plain Writing Act set forth specific guidelines governing the design of online spaces and the writing style those spaces contain. Some of those guidelines dictate the organization of text, paragraph length, writing style, word selection, and sentence length (plainlanguage.gov, 2011). Likewise, the act dictates governmental websites must make certain improvements to the usability, such as recommended page length, text line length, menu types, and webpage layout.

Recently it has been determined that the website does not conform to these guidelines (Center for Plain Language, 2012). In fact, the Department of Veteran Affairs has done nothing besides naming a plain language officer to meet the plain language guidelines (Center for Plain Language, 2012). Administrators for the Veterans Affairs website refused to comment on why the website has not been updated to meet the new plain language guidelines, and it appears that there are no plans to attempt to meet these guidelines (Center for Plain Language, 2012). Measures must be taken to ensure productive communication between the public and the Department of Veterans Affairs.

The rise of the Internet has created an entirely new source of information for readers, along with an entirely new set of obstacles to overcome. Readability and communication experts know that skilled readers have an arsenal of strategies they employ to make meaning from traditional print media; some of these strategies include “previewing the text, setting goals, making predictions, asking questions, monitoring understanding, and making connections” (Coiro, 2011, p. 108). However, the same experts also know that “as readers transition to Internet reading environments, emerging work suggests these traditional reading and thinking strategies are necessary, but not sufficient, to successfully navigate and make sense of online information texts” (Coiro, 2011, p. 108).

Users must overcome many obstacles to comprehend information found on the Veterans Affairs website as it is currently. They are faced with poorly organized information, web pages that are too long and require too much scrolling, and pages that contain too much information. The result of these design flaws is decreased comprehension and increased confusion due to information overload, lack of textual coherence, and poor website design.

Information overload is one strike against readers’ comprehension of online information. This condition is a result of readers encountering too much pertinent information in their web searches (Koltay, 2011a). Literacy is the most effective means of enabling readers to sift through the plethora of available information to find what is most relevant and useful; in particular, the act of “filtering,” one of the skills that digitally and informationally literate readers possess that digitally and informationally illiterate readers do not (Koltay, 2011a). Users expect to encounter a certain amount of information on each page, and when that expectation is ignored, their comprehension suffers. Illiterate users have poorly informed expectations of web pages that further limit their processing abilities.

Furthermore, comprehension suffers when important cognitive reading processes such as decoding (or meaning-making), lexical access, and inference formation are not met by readability and usability experts. Readers are forced to work harder to obtain the information they desire. Comprehension also suffers when readers experience information overload. Some readers may become discouraged and simply give up on their information search, while others will turn to less-credible sources that are easier to comprehend (Jansen, 2009). These problems could potentially be overcome by taking readers' expectations into account by designing web pages and text in a way that readers can intuitively navigate to and interpret information, addressing the problems of information overload, avoiding decoding difficulties, and reducing digital, information, and media illiteracy.

Conforming to users' expectations is becoming more important as readers' comprehension abilities continue to decline (Koltay, 2011b). Readability scholars and researchers have devised some means to try to aid readers in comprehension and evaluation of information, but these methods are still imperfect. The fields of usability and information architecture are just as responsible for attending to reader literacy and comprehension, and they have their own methods of assessing these areas. These methods differ from readability methods in their approaches to user interactions, needs, and comprehension, but are still by no means ideal. Experts in usability, readability, and information architecture are all too ready to rely on formulaic and procedural methods of usability and readability analysis that fail to involve the user in their evaluations.

Many usability experts note that user expectations should be considered and used as design guides for website creators. Saxtoft (2008) posits that users' expectations shape their experience with a particular website. Similarly, Osborne (2005) asserts that users expect certain

features from every website, including a home page, an “About Us” page, links, and a “Contact Us” page.

Users’ satisfaction with websites is a result of their first impressions of that site (Sørum, Andersen, & Vatrapu, 2012). First impressions are influenced in part by a website’s ability to meet users’ expectations. Designing websites to meet user expectations can create greater user satisfaction.

Some usability experts and website designers already consider users’ expectations before and during website building. One smart phone website designer and usability expert used a wooden prototype to gather information about users’ expectations for an interactive tour for Fort Vancouver National Site (Still, 2010). Users were asked to define the types of navigation menus and different media they expected to see on their smart phones throughout different stops on the tour (Still, 2010). The information yielded from this study will be used to tailor an interactive tour app to users’ expectations and create a more satisfying experience (Still, 2010).

It is evident that user expectations are an important design factor for usability experts and website designers to consider, along with federal guidelines for usability and readability. Applying information about user expectations can help to create websites that are not only more satisfying to their users, but are also better at communicating vital information in a comprehensible manner to those users. The Veterans Affairs website needs to be redesigned to meet federal readability and usability guidelines, and factoring user expectations into that redesign will only serve to make the website more effective as a communication tool.

Literature Review

The Importance of Comprehension

All texts, or written forms of communication, whether printed or online, are created to convey information to readers. However, if readers cannot comprehend texts, they cannot learn the information within. Comprehension can be affected by a number of structural features (explained later, under “The Future of Comprehension Research”), as well as by the reader’s experience and knowledge (Sharp, 2003). The difficulty of assessing each individual reader’s knowledge and experience for each text is extremely limiting to writers, who instead depend on readability testing strategies and formulas. Readability tests offer writers a means of evaluating the comprehensibility of their texts based on textual factors like sentence length and the number of syllables in words.

Writers have expressed concerns about their readers’ ability to comprehend their writing for thousands of years. According to Chall (1988), classical writers like Plato and Aristotle used rhetorical devices and theories in an effort to make their discourse more comprehensible to readers. Hebrew scholars also committed their lives to studying the Torah in an effort not only to understand its teachings better, but also to decode the vocabulary of the Torah (Chall, 1988). However, the desire to assure readers can comprehend texts became a formal field of study after the rise of compulsory public schooling; educators wanted to be able to assess the comprehensibility of textbooks (Chall, 1988). This desire led to the birth of the field of readability research.

A Brief History of Readability

The beginnings.

The field of readability is highly focused on statistics and formulas as a means to evaluate the comprehensibility of texts, and has been since its very beginnings. This foundation in statistical calculation of comprehension is the result of the very first formal readability studies conducted by Sherman (DuBay, 2004a). Sherman was an English professor at the University of Nebraska; in 1880, he developed an interest in the historical and statistical aspects of literature and began to investigate how English-language literature has evolved (Sherman, 1893). He noticed that sentences had become shorter and shorter over time through the comparison of texts by older authors, such as Shakespeare, with more contemporary ones, like Ralph Waldo Emerson (Sherman, 1893).

Sherman's work in determining how sentence length is evolving over time set a precedent for statistical analysis of literary texts (DuBay, 2004a). Other researchers who developed interests in readability used Sherman's work as the basis for their own studies, and so produced more quantitative, statistical means to analyze text comprehensibility.

It is important to remember that quantitative analysis was by far the favored research mode within the positivist paradigm, and positivist thought dominated scholarly research when Sherman began his work. Positivism is a research paradigm defined by empirical investigation directed toward determining the "truth" about an issue (Lindlof & Taylor, 2011). Lindlof and Taylor (2011) assert that positivist researchers believe in a universal reality that can be objectively experienced in the same way by all people. Furthermore, Lindlof and Taylor (2011) note that positivist researchers search for the truth about phenomena through objective, rigorous, and quantitative experimentation.

The influence of positivism on communication studies “included a search for external and psychological causes for communication, a focus on predicting and controlling that ‘behavior,’ and the use of quantitative methods in artificial settings” (Lindlof & Taylor, 2011, p. 6). Because positivist research was considered the most accurate form of research in Sherman’s time, the readability studies created then, as well as many of the readability studies used today, are highly quantitative and formula-driven.

The move into schools.

Schoolteachers learned of Sherman’s work and became interested in assessing readability in order to better educate their students and offer them the most useful textbooks possible. Teachers’ interest in calculating readability dates back to the late nineteenth century (DuBay, 2004a). These early readability tests focused on grade school students’ abilities to paraphrase passages that they had read silently (Willis, 2008). The results from these tests were evaluated by teachers according to how closely the students’ paraphrases did or did not reproduce the meaning of the text (Willis, 2008). The results of these tests varied widely because there was no standardization of scores; the same test evaluated by two different teachers could receive two vastly different scores based on the teachers’ perceptions of the student’s comprehension (Willis, 2008).

These early readability tests were not quantitative at all in nature, but instead highly subjective and qualitative. They did not take factors like word count or sentence length into account. These tests also did not account for weak writers. A student might comprehend a text but be unable to paraphrase it in a way that reflects that comprehension, and therefore receive a lower score that does not accurately reflect his or her comprehension. In addition, these tests graded the students’ comprehension, not the overall readability of the text.

New methods were deemed necessary to create a standardized means of determining readability based on the wide variances in grades different teachers might assign to the same reading test. Charles Judd, a member of the Committee of Standards within the National Council of Education, argued in 1914 that “the kind of comparison which the teacher is able to make within the limits of her own class ought to be extended in such a way that the class as a whole may be compared to larger units of school organization” (Judd, 1914, p. 366). He went even further to argue that nationwide standardized tests could be of immense value (Judd, 1914).

Judd’s call for more objective means to gauge readability was strongly influenced by positivism’s grasp on the scientific community. Readability scholars at the time thought that all readers approached and accessed texts in the same way because of positivism’s views of the nature of reality. Little thought was given to the highly subjective nature of reading and comprehension as researchers worked to create readability measurement formulas based solely on the tenets of positivism.

One of the first standardized readability assessment methods for schoolchildren came from Edward L. Thorndike. Thorndike, an educational psychologist, focused his studies on the improvement of students’ comprehension of textbooks (Thorndike, 1921). His focus was strongly positivist, the result of his work as a student in a laboratory in which students’ comprehension of school subjects was measured statistically. His research is considered seminal in shaping modern readability testing methods (Willis, 2008). Thorndike’s work in readability focused on the words that readers encountered—he measured the frequency at which words were seen in English texts, the lengths of those words, and the difficulty they posed to readers (Thorndike, 1921). Commonly occurring words were considered easier for lower-level readers,

while less common words were considered to be harder because they were outside the readers' vocabulary ranges (Thorndike, 1921).

Thorndike took the next step towards a standardized reading comprehension test in 1921 with the creation of his *Teacher's Word Book*. The *Teacher's Word Book* contained 10,000 words that Thorndike found to be the most common in English writing (Thorndike, 1921). This list allowed other researchers to more easily create formulas to assess text readability. The book was expanded in later years as Thorndike's research continued—20,000 words in 1932's *A Teacher's Word Book of 20,000 Words*, and 30,000 words in 1944's *A Teacher's Word Book of 30,000 Words*, which was co-authored with Irving Lorge (DuBay, 2004a).

More positivist research into readability was carried out during the 1920s. This period saw an enormous increase in the number of statistical readability formulas. It was during this time that readability researchers began to label texts as “inferior” or “superior” for readers of different abilities based on their calculated grade-level readability (Willis, 2008). Texts that were thought to be above a child's grade reading level were “inferior,” while those that were below or within the grade reading level were considered “superior” (Willis, 2008). It is this “superior”/“inferior” dichotomy that has influenced writers' text-leveling goals; even today, if a text is scored below or at a reader's grade reading level, that text is considered to be more comprehensible than one that exceeds a reader's reading level.

As mentioned above, teachers and researchers were primarily concerned with rating texts as “superior” or “inferior” for readers of a certain grade level to aid in comprehension. Other researchers soon picked up the work started by Thorndike and sought to expand on his textbook readability studies. They, too, were concerned with the readability and comprehension of textbooks to schoolchildren and the division of texts into grade levels and “superior”/“inferior”

categories. Bertha Lively and S. L. Pressey created the first formula designed specifically to determine grade reading level in 1923 (Lively & Pressey, 1923).

