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AN ANALYSIS OF THE DANIELSON COMPUTERIZED READABILITY PROGRAM AS APPLIED TO A CORPORATION'S NEWS RELEASES

A Thesis

Presented for the

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Degree

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Mary K. McSpadden

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ABSTRACT

In this study, a new computerized readability program designed to run on an IBM Personal Computer was used to analyze news releases from the public relations department of Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee. Developed by Dr. Wayne Danielson, a professor of journalism at the University of Texas at Austin and a pioneer in the computer automation of readability formulas, the program provided calculations and comparison of four readability formulas (the Flesch Reading Ease formula, the Farr-Jenkins-Paterson formula, the Danielson-Bryan formula and the Gunning Fog Index).

Over 120 pieces of text were typed into the computer and run through the Danielson program. Seven different readability predictors (four grade scores and three scale scores) were produced for each written passage. The purpose of this study was to use the data generated from the Martin Marietta Energy Systems readability study to make some general observations about the strengths and weaknesses of the Danielson computerized readability program.

Analysis of the data indicated that the Danielson program has merit in helping students gain general readability scores for their writing work, the purpose for which it was designed. Additionally, the program was found to be an adequate tool for analyzing (in a general way) the readability of a corporation's news releases. It produced a number of grade scores and scale scores, suggesting that

it can be used to generate rough measures for various kinds of writing. The program was also inexpensive ($35), easy to use and efficient.

There were, however, deficiencies in the Danielson program that caused questions about its validity, reliability and accuracy to arise. Inconsistencies between grade scores and scale scores and computer counts and hand counts done on some of the releases showed that Danielson's program lacks precision. It became apparent that in adapting the readability formulas to the personal computer, Danielson made some arbitrary changes that altered the validity of the readability scores.

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INTRODUCTION

"Fog," as described by Carl Sandburg, "comes on little cat feet. It sits looking over harbor and city on silent haunches and moves on." There is another kind of fog, however, that comes on typewritten pages. But it does not move on. This fog sits endlessly, hindering the reader from easily comprehending the written passage.

Even though advocates of clear writing have been concerned with lifting the fog from written passages for hundreds of years, systematic means for determining readability have only been used since the 1920s (Klare, 1963, p. 37). At that time, educators first saw the need to determine the suitability of the written materials they assigned by defining the measurable elements of reading difficulty and establishing a systematic base for determining readability. Hence, readability formulas, based on the primary criteria of sentence length and word complexity, were developed.

Since that time, readability research has been applied not only in education, but in business and industry, journalism, law and government, scientific and technical fields, and public relations.

As the applications of readability research have increased, the methods for testing readability have changed. With the widespread use of computerized word processing equipment comes a related development of programs for performing computerized readability analyses. No longer is it necessary to perform the time-consuming hand counts of words and syllables. Computer software programs have been

developed to look at the measurable elements of writing style and calculate a readability level for a written passage.

Since the early 1960s, several computerized readability programs have been developed. Dr. Wayne Danielson, a professor of journalism at the University of Texas at Austin and a leader in computer application in journalism, was among the first to automate readability formulas. His original program was for a mainframe computer. Since that time, Danielson's program has been adapted to run on an IBM Personal Computer. Using vocabluary complexity and sentence length as the two criteria for predicting how hard or easy a text might be to read, Danielson has incorporated into his program adaptations of the Flesch Reading Ease formula, the Farr-Jenkins-Paterson formula, the Gunning formula and the Danielson-Bryan formula. In this study, Danielson's computerized readability program was used to measure the readability of technical news releases published by the public relations department of Martin Marietta Energy Systems, Oak Ridge, Tennessee.

The