Lively and Pressey attempted to create a formula to aid in the selection of science textbooks for students in junior high school (Lively & Pressey, 1923). Their method employed the analysis of 1,000-word sections of text from selected books based on Thorndike's 10,000-word lists of common words; passages that correlated more closely to Thorndike's list were considered easier, and therefore "superior" to those that did not correlate as closely (Lively & Pressey, 1923). As DuBay (2004a) points out, Lively and Pressey's lists merely tracked correlations between the passages and Thorndike's word list—it did not take into account any of the reasons besides word familiarity that might affect how well students comprehend texts.

The Status of Readability Research

The use of readability formulas became even more widespread as the number of researchers creating their own formulas increased. This section will outline a number of the most popular and relevant readability studies from the 1920s to the 1980s.

The number of statistical formulas for calculating readability of a text mushroomed in the years following the foundational work from the 1920s. Many of these formulas are still in use today and some are still extremely common. For example, Microsoft Word can calculate the readability score of a document in both the Flesch Reading Ease and Flesch Kincaid Grade Level formats, which were created in 1948 and 1975, respectively (Books LLC, 2010).

The Gray-Leary readability study.

The Gray-Leary readability study, which looked at adults' comprehension of texts, was vastly different from the work of other readability scholars in the 1920s. Gray and Leary were interested in the interplay of many factors within and outside of the text that may influence text

comprehension (Gray & Leary, 1935). The researchers looked not only at word length, word difficulty, and reader interest, but also at the physical features of the book itself, such as the length of text lines, margin width, and the qualities of illustrations (Gray & Leary, 1935).

Gray and Leary sought to create a test of adult reading comprehension for various reading materials (Gray & Leary, 1935). They first compiled a list of every possible factor that might affect a reader's comprehension. This list was comprised of 228 unique content, style, format, and organization variables that could occur in a text (Gray & Leary, 1935). The researchers then interviewed 170 volunteer adult readers to create two lists: one list of factors that indicated reading ease and another that indicated reading difficulty (Gray & Leary, 1935).

Gray and Leary were successful in creating a more definite conception of the difference between "difficult" and "easy" texts, along with guidelines for selecting adult reading materials. Gray and Leary found that there were no effective ways to statistically test the text factors format, content, and organization (DuBay, 2004a). However, their work inspired many other readability researchers to attempt to create formulas that could better assess text readability and give a truly accurate depiction of the readability of any text (DuBay, 2004a).

Flesch tests.

The readability formulas created by Rudolph Flesch were incredibly important when they were created, and continue to be among the most-used formulas today. His first readability formula, the Flesch Reading Ease test, was introduced in 1948, and consisted of two separate formulas that are combined to create an overall readability score (Flesch, 1949). The first formula calculates the readability of a document on a 100-point scale based on the number of letters in the words and the number of words in the sentences of a given 100-word passage (Flesch, 1949). The second formula calculates personal interest to the reader by counting the

number of pronouns in a 100-word selection, followed by the number of dialogue sentences and direct addresses to the reader within the passage (Flesch, 1949).

An update to the Flesch Reading Ease test was created at the request of the United States Navy. The Flesch-Kincaid Grade Level test was the result of a 1975 Navy study on adult readability (Kincaid, Fishburne, Rogers, & Chissom, 1975). The study converted the 100-point scores from the Flesch Reading Ease test into grade-level scores that could tell researchers and writers quickly and easily the grade-level difficulty of any text (Kincaid, Fishburne, Rogers, & Chissom, 1975).

Dale-Chall readability test.

Edgar Dale, an educator, and Jeanne Chall, a readability researcher, created a readability formula intended for readers, both adults and children, over the age of 11. Dale was a longtime critic of Thorndike's common word list, which he felt did not accurately measure the familiarity of words to readers (DuBay, 2004a). He created new lists of words that should be familiar to most readers, and then he and Chall devised a new formula in 1948 based on these words lists to measure readability (Dale & Chall, 1948). Dale and Chall's formula assessed a 100-word passage based on the average number of words in a sentence and the number of words in the passage that were not in Dale's 3,000-word list of common words (Dale & Chall, 1948). These two scores were then plugged into a formula that yielded the supposed grade level of the text (Dale & Chall, 1948).

Fog and SMOG indexes.

In 1952, readability scholar Robert Gunning published *The Technique of Clear Writing*, which contained his Fog Index (Gunning, 1968). The Fog Index was developed to assess adults' reading comprehension, and quickly became the readability test of choice for government

agencies such as the Department of Agriculture, as well as the Army and Navy (Gunning, 1968). The Fog Index uses sentence length and the number of words greater than two syllables in a 100-word passage to calculate readability (Gunning, 1968).

The SMOG Index was developed in 1969 by McLaughlin and was created specifically to determine the readability of medical and health literature for both child and adult readers (McLaughlin, 1969). McLaughlin agreed with Gunning's decision to count only multi-syllable words to determine readability, and based his formula on Gunning's (McLaughlin, 1969). The SMOG Index reports readability as a percentage rather than as a grade level, which can sometimes skew results and make texts appear to be more difficult to comprehend (Burke & Greenberg, 2010).

The plain language movement.

The 1960s saw the rise of the plain language movement, which focused on increasing readers' ability to comprehend texts by editing for jargon and complex words (DuBay, 2004a). This movement was especially relevant in government communication and documents, and eventually led to the creation of federal guidelines governing writing style. Public Law 111-274 states that the Plain Writing Act of 2010 is intended "to improve the effectiveness and accountability of Federal agencies to the public by promoting clear Government communication that the public can understand and use" (2010, p. 2). All Federal agencies are required to comply with this act and write their documents and websites using plain language practices.

The Plain Writing Act of 2010 ensures that government documents, including online communication, are readable to a larger majority of United States citizens (Plain Writing Act of 2010: Pub. L. No. 111-274 , 2010). Before the Plain Writing Act, government communication was extremely dense writing similar to legal writing styles. This communication style was

commonly acknowledged by the public to be unreadable and incomprehensible. The Plain Writing Act set forth certain standards for writing to ensure clarity, conciseness, and comprehension; it also set deadlines by which government communications must be reformatted to fit the plain writing criteria (Plain Writing Act of 2010: Pub. L. No. 111-274 , 2010).

The Plain Writing Act created guidelines that dictate how government communication should be written so that readers can quickly and easily locate the information they need and comprehend it to use in their lives (Plain Language Action and Information Network, 2012). PLAIN, The Plain Language Action and Information Network established these guidelines. The guidelines focus on writing to meet readers' needs and creating documents with lower readability scores (Plain Language Action and Information Network, 2012). The PLAIN (2012) guidelines instruct writers to analyze their audience before writing, and then tailor their writing to suit this audience. Documents should be organized in a manner that allows readers to quickly find the information they need through the use of information chunking, short sections, and descriptive headings (Plain Language Action and Information Network, 2012). Sentences should be simple and direct, and should be written in active voice; simpler words should be used in place of long or technical words (Plain Language Action and Information Network, 2012). The PLAIN (2012) guidelines also instruct writers to write web documents that allow readers to complete tasks, such as filling out tax forms.

Many government documents and websites have conformed to the Plain Writing Act and have rewritten their textual communications to be more easily comprehended by U. S. citizens. However, the Veterans Affairs website still does not meet the criteria set forth in the Plain Writing Act. According to a recent report by the Center for Plain Language, the Veterans Affairs website has failed to meet Plain Writing Act basic requirements, such as using shorter words,

writing shorter sentences, and organizing text in a logical fashion (Center for Plain Language, 2012). The Veterans Affairs website has also failed to enact any supporting activities to promote plain communications, such as training employees in plain writing (Center for Plain Language, 2012).

The Future of Comprehension Research

The limitations of readability formulas.

Both writers and researchers have determined that there are serious limitations to readability measurement formulas. Each scholar has his or her own set of drawbacks that he or she believes renders readability formulas deeply flawed or useless. This section contains a summary of those flaws, as well as some of the new methods researchers and writers use to determine readability.

One of the most pertinent flaws of readability measures is that they are intended to give reading scores as a grade level, and are thus only applicable for children. DuBay (2004a) notes that “for a long time, no one thought of grading adults, who were considered either literate or illiterate” (p. 4). Because the formulas are intended for children, they are not an accurate means to measure adult comprehension. Not all adults can comprehend text written at a post-high school reading level, yet this factor is not accounted for in many readability formulas.

Another of the most salient critiques of readability formulas is that they fail to take into account the cognitive processes readers employ to create meaning. Magliano, Millis, Ozuru, and McNamara posit:

Comprehension arises from a series of cognitive processes and activities, including word decoding, lexical access, syntactic processing, inference generation, reading strategies (e.g., self-explanation), and postreading activities (e.g., summarization, question asking

and answering, argumentation). These contribute to a reader's ability to connect the meaning of multiple sentences into a coherently connected mental representation of the overall meaning of a text. (2007, p. 109)

These cognitive factors indicate that reading is an intensely personal activity, one that usually occurs silently and without interaction from others. Readers must use these cognitive processes to make sense of a text when they are unable to confer with others about the meaning of the text. Dreyer (1984) sums up the lack of cognitive considerations in readability formulas succinctly and accurately: "readability is not an inherent property of texts, but results from the interaction between reader and text" (p. 337).

Differences among readability test scores.

Many scholars note that readability scores vary according to the formula being used to make assessments. Zakaluk and Samuels (1987) note that the same text analyzed according to two different readability tests will receive two different scores, which are sometimes strikingly different. This inconsistency between formulas creates confusion among readers, teachers, writers, and researchers. In essence, there is no true measure for readability because of the lack of external consistency between the different assessment methods. Inconsistency between formulas creates problems for teachers trying to find texts of a certain grade level for their students, and makes study comparisons more difficult for researchers.

Structural features.

Many scholars cite readability formulas' lack of consideration of structural features of texts—factors such as rhetorical devices and causal reasoning (Magliano, et al., 2007). Magliano et al. (2007) note that the study of these features could lend insight into the conclusions readers draw and how those conclusions are reached. Sharp, too, notes that readers are extremely aware

of the organization of texts, and that this organization is key to their comprehension (2003). Zakaluk and Samuels point out that “it is possible to randomize every sentence in a text without changing the tabulated readability” (1987, p. 124). Any formula that allows for the randomization of sentences with no effect on the readability is not capable of giving a realistic assessment of a text’s clarity.

Sharp (2003) addresses the absence of microstructures and macrostructures in readability formulas. He defines microstructures as propositions in a text—“the smallest definable text units” (p. 49). These microstructures relate to each other to enable comprehension, and are ultimately shaped in readers’ minds into macrostructures (Sharp, 2003). These macrostructures relate ideas on a large scale and enable readers to construct meaning (Sharp, 2003). Without macrostructures, readers have difficulty encoding and recalling texts, and thus demonstrate poor comprehension (Sharp, 2003).

Lexical difficulty.

Lexical difficulty is another factor that many researchers claim has an impact on readers’ comprehension but is not an important element of any readability formula. Sharp (2003) claims that some of the textual features that most contribute to lexical difficulty are “the frequency or familiarity, abstractness, length, nominalization, compounding and the use of unfamiliar idioms” (p. 37). These factors all play a role in shaping comprehension, but writers and researchers should note that repetition is the factor that most strongly affects lexical cohesion (Anders & Pearson, 1987). Readability formulas do not examine the effects of repetition and other lexical factors of texts.

New Horizons in Comprehension Research

Considerable new research is being conducted into readability and the textual and cognitive factors that affect how readers comprehend texts. One of the most exciting areas is contextual readability, which attempts to reconcile the contexts within which readers encounter texts to those readers' interpretations of the text (Anders & Pearson, 1987). Research into contextual readability has suggested that readers are able to construct meaning differently depending on the context of the reading. For example, work reading differs from pleasure reading because of the circumstances surrounding the reading act (Anders & Pearson, 1987). Furthermore, even the type of document being read and its format differ greatly between work and pleasure reading (Anders & Pearson, 1987). Textual coherence has not been factored into any known readability formula.

Readers' expectations.

As of late, the call for alternative readability assessment measures has increased. In particular, some researchers have noticed the need to consider users' expectations when creating written communications. Expectations relate to the other cognitive factors that affect readability. Schemata are activated as the user decodes meaning, but if the intended meaning defies the user's expectations, incorrect schemata might be used and the constructed meaning may differ significantly from the intended meaning. Readers also have difficulty comprehending texts that are organized differently than they expected. It is important for writers to "keep in mind that when the textual structure is in agreement with the reader's expectations, text processing and comprehension are facilitated" (Kools, Ruiters, van de Wiel, & Kok, 2004, p. 723).

Kintsch (1987) posits that "comprehension is a cognitive process" that allows readers to interpret the meaning of a text (p. 11). This meaning construction is the result of the reader's

cognitive processes. Some scholars assert that schemas are the cognitive processes at work decoding meaning. Schemas are knowledge networks composed of experiences and memories that are activated and compared to incoming information during comprehension (Sharp, 2003). The cognitive factors that underlie comprehension are vital to understanding how meaning is made from a text. They will be explored in greater depth in the following section.

Cognitive Factors

Schema and scripts.

Schemas are an integral part of the cognitive processes readers use to interpret texts. LaZansky, Spencer, and Johnston (1987) define schemata in the context of readability as the “highly abstract frameworks of knowledge that operate in a subordinate fashion to interpret information” (p. 257). Every person’s schema is different, because they are based on firsthand knowledge of the world and previous learning (LaZansky, Spencer, & Johnston, 1987). Because every person has had different life experiences and learned (and retained) different knowledge from those experience, all schemata are inherently unique. There is no possible way that readability formulas could possibly factor in every individual’s schema.

Script theory.

Script theory emerged from research in artificial intelligence and efforts to program computers to understand natural human language (Abelson, 1981). Script theory is based on schemata, where scripts are one type of schema used to aid in processing information in common situations (Abelson, 1981). Within computer science, scripts allow artificial intelligence systems to make inferences based on generalizations of situations to try to create meaning from natural human speech (Abelson, 1981). When applied to human cognition, scripts remind people of

similar previous situations and allow them to plan their actions to bring about the best outcome in the current situation (Schank, 1982).

Abelson defines a script as:

A hypothesized cognitive structure that when activated organizes comprehension of event-based situations. In its weak sense, it is a bundle of inferences about the potential occurrence of a set of events that may be structurally similar to other schemata that do not deal with events. In its strong sense, it involves expectations about the order as well as the occurrence of events. (1981, p. 717)

Scripts are present in all people. They are cognitive structures based on stories of one's experiences, as well as others' experiences, that inform knowledge, memory, and social interaction (Schank & Abelson, 1995). People use scripts to form expectations about what should happen in a situation and use those expectations to anticipate other actors' actions (Schank, 1982). Schank (1982) notes that anticipation of others' actions allows for planning; typically, people plan for more than one outcome so that they are ready to act after a number of different events.

For example, a library script is activated when a college student enters a university library to find research materials. The student knows from past library experiences that there are certain steps to be followed in a certain order to bring about the best outcome, which is a successful search for useful research materials. The student will remember previous library visits and use those experiences to plan for the current library visit. Some of the memories that the student might remember are searching the electronic catalog, consulting with a librarian, and searching through the stacks for a specific section of books. All of these memories represent potential actions the student could take during the current library visit.

Scripts are useful for reminding a person what should happen in an event based on what has happened previously in similar events. They are a means to organize information in the memory (Schank, 1982). A person will act according to the rules of the event of which they are most reminded (Schank & Abelson, 1995). Because scripts are based on previous events of which people are most strongly reminded, they shape how people interpret current events. For instance, a woman who has been abused in a past relationship might interpret her partner's silence during a disagreement as animosity, when in reality the partner is taking time to formulate a composed response.

Scripts can be thought of as an "expectation bundle" that aids a person in making inferences to help them comprehend a situation (Abelson, 1981). Scripts shape understanding, which is:

A memory process in which the ordinary events we encounter . . . are organized into temporally ordered sequences of scenes termed 'memory organization packets.'

Associated with these scenes are the roles typically played by various agents, the goals they have, and the plans executed in service of those goals. (Schank & Fano, 1995, p. 263)

These hypothesized roles, goals and plans are, in fact, the expectations people hold about how a situation will occur.

Schank and Abelson posit that comprehension is derived from the playing out of an event according to its corresponding script, and that events that differ from the script are met with confusion (Schank & Abelson, 1977). The plans a person has made in an effort to bring about a desirable outcome are rendered useless, and new plans must be formulated (Schank & Abelson,

1977). This reformulation requires the person to draw upon other scripts that do not remind him or her as much of the current situation (Schank & Abelson, 1977).

Scripts and expectations that pertain to website navigation are of particular interest in this study. Individuals possess scripts and corresponding expectations about how a search on the Internet for particular information will occur based on previous website information searches. The expectations generated from a web search script inform how an individual will approach other web search events. The person's actions and tasks will be determined by expectations formed by past web search experiences, and their ultimate success or failure in the information search will be shaped by how well the current web search corresponds with or defies the person's expectations.

Usability

The field of usability provides information about the importance of the various facets of website construction about which users form expectations, which can affect the user's comprehension of information. Web analysts and information architects investigate how a website's design and the information it contains affect user satisfaction and success. Their ultimate goal is to create a website that is easy for users to navigate and where information is presented in a comprehensible format (Ding & Lin, 2010; Jansen, 2009). Satisfaction is the measure of how well website designers and information architects meet this goal. Satisfaction is defined as "the comfort and acceptability of a website to its users" (Lee & Kozar, 2012, p. 451). Sørnum et al. (2012) have measured satisfaction according to "(1) how easy it is to find information on the website, (2) content of the website and (3) usefulness of the website" (p. 700).

Usability experts typically evaluate a website's usability through web analytics (Jansen, 2009). Jansen (2009) notes that this process utilizes software that gathers information about

factors such as visit length, in-site searches, visitor path, and referring pages. These factors can tell usability experts about sections of the website in which users are or are not interested, as well as users' interest in various web pages (Jansen, 2009). Web analytics can also reveal through searches and click-through paths any obstacles users may have encountered (Jansen, 2009). However, all of the factors that web analytics measures cannot reveal to usability experts *why* users experienced difficulty with pages. Instead, usability experts are left to infer why certain web pages or features troubled users.

Similarly, information architects, experts who are tasked with organizing how information on a website is organized and broken up onto different pages, use personas and personarios to analyze how certain groups of people use websites (Ding & Lin, 2010). Personas are personality profiles based on composite data gathered from many real-world users (Ding & Lin, 2010). Ding and Lin (2010) contend that personas help information architects understand who users are, from their hobbies, occupation, and interests, to their goals in using a specific website. Personas can operate within website-searching scenarios. The combination of a persona and a scenario is known as a personario: information architects use personas and personarios to understand how and why users use websites as they do (Ding & Lin, 2010).

While personas and personarios are created from data gathered from real-world users and can operate similarly to a real-world user, they do not offer information about problems users might encounter while searching a website for information. Personas and personarios cannot tell information architects how users want information displayed, and cannot offer information about confusing wording or features.

The government usability website endorses the use of personal and group interviews as means to evaluate a website's layout, functionality, and information presentation (Usability.gov,

n.d.). Usability.gov (n.d.) also recommends the use of personas and scenarios while website designers are analyzing the website's audience and their needs. Despite recommending the use of personas and personarios while a website is under construction, Usability.gov does not recommend using personas or scenarios as means to evaluate a website once it is available to the public. The use of web analytics is not recommended (Usability.gov, n.d.).

Conceptualization of Study

This study will use readability, and the related concept of comprehension, to investigate the efficacy of communication on the Veterans Affairs website. The researcher intends to investigate the interplay of textual factors related to readability, website design, and user expectations in shaping overall satisfaction and comprehension of information in an information-seeking event. The researcher devised a concept map for the study after reviewing the literature on readability, usability, and scripts. Figure 1 illustrates the overarching conceptual relationships this study will attempt to evaluate.

The diagram explains how concepts within this study are linked. The concept map was created by the researcher after reviewing the literature on readability and usability. It is assumed that every website user comes to an information-seeking event with pre-set expectations about what he or she will encounter during the information search. These expectations relate to the qualities and presentation of written information, and to the website's layout and features. Script theory explains how users' expectations are formed and used to make predictions about a given information-searching event. Within this study, script theory informs the importance of expectations in shaping veterans' evaluations of the website.

Within the diagram, comprehension and satisfaction are inextricably linked—users who do not comprehend the information they find will not be satisfied with the website's functions.

Schank and Abelson’s (1977) script theory serves as the foundation upon which the relationship among concepts will be investigated. The researchers’ definition of a script (previously defined) explains how user expectations are formed. Schank and Fano (1995) provide the definition for expectations, which they posit are “the roles typically played by various agents, the goals they have, and the plans executed in service of those goals” as defined by an individual’s memories of previous similar events (Schank & Fano, 1995, p. 263).

The Effects of User Expectations on Website Information Comprehension

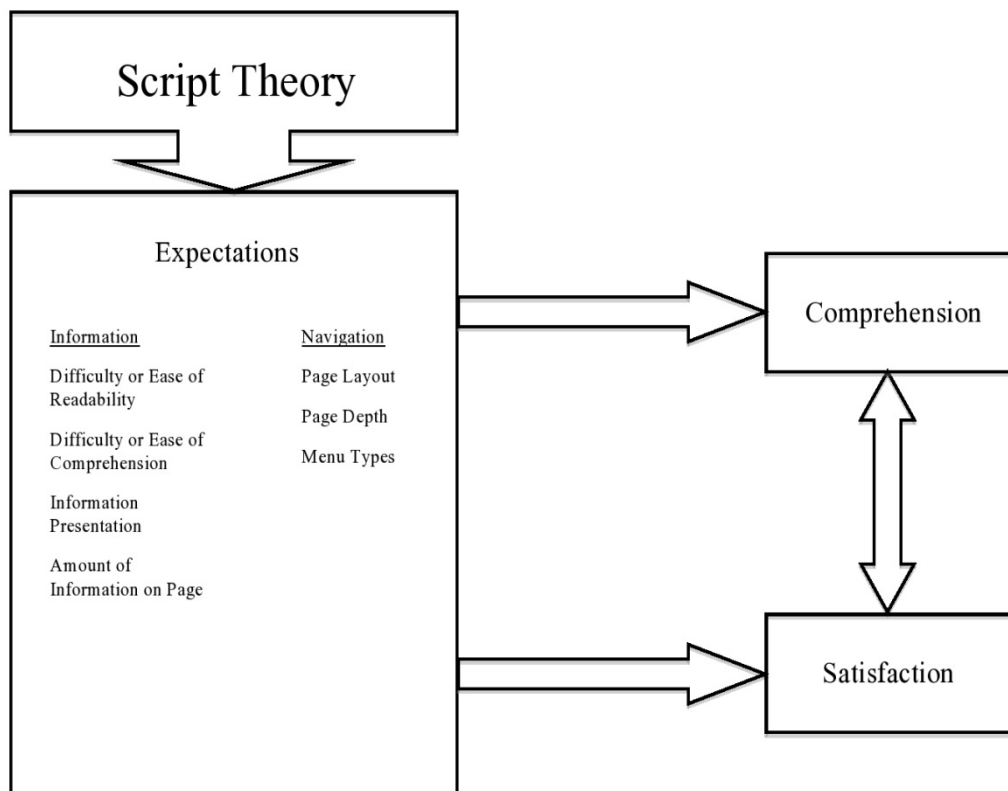


Figure 1. Conceptualization map for expectations study. This figure visually represents the relationship between concepts under investigation within this study.

Users possess particular expectations about website information searches; these expectations are formed based on previous searches. This study will investigate how user

expectations formed before the information-seeking event affect users' comprehension of information and satisfaction with the website after the information-seeking event. The researcher believes that comprehension and website satisfaction are inextricably linked: users who fail to comprehend the information they find will demonstrate less satisfaction than those who were better able to comprehend the information they found.

This study is intended to investigate website user expectations within two broad domains: information expectations and navigation expectations. Information expectations pertain to:

1. The difficulty or ease of readability. Sharp (2003) defines readability as “the accessibility of the text to the reader” (p. 37). This study will seek to determine how well or poorly website users expect to be able to read the information contained within the website. This portion of the study will consider the ease of readability of the text as expected by website users and as calculated by readability formulas.
2. The difficulty or ease of comprehension. This study will seek to determine how well or poorly readers expect to comprehend (previously defined) the information they find on the website.
3. Information presentation. The study will investigate how website users expect information will be presented to them within the website. This portion of the study will examine different organizational structures employed by the website's designers to organize information on the page. Factors under consideration include the font, font size, use of descriptive headings, and use of descriptive web page titles (Services, 2012f; Services, content organization, 2012; Services, text appearance, 2012e). Other factors under consideration include use of paragraphs, long sentences, unnecessary words, and unwanted information (Plain Language Action and Information Network, 2012).

4. The amount of information on each page. The study will investigate website user expectations about how much information each page will contain, whether in paragraph, bulleted list, or table form (Services, scrolling and paging, 2012d).

Navigation expectations pertain to:

1. Page layout. The study will investigate website users' expectations about where information will be placed on the page (Services, page layout, 2012c).
2. Page Depth. The study will investigate how many pages website users expect they will have to click through in order to reach the information they seek (Ding & Lin, 2010; Services, scrolling and paging, 2012d).
3. Menu types. The study will investigate website users' expectations about the types of navigation menus they will encounter in their search for information (Ding & Lin, 2010; Services, navigation, 2012b)

The following questions will investigate the influence of website user expectations on their overall satisfaction with the website and comprehension of information found:

RQ1: How do users' expectations of a website affect their satisfaction with the website?

RQ2: How do users' expectations of a website affect their comprehension of the information they find?

RQ3: Do users who feel that they successfully found and comprehended information feel greater satisfaction?

Methodology

Specific procedures were used to collect information about users' expectations of the Veterans Affairs website. The study utilized both quantitative and qualitative research methods in order to uncover these website expectations. Readability tests comprised the quantitative side of the study, while interviews and think-aloud website viewing sessions made up the qualitative side. The following sections outline the exact means that were used to measure user expectations and their role in shaping information comprehension. The words "veteran," "volunteer," and "user" were used interchangeably in the following section to describe the group of people who took part in the study.

Web Pages

The study looked at the different readability and usability factors of the Veterans Affairs website, in particular the Montgomery G. I. Bill section. This section was chosen because it outlines benefits available to the spouses and children of veterans considered completely and permanently disabled. Many veterans fall under the Post-9/11 G. I. Bill guidelines, but the Montgomery G. I. Bill guidelines are still relevant to many families and older veterans who may have more difficulty interpreting the information presented within the Montgomery G. I. Bill portion of the Veterans Affairs website.

Readability Assessment

The Flesch-Kincaid grade level test and FORCAST formula, statistical readability formulas, were used to determine the readability of the current G. I. Bill information pages on the Veterans Affairs website. Burke and Greenberg (2010) note that the Flesch-Kincaid grade level test is an appropriate test for reading materials intended for readers above a fourth-grade

reading level, making it an ideal general test. The FORCAST formula was chosen because it was created specifically to analyze non-narrative text and was tailored for adult readers (Caylor, Sticht, & Ford, 1972).

It was necessary to first determine the statistical readability score of the web pages under consideration, which gave an approximate measurement of the overall comprehensibility of the presented information. The scores were averaged together and served as a baseline from which recommendations to improve readability and comprehension were made (Lindlof & Taylor, 2011). The scores from two different readability tests were taken and averaged together to give a more accurate readability score than a single readability test score alone. There is some variation between the grade-level scores of all readability tests, so the use of the average of two different readability tests helped create a more accurate grade-level score than a single readability grade-level score alone. The tests are similar enough that it was feasible to average them together to obtain a more realistic readability score for the website textual information.

The Flesch-Kincaid grade level test was used to convert the score from the 100-point Flesch Reading Ease test to a United States grade level score, known as the Flesch-Kincaid Reading Age, according to a number of variables entered into a formula (Books LLC, 2010). This formula examines the average sentence length (ASL) and the average number of syllables per word (ASW) within the text of the document under analysis (Books LLC, 2010). The formula is: $\text{Flesch-Kincaid Reading Age} = (0.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59$

The FORCAST formula was designed in 1972 to determine the readability of text, specifically non-narrative text, for the United States military (Caylor, Sticht, & Ford, 1972). It was used initially to test the readability of job training documents for military personnel and to

ensure that the training documents were optimized for a wide range of readers (Caylor, Sticht, & Ford, 1972).

The FORCAST formula analyzes 150-word passages from the text (Caylor, Sticht, & Ford, 1972). It first counts the number of single syllable words (represented as ‘N’) in the passage, and divides that score by 10 (Caylor, Sticht, & Ford, 1972). That score is then subtracted from 20 to calculate the overall grade level score for the text (Caylor, Sticht, & Ford, 1972). The FORCAST formula is: $\text{FORCAST Grade Level (GL)} = 20 - (N/10)$

These particular readability tests were chosen based on the recommendations of educational psychologists Burke and Greenberg (2010), whose work analyzes the suitability of particular readability tests for evaluating Web-based reading materials. Burke and Greenberg posit that the Flesch-Kincaid grade level test is useful for evaluating the readability of documents at or above a fourth grade reading level, making it an ideal general test (Burke & Greenberg, 2010). The FORCAST readability test is described by Burke and Greenberg (2010) as the best test for non-narrative materials. This test was tailored to evaluate the types of reading materials present on the Veterans Affairs website.

The results from the more general Flesch-Kincaid grade level test and the FORCAST test were averaged together to yield an overall readability score. The separate scores were averaged in an effort to ensure greater score accuracy and reliability, as any one method alone may yield unreliable or inaccurate results.

A Flesch-Kincaid grade level score within the seventh grade range is considered acceptable for any writing intended to be used by the general public (DuBay, 2004b). A readability score at this level will not only comply with plain language guidelines, but will ensure that as many people as possible will be able to comprehend the information within the

document. Similarly, a FORCAST grade level score also within the seventh grade range is also considered an optimal readability score, and indicates a text that is comprehensible to a wide range of readers.

Recruitment

The study was conducted with 12 veterans, and was approved by Colorado State University's Institutional Review Board. This number was chosen to ensure veterans' interview responses reached theme redundancy and the range of possible responses was fully explored (Lindlof & Taylor, 2011). This population was chosen because they represent the people who use the Veterans Affairs website the most. Most importantly, this population's expectations are the most relevant and useful when considering how to improve communication on the Veterans Affairs website.

Volunteers' names were not required to carry out this study, and therefore were not recorded. Anonymity was ensured because veterans' names were not collected, nor were the names in any way linked to any information gathered in interviews or think-aloud sessions. Compensation was not available to be offered to any veteran.

With the study complete, the researcher will retain all forms for seven years.

Method Selection

Interviews were chosen as one method of data collection, as they "are well-suited to understanding the social actor's experience, knowledge and worldviews" (Lindlof & Taylor, 2011, p. 173). The purpose of this study was to understand the interplay between users' expectations and experiences in order to better communicate information via a website, and interviews offered the best means of understanding that interplay.

Interviews can reveal information on factors that current readability measures cannot. They “enable people to give accounts” and can be “vehicles for exploring people’s explanations” (Lindlof & Taylor, 2011, p. 174). By gathering accounts and explanations from actual users, rather than just calculating readability statistics based on the length of words and sentences, it was possible to gather evidence about users’ expectations of the Veterans Affairs website that were used to make recommendations to improve the website. Explanations allowed volunteers to give detailed accounts of their reasons for an expectation.

The think-aloud method of observation was chosen as the other data collection method for this study. This observation method was first used by Ericsson and Simon to study the interplay between cognitive processes and actions (Ericsson & Simon, 1980). This method of observation allows the researcher to be present while the interviewee carries out a specific task: the interviewee vocalizes his or her thoughts as the action is carried out, which allows the researcher to understand the cognitive processes and reasoning that underlie the interviewee’s actions (Ericsson & Simon, 1980). The authors posit that “introspection . . . may be useful for the discovery of psychological processes” (Ericsson & Simon, 1980, p. 216). For example, the think-aloud observation method might be used to investigate how college students select research materials for an upcoming research paper. The students might use the electronic card catalog at the university library to complete subject or topic searches. The think-aloud method allows researchers to understand how college students determine which sources are useful and which are not by making the students’ internal thought processes, which are usually silent, audible.

Because this study was intended to determine the role that the cognitive process of expectation plays in shaping website users’ comprehension, the think-aloud method naturally arose as the best choice for observation of the hidden role of expectations.

Pre-Viewing Website Expectations Interviews

The veterans were first interviewed privately before they were asked to access the website under consideration. These pre-viewing interviews established the veterans' expectations for the page they were asked to evaluate. Prior to the pre-viewing interviews, volunteers were given a scenario for which they were to search for information on the Veterans Affairs website. The scenario asked users to find information on a number of different questions pertaining to education benefits for themselves and dependents as if they were veterans recently given the "totally and permanently disabled" status by the Department of Veterans Affairs. This information-seeking scenario was based on the researcher's own search for information within the Montgomery G. I. Bill portion of the Veterans Affairs website. The interview question guide and scenario are available in Appendices A and B, respectively.

The pre-viewing interview questions were intended to determine whether or not users expected the information on the website to comply with the Plain Writing Act of 2010 (explained in detail in the earlier chapter), or if they expected to find incomprehensible government-speak.

During the pre-viewing interviews, veterans were asked a number of questions regarding their expectations about the web page and the information on it. These questions about expectations are split into two categories: navigation expectations and information expectations. These categories were created to separate responses, and therefore expectations, based on whether or not they pertained to plain language expectations or usability expectations. The responses were then more easily analyzed according to plain language or usability guidelines based on which area the response was more closely tied.

Navigation expectations were further categorized into three factors (page layout, page depth, and menu type), and information expectations were categorized into four factors

(difficulty or ease of readability, difficulty or ease of comprehension, information presentation, and amount of information on the page). Information expectations were designed to uncover veterans' expectations about the organization, readability, and comprehensibility of the information they were asked to find. Veterans were asked questions designed to discover their expectations regarding the factors of both information and navigation.

Questions that were used in the interview were created based on the author's own search for information about G. I. Bill benefits, as well as subsequent reviews of the Montgomery G. I. Bill web pages. Specific pages that do not comply with the plain language and usability guidelines available on usability.gov and plainlanguage.gov were identified. Questions were then created to steer users toward those flawed pages and analyze their layout and information.

Think-Aloud Session

After the pre-viewing interviews, the veterans were asked to view the Montgomery G. I. Bill section of the Veterans Affairs' website and asked to search for information regarding enrollment in the Dependents' Education Assistance program. The think-aloud method of readability testing was used during this portion of the interview.

Veterans were given certain information to find according to a pre-defined scenario, and were then asked to discuss their thoughts as they search the VA website for this information. The researcher sat next to the veteran as he or she searched the website. Screen-capturing software was used to record volunteers' actions, search strategies, and page selections for later analysis. An audio recorder was used to record the users' responses for later transcription and analysis.

Post-Viewing Website Satisfaction Interview

Veterans were given a post-viewing interview after the webpage viewing session. This interview was intended to determine how the website did or did not meet users' expectations.

The interviews were recorded and the dialogue transcribed for further analysis. This interview was intended to determine users' satisfaction with the website; questions regarding the various factors that affect user satisfaction were asked.

Analysis

Interviews were recorded to allow for the transcription of the interview dialogue. Four codebooks were used for response recording, one for each portion of the study:

1. Pre-viewing response codebook
2. Think-aloud verbal response codebook
3. Think-aloud action codebook
4. Post-viewing response codebook

Open coding was used to create broad categories of responses, and these responses were then sorted into more definite categories, which were used to create a codebook of specific response types. Responses were then coded according to the codebook. The transcribed dialogues for each portion of the study were also coded and the responses were sorted into groups based on which pre-determined information or navigation factor best fits the response. The most common response for each factor was noted to create an overall picture of users' expectations.

The occurrence of various information or navigation expectation themes throughout all of the interview transcripts was recorded and tabulated. The most common response for each factor was considered the primary indicator of reader expectations for that particular factor. The responses for each factor indicated the unmet expectation that must be corrected to improve readability and usability.

The triangulation of methods that the FORCAST readability test, Flesch-Kincaid Grade Level test, and interview transcripts offered allowed all aspects of users' expectations related to

readability and information presentations to be explored in this study. It is believed that these measures combined offered the greatest insight into the design and presentation flaws affecting readability and comprehension of information found on the Veterans Affairs website.

Results

The results section is organized into code categories based on the information and navigation expectation factors outlined in the study conceptualization. The code categories include Difficulty or Ease of Readability, Difficulty or Ease of Comprehension, Information Presentation, Amount of Information on the Page, Page Layout, Page Depth, and Menu Types.

Expectations for each code category are communicated first, followed by responses given during the think-aloud session and post-viewing interview. Participants' satisfaction with the Veterans Affairs website were determined for each code category based on the most common response given during the think-aloud sessions and post-viewing interviews.

Additionally, readability scores for the Veterans Affairs website determined using the FORCAST readability test and Flesch-Kincaid grade level test are reported. Finally, the percentage of questions that participants were able to answer using information available on the Veterans Affairs website is presented, as well as the percentage of questions participants answered correctly using information on the Veterans Affairs website.

Difficulty or Ease of Readability

The readability category consists of responses that pertain to the text's ability to communicate information to people of all reading levels. This category was used to determine how accessible participants felt the text on the Veterans Affairs website would be to readers, and how satisfied participants were with the text's ability to communicate information.

Expectation.

Responses overwhelmingly indicated that participants expected information on the website to be "clear." One participant responded that information should "be clear and easy to

understand” (Participant 12, personal communication, December 30, 2013). Another responded that information should be written “In a basic and logical format. In a way that reading it you can understand what it says—they don’t really have terribly complex explanations” (Participant 11, personal communication, June 13, 2013).

Think-aloud session responses.

Participants commented on the small size of the text on the website most often. Participant 2 noted that “I can’t imagine that if I’m actually a veteran who’s got a kid in high school, about to graduate, and I’m disabled 100%, my eyes might not be so good, either. And it’s really small print” (personal communication, April 11, 2013).

Think-aloud session actions.

No actions were recorded on-screen that indicated any of the participants took actions to increase text size.

Post-viewing responses.

During post-viewing interviews, participants mostly felt that the information on the Veterans Affairs website was readable. Participants felt “it was easy to read” (Participant 4, personal communication, April 12, 2013).

Satisfaction.

Overall, the majority of participants expressed satisfaction with the readability of the text on the Veterans Affairs website. It can be concluded that readability was not a major hindrance for most of the participants in the study.

Difficulty or Ease of Comprehension

The comprehensibility category consists of responses that pertain to how hard the participant had to work to make sense of or understand the text. It was used to determine whether

participants felt that they could understand the text on the website easily, and whether they were satisfied with the text.

Expectation.

Most participants expected the information to be easy to comprehend. Participant 4 “[expected] it to be pretty dumbed-down, that way everybody can easily understand it” (personal communication, April 12, 2013). Another participant responded that information should be “pretty comprehensible. You need to be able to understand the information for sure” (Participant 6, personal communication, April 29, 2013).

Think-aloud session responses.

The most common response concerning comprehension of information on the Veterans Affairs website was the number of credit hours the Veterans Affairs considered to be “full-time” college attendance. Participant 8 was frustrated and said “well, damn it, it’s so vague. It says ‘monthly payments based on your training time: full-time, three-quarter, half-time.’ But what it doesn’t tell me is full-time based on whose criteria. Full-time based on the university, or full-time based on the GI Bill?” (personal communication, April 30, 2013).

Think-aloud session actions.

As a result of participants’ confusion over the number of credit hours that qualify as full-time, the most common action was a keyword search using the search feature on the Veterans Affairs website. Veterans searched for keywords in an attempt to find a definite answer to the number of credit hours a child would need to enroll in each semester to receive full benefits. Participant 7 searched multiple times with different terms to try to determine how many credit hours are considered full-time attendance, including “credits,” “credits children,” and “how many credits child enrolled” (personal communication, April 30, 2013).

Post-viewing responses.

Despite their trouble defining the term “full-time,” participants felt that the information on the Veterans Affairs website was comprehensible. Most participants felt that the information “was pretty point-blank” (Participant 6, personal communication, April 29, 2013). Participant 3’s response helps reveal what the other participants might have meant when they said that the information was comprehensible when he elaborated that “you could understand what they were trying to say, but you couldn’t understand what it meant” (personal communication, April 11, 2013). Participant 11 noted that information was comprehensible:

For the most part. Most of the questions had pretty straightforward answers. Some of them, like question one, that one was hard to comprehend for the sole fact that the information wasn’t anywhere. Well, it was somewhere—I eventually found it—but most of the time it just said ‘full-time’ and didn’t say how many credits. When I found the information, it was comprehensible, but a lot of times the information just wasn’t there, making it incomprehensible because it’s undefined. (personal communication, June 13, 2013).

Satisfaction.

Although participants claimed the information was comprehensible, when they elaborated on their responses it became evident that they were able to understand the words on the page, but that some of the terms used needed to be defined to eliminate confusion. It can be concluded that the participants were not fully satisfied with the comprehensibility of information on the Veterans Affairs website.

Information Presentation

The information presentation category contains responses that describe how information is organized or formatted for presentation to readers. Some examples of information organization include paragraphs of text, charts, graphs, and tables. This category was used to determine what types of organizational strategies participants expected to see, and whether the strategies that were used resulted in satisfaction.

Expectation.

Participants expected information on the Veterans Affairs website to be presented in a way so that they did not have to search for too long to find the information they need. They expected web pages to be easy to navigate, as illustrated by participant 9's response that information should be "clear; direct; shouldn't have to be doing a lot of clicking, searching. Should be easy" (personal communication, May 2, 2013).

When asked to elaborate and explain how they expected information to be formatted, participants expected to encounter paragraphs of text. Participant 11 "wouldn't necessarily expect any charts or pie graphs, but usually paragraphs" (personal communication, May 13, 2013).

Think-aloud responses.

Many participants accessed brochures available on the website as PDF files. These brochures were annoying to the participants because of their length (30 or more pages) and the length of time it took to download the file. Participant 12 was dismayed upon finding the brochures and said, "PDF format. I would have liked it to have been on the website first" (personal communication, December 30, 2013).

Think-aloud actions.

Participants who were able to download and read PDF files used the table of contents at the beginning of the brochure to find relevant information. Participants searched the table of contents for sections that appeared to contain information to answer the website information searching scenario questions, then scrolled to the appropriate page.

Some of the participants used their browsers' "find" function to search the brochure for keywords from the table of contents. Those participants were able to advance through the brochure from one instance of their search term to the next.

Post-viewing responses.

Participants expressed frustration with the difficulty they experienced using the website's search function. Participant 11 used the website's search to find information related to "full time Montgomery G. I. Bill" with no success. This participant tried another search for "full time credits" that was also unsuccessful (personal communication, May 13, 2013).

Satisfaction.

Participants were overwhelmingly dissatisfied with the ways information was presented on the Veterans Affairs website. They were dissatisfied with the website's search bar and its inability to return results based on their keyword searches. Participant 7 stated:

It was awful. The related questions weren't all that related. If I picked something, clicked on something that I thought was very close to what I was looking for, the related questions were all very not-related, where I would expect my answer to be (personal communication, April 30, 2013).

Amount of Information on the Page

This category indicates how much text or visual information is available on each web page. This category indicates how much information participants expected to see on each web page, and if there was too much or too little information, causing participants to feel dissatisfied.

Expectation.

Participants expected pages to contain less text rather than more. When asked to elaborate on the meaning of “less text,” participants responded with answers such as “200 words” (Participant 1, personal communication, April 8, 2013) and “500 words or less” (Participant 3, personal communication, April 11, 2013).

Think-aloud responses.

Participants most often commented on there being too much text on the web pages. Participant 9 felt “I can’t find any of this information right here, at least not in a short amount of time. I mean, I’d have to read everything word-for-word, and I don’t have that much time. There’s a lot of good information here, but it’s almost like it’s overwhelming. It’s too much” (personal communication, May 2, 2013).

Think-aloud actions.

Participants skimmed pages when they felt that there was too much information to read to find an answer. In the case of brochures presented as PDF files, some participants used the browsers’ “find” function to skip ahead in the document from one instance of a keyword to another.

Post-viewing responses.

Participants felt that the web pages contained too much text. Participant 1 felt “there’s always too much text on the pages. Well, it’s a recurring problem on the Internet in general, but

especially the VA website” (personal communication, April 8, 2013). Participant 6 felt there was “quite a bit of text. They could have narrowed that down a bit more” (personal communication, April 29, 2013).

Satisfaction.

Participants were not satisfied with the amount of information on each page. They felt that the web pages contained too much information, and in some cases they were not willing to read through all of the information to find the answer to their question.

Page Layout

The page layout category describes the visual organization of information and navigation elements on web pages on the Veterans Affairs website, including the location of links, menus, and text. This category was used to determine how participants expected elements such as text, links, and navigation menus to be placed on the web pages. Information relating to this category was used to determine if participants were satisfied with web page layout on the Veterans Affairs website.

Expectation.

Participants expected the page to be organized so that it was clear to them where they should navigate to find information to answer their questions. They expected pages to have little text, as illustrated above. Participants expected to encounter a link bank along the side of the web page, and easily identifiable links within the text of each page. Participant 1 wanted “little tabs up at the top, text in the middle or in the main part. Probably a lot of tabs on top” (personal communication, April 8, 2013). Participant 2 described the expected web page with “toolbars along the left. A lot of black and white text along the center. Sporadic links in between” (personal communication, April 11, 2013).

Think-aloud responses.

Participants responded that navigation tools on the website were not noticeable enough to grab their attention. They did not see useful links to help them navigate to desired information until they had already begun their information searches and navigated through the website some. Participants expressed frustration at missing useful navigation elements.

Participant 2 found a drop-down menu located above the banner at the top of each web page after nearly 20 minutes of searching the website. The participant had found and used the drop-down menus under the banner at the beginning of the think-aloud portion of the study, but had not noticed the drop-down menus above the banner. This participant noted that “I’ve rather inadvertently stumbled across a drop-down menu. It’s obvious once you find it, but it’s not something you’re going to immediately look for once you’re already looking farther down the page.” Participant 2 later said “it’s handy to have it as a drop-down menu, but it doesn’t grab my attention enough to immediately look there as opposed to anywhere else on the page, which is a bit annoying” (personal communication, April 11, 2013).

Participant 8 found a link bank at the bottom of the web page that he had not noticed until nearly 20 minutes of his interview had elapsed (personal communication, April 30, 2013).

Think-aloud actions.

Participants started to move the computer cursor over more of the text and around the web page more once they realized that there were links and menus on each page that were not obvious. They moved the cursor over the page in an effort to find more links and menus.

Post-viewing responses.

Participants were not pleased with the page layout used on the Veterans Affairs website. Participant 8 felt “none of it was. It was all over the place. There was no ‘Go to College’ section,

and it was not divided up very accurately” (personal communication, April 30, 2013). Participant 12 felt that “at first it seems like it [is organized], but once you started getting deeper it was really poorly organized” (personal communication, December 30, 2013).

Satisfaction.

It can be concluded that participants were not satisfied with the page layout used on the Veterans Affairs website. They felt that helpful navigation features were hidden, and that hiding those features made their search for information more difficult.

Page Depth

The Page Depth category consists of responses that refer to how deep web pages that contain desired information are buried. This category was used to determine how many pages participants expected to navigate through to find information to answer questions in the website searching scenario, as well as to gauge their satisfaction with the number of pages they actually had to navigate through to find needed information.

Expectation.

Participants expected to navigate through three pages to find an answer for each question. Participant 6 expected to navigate through “two, maybe three” pages for each question (personal communication, April 29, 2013). Participant 7 felt that it would be necessary to navigate through “no more than two or three” pages to answer a question (personal communication, April 30, 2013). Participant 12 felt that navigating through “less than four” pages would yield an answer to a question (personal communication, December 30, 2013).

Think-aloud responses.

Every participant had to navigate through more than three pages to find an answer to at least one of the questions in the website searching scenario. Participant 4 felt there was “way too

much searching to answer these questions” (personal communication, April 12, 2013). Similarly, participant 6 stated “it’s really not easy to find an answer to that question. I’d have to do probably some serious digging” (personal communication, April 29, 2013).

Think-aloud actions.

Participants became frustrated clicking links and using menus to search for information on the Veterans Affairs website. They resorted to using the search function on the website to search for keywords specific to the question they were trying to answer. This search function displayed results related to keyword searches, as well as a Frequently Asked Questions section. Participants used both the keyword search results and the Frequently Asked Questions to try to find answers.

Participants felt that their keywords search results and Frequently Asked Questions were not strongly tied to the actual keywords they used. Participants felt that the Frequently Asked Questions were not related to their keywords searches, and that in general, the Frequently Asked Questions were not very useful. Participant 1 felt “there’s got to be better Frequently Asked Questions.” He went on to remark “it’s funny, half those ‘answers others found helpful,’ who rated it helpful?” (personal communication, April 8, 2013).

Post-viewing responses.

Participants felt that the information they needed to answer questions in the website information searching scenario was buried deep, making it difficult to find. Participant 12 said “you really had to delve in to find it [the information]” (personal communication, December 30, 2013). Participant 10 likewise felt “it was deep” (personal communication, June 13, 2013).

Satisfaction.

As stated previously, participants were not pleased with the information they found by following the links displayed in the Frequently Asked Questions and keyword search results. Participants were dissatisfied with the information from these sources because the information on the linked pages was not strongly tied to their keywords searches. Participants also felt that the pages should have contained information that they did not.

Menu Types

This category consists of responses that pertain to the navigation options present on the Veterans Affairs website. It was used to determine the types of menus participants expected to see on the website, and whether the navigation options present met their expectations, resulting in satisfaction.

Expectation.

Participants expected to encounter in-text links, drop-down menus, and link banks along the side of the web page. Participant 6 expected to encounter “toolbars on the top. Search fields. Links on the side” (personal communication, April 29, 2013). Participant 2 expected “tools along the left. Different menus. Links within the text” (personal communication, April 11, 2013).

Think-aloud responses.

Participants noticed that they had failed to notice navigation options, such as in-text links and drop-down menus, on web pages on the Veterans Affairs website. Participant 2 failed to spot a drop-down menu above a banner at the top of each web page until well into the think-aloud session. He asserted:

You could more clearly label it as a menu, as opposed to just a bar, because, honestly, by the time I’m looking down here [at the main text on the page], none of that is legible, so I

don't see it. I should have, and I eventually did find it, but [. . .] obviously I'm going to look over here [at the left-hand menu]—we know these are buttons. But it's also small. (personal communication, April 11, 2013)

Participants also experienced confusion over text and other areas on the page that appeared to be links, but were actually not. Participant 6 tried to click on a section of a web page that looked like a tab labeled “Resources” that was not a link. This participant remarked:

Okay, yeah, this is kind of not fun, for sure. Okay, so it tells you how to apply for benefits, how to verify attendance, but then you get a ‘resources’ tab that you can't even click on, which is kind of useless. Why do they even have that there? (personal communication, April 29, 2013)

Participant 8 was also confused by areas of web pages that appeared to be “clickable” but were not actually links (personal communication, April 30, 2013).

Think-aloud actions.

Participants remarked on the confusing nature of the links and navigation menus throughout the Veterans Affairs website, and then resorted to using the website's search function to search for keywords relevant to the question they were trying to answer. As stated above, they felt that the search results were not helpful.

Post-viewing responses.

Participant 1 felt “an option should be obvious, and not look like every other part of the page” (personal communication, April 8, 2013). Participant 3 did not feel that the navigation menus were helpful because “they lacked exactly what you were looking for. You had to click through too many options to get to something, and the most important information was buried within text or within submenus” (personal communication, April 11, 2013).

Satisfaction.

Based on their think-aloud and post-viewing responses, it is obvious that participants were not satisfied with the menu types available on the Veterans Affairs website. They felt that the menus available were not specific enough to help them navigate to the information they needed. They also felt that the menus and links needed to be more obvious so that they were could find them more easily.

Readability Test Scores

Three sample pages were chosen from the G. I. Bill section of the Veterans Affairs website. These pages were selected based on the fact that they contained paragraphs of text long enough to be analyzed using the FORCAST readability formula and the Flesch-Kincaid Grade Level test. Other pages under the G. I. Bill section contained tables and bulleted lists, which are not suitable for readability testing using the selected formulas, or contained too little text to analyze.

The selected pages were Montgomery G. I. Bill—Active Duty, Dependents' Educational Assistance, and Montgomery G. I. Bill—Selected Reserve.

FORCAST readability scores.

FORCAST scores were determined for each page as follows:

- Montgomery G. I. Bill—Active Duty: grade level 12.8
- Dependents' Educational Assistance: grade level 11.7
- Montgomery G. I. Bill—Selected Reserve: grade level 12.0
- The average FORCAST grade level score for all three pages was 12.2

Flesch-Kincaid grade level test scores.

Flesch-Kincaid grade level test scores were determined for all three pages as follows:

- Montgomery G. I. Bill—Active Duty: grade level 13.5
- Dependents' Educational Assistance: grade level 11.5
- Montgomery G. I. Bill—Selected Reserve: grade level 12.6
- The average Flesch-Kincaid grade level score for all three pages was 12.5

Overall readability grade level score.

The overall readability grade level score was determined by averaging the FORCAST and Flesch-Kincaid grade level readability formula scores. The overall grade level for all three text samples was 12.35.

Overview

Success rate for answering questions.

On average, participants were able to answer 2.3 questions of the six they were asked to answer. In this case, an answer is any information, correct or incorrect, that participants found that they believed was an answer to one of the questions posed in the website information searching scenario. In other words, participants believed they had answered questions 39% of the time using the Veterans Affairs website.

Participants were able to correctly answer an average of 1.9 of the 6 questions posed in the website information searching scenario. This means that participants experienced a success rate of 32% using the Veterans Affairs website.

Common themes.

Many participants commented on the difficulty they experienced searching for information on the Veterans Affairs website. In particular, they felt that the benefit payment rates section of the website was “an infinite loop” (Participant 11, personal communication, June 13, 2013). This participant, and others, found that the Veterans Affairs website that directed them to

the Department of Defense website to learn more about payment rates for education benefits. They clicked the link to take them to the payment rate information on the Department of Defense website, and once there found a link back to the Veterans Affairs website, and no information about payment rates. Each participant who followed the link to the Department of Defense website expressed frustration at being “shuttled over to DoD [then] DoD shuttled [them] right back” (Participant 11, personal communication, June 13, 2013).

Another common theme amongst participants was frustration with the Veterans Affairs website’s search function. Participants consistently felt that results for keyword searches were not tied strongly enough to their search terms. “Credit hours” was one of the most common search terms, and none of the results for this keyword search revealed information about how many credit hours a participant’s child would need to enroll in to qualify as full-time enrollment. Participant 11 spent an exceptionally long time using the search function to find out how many credit hours qualified as full-time. This participant eventually found the answer not through search results, but on the page linked to the website’s front page through the “IHL” tab. He remarked, “So, IHL—institutes of higher learning. [. . .] Maybe that’ll trip some people up” (personal communication, June 13, 2013).

Overall website perceptions.

Participants were not pleased with the information and navigation features of the Veterans Affairs website. They felt it was difficult to use the website to find information about education benefits. Participant 1 declared “this website’s garbage. [. . .] I couldn’t find anything” (personal communication, April 8, 2013). Participant 9 did not feel the website was useful at all, and said he “would have to ask somebody” (personal communication, May 2, 2013). This participant went on to say he “would rather just call. [. . .] Time means a lot to me, and I don’t

like spending a whole lot of time looking stuff up. I'd rather just call somebody" (personal communication, May 2, 2013).

Many participants also expressed frustration at encountering brochures online as large PDF files. Some participants did not have sufficient administrative privileges on the computers they used to download the PDFs, and were unable to view the brochures. Those who were able to download the PDFs had to scroll through many pages to find the section they wanted to read. One participant had a very slow Internet connection, and downloading the PDF on the slow connection took a long time.

Finally, many of the participants did not understand the terminology used on the Veterans Affairs website. They believed they were attempting to answer questions during the information searching scenario as if they were trying to transfer their education benefits to their child, instead of trying to find out about the child's own benefits.

Participants were confused by when the website referred to the various chapters of the G. I. Bill. Dependents' Educational Assistance falls under Chapter 35 of the G. I. Bill, but participants often ended up finding answers they believed to be correct under Chapter 30 (Montgomery G. I. Bill—Active Duty) or Chapter 33 (Post 9/11 G. I. Bill).

Conclusions

The information participants offered reveal some aspects of the Veterans Affairs website that most need improvement to make it useful for veterans and their families.

First, written information on the website needs to be written to increase readability. Although none of the participants in the study expressed difficulty understanding what they read, the results of the FORCAST and Flesch-Kincaid grade level readability tests reveal that the website is written at far too high a reading level to comply with the Plain Writing Act.

Next, the website's search function needs to be improved so that keyword searches will offer results that are relevant to the keywords entered. Participants quickly turned to keyword searches when they were unable to find the information they needed using menus and links. Many participants gave up trying to answer questions after the search results failed to be useful, and some said they would turn to a Veterans Affairs representative or the call center to get answers in real-life situations. It can be assumed that most other users of the Veterans Affairs website will also turn to keywords searches, and that they will also turn to the same resources for help. Call centers and representatives have a finite amount of time in which to help those confused by the website, so the most logical option is to improve the website.

Discussion

The results of this study help to illuminate the role of expectations in shaping how people comprehend the information they find on websites and their satisfaction with those websites. The discussion will explain the study's findings about expectations, comprehension, and website satisfaction. It will then explore the limitations of the study and their impact on the data that was gathered. The discussion will finally outline recommended actions that should be taken to improve the Veterans Affairs website that are based on data gathered in this study.

Expectations and Confusion

This study has revealed that website users form definite expectations about websites prior to accessing those sites. Those expectations inform how users interact with the site, including aspects such as the places they expect to find navigation menus and the amount of text they are willing to read. Their expectations are created by previous experiences using websites to find information, and formed the scripts that people use to guide their actions while searching on a website for information.

When those expectations were not met, participants experienced confusion. They were confused when keyword searches resulted in links to pages that did not contain information relevant to their keywords. Participants had used scripts for website information searches to create a plan to find needed information quickly and easily. Their confusion was a result of the information search defying their script. Without the direction of a script, participants had to devise a new plan.

Participants' confusion as a result of the website failing to meet their expectations indicates that the claims of Abelson's (1981) Script theory were supported. Website users come

into an information-searching session with a script that they use to determine how they will search for information, how that information will be presented, and how best to navigate a website to reach that information. They rely on the script to streamline their information search, and websites that defy their expectations, and therefore fail to conform to their scripts, take longer to search.

In the study, this claim was supported by participants' dissatisfaction with the navigation features of the website. Users were also dissatisfied with the information features of the site, indicating that their scripts also informed how they expected information to be presented to them during their search. Websites must conform to users' information and navigation expectations to best fit their scripts. Those sites that do not fit with users' scripts will confuse users by causing them to have to create a new information-searching plan without the aid of a script.

When participants had to create a new plan after their scripted plan failed, they were more likely to find an incorrect answer, which led to decreased comprehension. Question 1 from the website information-searching scenario created confusion for many participants because the definition of "full-time credit hours" was only on one page. Participants who were unable to find the answer (12 credit hours) experienced decreased comprehension because they were unsure how many credit hours would be considered full-time by Veterans Affairs.

This study concluded that comprehension of a website and the information it contains relies on a website that conforms to users' scripts and presents information in a way that they expect. Satisfaction relies on comprehension as well as conformation to website information-searching scripts. It can be concluded that websites that more closely align with users' expectations will make those users more satisfied.

Satisfaction

Participants in the study were not satisfied with the Veterans Affairs website. The website did not conform to the scripts they had formed based on previous information searches using websites, so they had to improvise a new search strategy. They experienced more confusion without a script to guide their search, leading to decreased comprehension, and ultimately to less confidence in the answers they were able to find.

Information searches took longer when necessary information was not on the web page participants expected it to be based on their scripts. Many participants spent longer than five minutes searching for the answer to Question 1 from the website information-searching scenario. They expressed great frustration while trying to find the answer, and many were unable. This long, and often unsuccessful, search led to decreased satisfaction with the Veterans Affairs website.

Part of the frustration participants experienced was due to their inability to comprehend Veterans Affairs' definition of "full-time" because the website only defined the term on one page. They looked for the definition, but because the website did not conform to their scripts, they had difficulties finding the definition. If the definition had been listed on more pages, comprehension would have been higher, leading to greater satisfaction.

Research Questions

The three research questions posed earlier in the study were all answered with the data gathered from the participants' information searches.

RQ1: How do users' expectations of a website affect their satisfaction with the website?

Users expect websites to conform to their scripts for website information searches. When websites fail to meet that expectation, users are less satisfied.

RQ2: How do users' expectations of a website affect their comprehension of the information they find?

When users cannot use the information-searching strategies they formed based on their scripts, they experience confusion. Confusion causes them to doubt whether the information they found correctly answers their questions. Nearly every participant indicated doubt in the answers they found at the end of the think-aloud session. Participant 8 noted that he “got all six [answers]. But am I confident in any of those answers? Absolutely not. I would still defer everything—those six questions—I would send to the VA [representative]” (personal communication, April 30, 2013).

RQ3: Do users who feel that they successfully found and comprehended information feel greater satisfaction?

None of the participants were able to answer all six of the questions posed during the think-aloud session correctly. As a result, all of the participants expressed dissatisfaction with using the Veterans Affairs website as a source of information. Participants who correctly answered more questions expressed greater satisfaction with the site. It can be concluded that users will feel greater satisfaction with the website when they feel that they have used it to correctly answer their questions.

Readability Scores

The readability tests carried out on the text on the Veterans Affairs website indicated that the information presented to users was not written so that it can be comprehended by the majority of users who access the site. The information is written at too high a grade level to be useful to all of the users who access the site for information. The site is therefore not in compliance with the Plain Writing Act, and must be edited to meet the law's requirements.

None of the participants in this study expressed having difficulty understanding content on the Veterans Affairs site because it was written at a high reading level. However, other veterans and their family members may not read at the same level as the participants in this study, and may experience difficulty understanding information fully. The text needs to be accessible to all who access the site in search of information.

Comprehension of the information on the website suffers as a result of it being less accessible to some readers. As a result of decreased comprehension, satisfaction with the site also suffers. If the Department of Veterans Affairs were to rewrite the text to a lower grade level, more users would be able to use the site to correctly answer their questions and learn more about their benefits. The content must be rewritten to meet plain language standards set forth in the Plain Writing Act, as well as to be of greatest use to veterans and their families.

Limitations of the Study

There were a number of limitations that affected the results of this study. These limitations and their possible impact on the study are listed below.

Overall satisfaction.

The researcher did not ask the participants if they were satisfied with the Veterans Affairs website overall, because she instead chose to focus on users' satisfaction with individual elements of the site, such as difficulty or ease of comprehension and page depth. Participants were asked about their satisfaction with certain aspects of the website, but their perceptions of the website as a whole were not measured. Participants' responses during the think-aloud session are a good indicator of their satisfaction, but the study would have been stronger if a clear picture of their satisfaction with the website were available.

Some participants expressed satisfaction with certain aspects of the Veterans Affairs website during the post-viewing interview, but their responses during the think-aloud session showed that they were dissatisfied with those aspects. Information comprehension was one of the aspects participants claimed to be satisfied with despite their think-aloud responses indicating otherwise. The reasons why participants expressed satisfaction after they finished searching the website are unknown. This phenomenon may require future research to understand what factors are involved in the reporting of satisfaction with a website.

The website has been changed.

The Veterans affairs website has been changed since the study began. Some of the web pages with information about education benefits no longer exist. The menus have been changed so that users can now select their relationship to a veteran family member to find out more information about benefits. Despite these changes, the website is still difficult to use. The text on the website is still not written in plain language, and users still experience confusion because terms used the Veterans Affairs are not defined.

Participant 12 used the new version of the website during the think-aloud portion of the study and experienced the same problems that other participants did on the old version. In particular, the website still relies on the same PDF brochures it did before the change to communicate information about benefits.

Participants' reading level.

Participants did not communicate any problems reading the text on the Veterans Affairs website due to reading level. Most of the participants in the study were college educated, so it can be expected that they read at a higher level than that of the text on the website. However, the

veteran population at large may have a lower reading level, and could experience difficulty reading the text that is currently on the website.

Recommendations to Improve the Veterans Affairs Website

This study has revealed a number of aspects of the Veterans Affairs website that should be changed to better conform to users' website information-searching scripts, and thereby increase user satisfaction.

1. The text on the Veterans Affairs website needs to be changed to comply with the Plain Writing Act. The information currently on the website is written at far too high a reading level to be useful to the population of veterans and their families at large. The deadline to comply with the Plain Writing Act was October 13, 2011, and the Veterans Affairs website is still not in compliance (C. R. Sunstein, personal communication, April 13, 2011).
2. Several participants expected to see web pages about veterans' benefits start out with general, summarized information for quick reference that included links to more specific information. Adding summaries of benefits to the Veterans Affairs website broken down by demographic—for veterans, for veterans' spouses, for veterans' dependents—with links to pages with more specific information could greatly increase comprehension and satisfaction.
3. Web analytic software should be used to track the terms that veterans and their families search for most often on the Veterans Affairs website. Those terms can then be used to optimize each web page for keyword searches. Optimized keyword searches will bring relevant information to the top of search results and will greatly improve information communication.

4. Practices used in search engine optimization can be used to create more useful keyword search results. Web page content can be rewritten so that the most searched keywords are used on the beginning of the text and in the title (Fishkin, 2013). Putting keywords that users search for most in the title of relevant web pages and in the text helps those pages to rank higher in search results, allowing users to find them more quickly and easily (Fishkin, 2013).
5. Terms commonly used by Veterans Affairs need to be defined on each page they are used to prevent confusion. Participants were confused by the undefined use of terms such as “full-time” and “Chapter 35,” making their information searches longer and more tedious. Defining terms on each page they are used will make the website more useful to veterans and their families.

Directions for Future Research

More research should be conducted on the specific scripts people use to inform their website information searching strategies. Common expectations based on those scripts can be used to create websites that are capable of communicating information to the largest number of people in the most usable fashion. Website creators can help to eliminate confusion and comprehension problems by allowing users’ scripts to dictate website construction.

Research into the topics that veterans and their families research most on the Veterans Affairs website will also help web designers to make the website as useful and usable as possible. Users will be more satisfied if the topics they most want to know about are easier to find and explained in a quick- and easy-to-read manner.

In particular, the search terms that Veterans Affairs website users use most often should be determined so that they can be incorporated into Frequently Asked Questions and page titles.

By using the terms that are searched for most often, the site can be a better source of information to veterans and their families.

References

- Abelson, R. P. (1981). Psychological status of the script concept. *American Psychologist*, 36(7), 715-729.
- Anders, P. L., & Pearson, P. D. (1987). Instructional research on literacy and reading: Parameters, perspectives, and predictions. In D. S. McNamara (Ed.), *Understanding readers' understanding: Theory and practice* (pp. 307-319). Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Andersen, K. N., Sørum, H., & Vatrapu, R. (2012). Public websites and human-computer interaction: An empirical study of measurement of website quality and user satisfaction. *Behaviour and Information Technology*, 31(7), 697-706.
- Books LLC. (2010). *Readability Tests: Lexile, Flesch-Kincaid readability test, readability, Gunning Fog index, Smog readability test, automated readability index, Coleman-Liau index, Fry readability formula, Linsear write, Raygor readability estimate*. Memphis, Tennessee: Books LLC.
- Burke, V., & Greenberg, D. (2010). Determining readability: How to select and apply easy-to-use readability formulas to assess the difficulty of adult literacy materials. *Adult Basic Education and Literacy Journal*, 4(1), 34-42.
- Caylor, J. S., Sticht, T. G., & Ford, J. P. (1972). *Methodologies for determining reading requirements of military occupational specialties*. Human Resources Research Organization.
- Center for Plain Language. (2012). *Plain Language report card*. Retrieved from www.centerforplainlanguage.org/resources/plain-writing-laws/plain-language-report-card/

- Center for Plain Language. (2012, July 19). *Who makes the grade? Plain language report cards for federal agencies*. Retrieved from <http://centerforplainlanguage.org/blog/government/who-makes-the-grade/>
- Chall, J. S. (1988). The beginning years. In B. L. Zakaluk (Ed.), *Readability: Its past, present, and future* (pp. 2-13). Newark: International Reading Association.
- Coiro, J. (2011). Talking about reading as thinking: Modeling the hidden complexities of online reading comprehension. *Theory Into Practice, 50*, 107-115.
- Dale, E., & Chall, J. S. (1948). A formula for predicting readability: Instructions. *Educational Research Bulletin, 27*(2), 37-54.
- Ding, W., & Lin, X. (2010). *Information architecture: The design and integration of information spaces*. Chapel Hill: Morgan and Claypool Publishers.
- Dreyer, L. G. (1984). Readability and responsibility. *Journal of Reading, 27*(4), 334-338.
- DuBay, W. H. (2004a). *The principles of readability*. Costa Mesa, California: Impact Information.
- DuBay, W. H. (2004b). *What is plain language?* Retrieved from http://qpc.co.la.ca.us/cms1_033658.pdf
- Ericsson, K. A., & Simon, H. A. (1980). Verbal reports as data. *Psychological Review, 87*(3), 215-251.
- Fishkin, R. (2013). *The beginners guide to SEO*. Retrieved from <http://moz.com/beginners-guide-to-seo>.
- Fishkin, R. (2013). *The beginners guide to SEO*. Retrieved from <http://moz.com/beginners-guide-to-seo>.
- Flesch, R. (1949). *The art of readable writing*. New York: Harper and Brothers Publishers.

- Gray, W. S., & Leary, B. E. (1935). *What makes a book readable, with special reference to adults of limited reading ability: An initial study*. Chicago: The University of Chicago Press.
- Gunning, R. (1968). *The technique of clear writing: Revised edition*. New York: McGraw-Hill Book Company.
- Jansen, B. J. (2009). *Understanding user-web interactions via web analytics*. Chapel Hill: Morgan and Claypool Publishers.
- Judd, C. H. (1914). Reading tests. *The Elementary School Teacher*, 14(8), 365-73.
- Kincaid, P. J., Fishburne, R. P., Rogers, R. L., & Chissom, B. S. (1975). *Derivation of new readability formulas (automated readability index, Fog count and Flesch reading ease formula) for Navy enlisted personnel*. Millington: Naval Technical Training Command.
- Kintsch, W. (1987). Contributions from cognitive psychology. In R. J. Tierney, P. L. Anders, & J. N. Mitchell (Eds.), *Understanding readers' understanding: Theory and practice* (pp. 5-14). Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Koltay, T. (2011a). Information overload, information architecture and digital literacy. *Bulletin of the American Society for Information Sciences and Technology*, 38(1), 33-35.
- Koltay, T. (2011b). The media and the literacies: Media literacy, information literacy, digital literacy. *Media, Culture & Society*, 33(2), 211-221.
- Kools, M., Ruiter, R. A., van de Wiel, M. W., & Kok, G. (2004). Increasing readers' comprehension of health education brochures: A qualitative study into how professional writers make texts coherent. *Health Education and Behavior*, 31(6), 720-740.

- LaZansky, J., Spencer, F., & Johnston, M. (1987). Reading to learn: Setting students up. In R. J. Tierney, P. L. Anders, & J. N. Mitchell (Eds.), *Understanding readers' understanding: Theory and practice*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Lee, Y., & Kozar, K. A. (2012). Understanding of website usability: Specifying and measuring constructs and their relationships. *Decision Support Systems*, 52(2), 450-463.
- Lindlof, T. R., & Taylor, B. C. (2011). *Qualitative communication research methods*. Los Angeles, California: SAGE Publications.
- Lively, B. A., & Pressey, S. L. (1923). A method for measuring the 'vocabulary burden' of textbooks. *Educational Administration and Supervision*, 9(7), 389-398.
- Magliano, J. P., Millis, K., Ozuru, Y., & McNamara, D. S. (2007). A multidimensional framework to evaluate reading assessment tools. In D. S. McNamara (Ed.), *Reading comprehension strategies: Theories, interventions, and technologies* (pp. 107-136). New York: Lawrence Erlbaum Associates.
- McLaughlin, G. H. (1969). SMOG grading--A new readability formula. *Journal of Reading*, 12(8), 639-646.
- Osborne, H. (2005). *Health literacy from a to z: Practical ways to communicate your health message*. Sudbury, Massachusetts: Jones and Bartlett.
- Plain Language Action and Information Network. (2012). *Federal plain language guidelines*. Retrieved from www.plainlanguage.gov
- Plain Writing Act of 2010, Pub. L. No. 111-274, § 124 Stat. 2861 (2010).
- plainlanguage.gov. (2011, May 1). *Federal plain language guidelines*. Retrieved from <http://www.plainlanguage.gov/howto/guidelines/FederalPLGuidelines/index.cfm?CFID=>

9882969&CFTOKEN=956d681a5c29b4ea-77603CB8-1372-4132-

8D9F4F35DF6BD40C&jsessionid=bc30c754fa21be3c91da1c527432172a7a49

Saxtoft, C. (2008). *Convergence: User expectations, communications enablers and business opportunities*. Chichester: John Wiley and Sons.

Schank, R. C. (1982). *Dynamic memory: A theory of reminding and learning in computers and people*. Cambridge, Massachusetts: Cambridge University Press.

Schank, R. C., & Abelson, R. P. (1977). *Scripts, plans, goals, and understanding*. Hillsdale: Lawrence Erlbaum Associates.

Schank, R. C., & Abelson, R. P. (1995). Knowledge and memory: The real story. In R. S. Wyer (Ed.), *Advances in social cognition* (Vol. 8, pp. 1-86). Hillsdale: Lawrence Erlbaum Associates.

Schank, R. C., & Fano, A. (1995). Memory and expectations in learning, language, and visual understanding. *Artificial Intelligence Review*, 9, 261-271.

Services, U. S. (2012a). *Content organization*. Retrieved from <http://www.usability.gov/pdfs/chapter16.pdf>

Services, U. S. (2012b). *Navigation*. Retrieved from <http://www.usability.gov/pdfs/chapter7.pdf>

Services, U. S. (2012c). *Page layout*. Retrieved from <http://www.usability.gov/pdfs/chapter6.pdf>

Services, U. S. (2012d). *Scrolling and paging*. Retrieved from <http://www.usability.gov/pdfs/chapter8.pdf>

Services, U. S. (2012e). *Text appearance*. Retrieved from <http://www.usability.gov/pdfs/chapter11.pdf>

Services, U. S. (2012f). *Headings, titles, and labels*. Retrieved from <http://www.usability.gov/pdfs/chapter9.pdf>

- Sharp, A. (2003). *Reading comprehension and text organization*. Lewiston: Edwin Mellen Press.
- Sherman, L. A. (1893). *A manual for the objective study of English prose and poetry*. Boston: Ginn & Company.
- Still, B. (2010). Usability for a ubiquitous computing world. *Intercom*, 57(7), 31-33.
- Thorndike, E. L. (1921). *The teacher's word book*. New York: Teacher's College.
- Usability.gov. (n.d.). *Usability methods*. Retrieved from <http://usability.gov/>
- Willis, A. I. (2008). *Reading comprehension research and testing in the U. S.: Understanding race, class, and power in the struggle for meaning*. New York: Lawrence Erlbaum Associates.
- Zakaluk, B. L., & Samuels, S. J. (1987). Toward a new approach to predicting text comprehensibility. In B. L. Zakaluk (Ed.), *Readability: Its past, present, and future* (pp. 121-144). Newark, Delaware: International Reading Association.

Appendix A: Interview Question Guide

Pre-Viewing Interview Guide

1. Can you describe how you expect the information to be written?
2. Can you describe how comprehensible you expect the written information to be?
3. Can you describe how you expect the information to be presented?
4. Can you describe how much text you expect to find on each web page?
5. Through how many pages do you expect to navigate to find relevant information?
6. What types of navigation menus do you expect to use or see?
7. Can you describe how you expect the web page will look?

Post-Viewing Interview Guide

1. Did the page appear to be well organized?
2. Was information presented in a manner that made it easy to find?
3. Was the information easy to comprehend?
4. Were you satisfied with the navigation options presented?
5. Was information presented in a way that made it easy to read?
6. Did you think the web pages you needed were buried deep or were they easy to find?
7. Do you think there was too much text on any of the pages?

Appendix B: Website Information Search Scenario

You are a veteran and have just received word that your appeal to increase your disability rating to 100%, or “completely and permanently disabled” was successful. You know that according to the Montgomery G. I. Bill your child, a senior in high school, can receive educational assistance for college. You wish to find answers to a number of questions:

1. How many credit hours your child must enroll in each semester to receive full benefits.
2. Whether your child can attend a vocational school and receive benefits.
3. How much money your child will receive from Dependents’ Educational Assistance.
4. When your child’s money will be disbursed.
5. If your spouse is also eligible for Educational Assistance benefits.
6. If your spouse and child can use their benefits at the same time.

Appendix C: Pre-Viewing Response Codebook

Information Factor Responses

Difficulty or ease of readability.

A.1 Responses given to the question “How do you expect the information on the website to be written?”

Difficulty or ease of comprehension.

B.1 Responses given to the question “Can you describe how comprehensible you expect the written information to be?”

Information presentation.

C.1 Responses given to the question “Can you describe how you expect the information to be written?”

Amount of information on the page.

D.1 Responses given to the question “Can you describe how much text you expect to find on each web page?”

Navigation Factors

Page layout.

E.1 Responses given to the question “Can you describe how you expect the web page will look?”

Page depth.

F.1 Responses given to the question “Through how many pages do you expect to navigate to find relevant information?”

Menu types.

G.1 Responses given to the question “What type of navigation menus do you expect to use or see?”

Appendix D: Think-Aloud Verbal Response Codebook

Information Factors

Difficulty or ease of readability.

- A.1 Responses that pertain to the factor “difficulty or ease of readability.”
- A.2 Responses that are positive about readability of text on the website.
- A.3 Responses that are negative about readability of text on the website.

Difficulty or ease of comprehension.

- B.1 Responses that pertain to the factor “difficulty or ease of comprehension.”
- B.2 Responses that are positive about comprehension of text on the website.
- B.3 Responses that are negative about comprehension of text on the website.

Information presentation.

- C.1 Responses that pertain to the factor “information presentation.”
- C.2 Responses that are positive about how information is presented on the website.
- C.3 Responses that are negative about how information is presented on the website.

Amount of information on the page.

- D.1 Responses that pertain to the factor “amount on information on the page.”
- D.2 Responses that are positive about the amount of information on the page on the website.
- D.3 Responses that are negative about the amount of information on the page on the website.

Navigation Factors

Page layout.

- E.1 Responses that pertain to the factor “page layout.”
- E.2 Responses that are positive about page layout on the website.

E.3 Responses that are negative about page layout on the website.

Page depth.

F.1 Responses that pertain to the factor “page depth.”

F.2 Responses that are positive about page depth on the website.

F.3 Responses that are negative about page depth on the website.

Menu type.

G.1 Responses that pertain to the factor “menu type.”

G.2 Responses that are positive about menu types on the website.

G.3 Responses that are negative about menu types on the website.

Appendix E: Think-Aloud Action Codebook

Information Factor Actions

Difficulty or ease of readability.

- A.1 Actions that pertained to the factor “difficulty or ease of readability.”
- A.2 Increasing text size on the web pages.

Difficulty or ease of comprehension.

- B.1 Actions that pertained to the factor “difficulty or ease of comprehension.”
- B.2 Using a dictionary to look up words.
- B.3 Using the website’s search function to carry out a keyword search.

Information presentation.

- C.1 Actions that pertained to the factor “information presentation.”
- C.2 Attempting to locate the same information presented in a different manner.
- C.3 Using the browser’s “find” function to quickly locate keywords in the text on the web page.
- C.4 Using the table of contents in a brochure to locate relevant chapters to search for information.

Amount of information on the page.

- D.1 Actions that pertained to the factor “amount of information on the page.”
- D.2 Attempting to find condensed versions of the same information.
- D.3 Scanning the available information to quickly find relevant information.

Navigation Factor Actions

Page layout.

- E.1 Actions that pertained to the factor “page layout.”

E.2 Using the cursor to search for menus.

Page depth.

F.1 Actions that pertained to the factor “page depth.”

F.2 Using the website’s search menu to locate relevant information using keywords.

Menu types.

G.1 Actions that pertained to the factor “menu types.”

G.2 Switching to navigating using a different menu.

G.3 Noticing a previously unnoticed menu on the page.

G.4 Switching to searching on the website’s search bar instead of clicking through links or menus.

G.5 Using the cursor to search the text for embedded links.

Appendix F: Post-Viewing Response Codebook

Information Factors

Difficulty or ease of readability.

A.1 Responses given for the question “Was information presented in a way that made it easy to read?”

A.2 Affirmative responses (information was easy to read).

A.3 Negative responses (information was difficult to read).

Difficulty or ease of comprehension.

B.1 Responses given for the question “Was the information easy to comprehend?”

B.2 Affirmative responses (information was easy to comprehend).

B.3 Negative responses (information was difficult to comprehend).

Information presentation.

C.1 Responses given for the question “Was information presented in a manner that made it easy to find?”

C.2 Affirmative responses (information was presented in a useable manner).

C.3 Negative responses (information was not presented in a useable manner).

Amount of information on the page.

D.1 Responses given for the question “Do you think there was too much text on any of the pages?”

D.2 Affirmative response (too much text on the web pages).

D.3 Negative response (not too much text on the web pages).

Navigation Factors

Page layout.

E.1 Responses given for the question “Did the page appear to be well organized?”

E.2 Affirmative response (the page was well organized).

E.3 Negative response (the page was not well organized).

Page depth.

F.1 Responses given for the question “Did you think that any of the pages you needed were buried deep, or were they easy to find?”

F.2 The pages were easy to find (not buried deeply).

F.3 The pages were difficult to find (buried deeply).

Menu type.

G.1 Responses given for the question “Were you satisfied with the navigation options presented?”

G.2 Affirmative response (satisfied).

G.3 Negative response (dissatisfied).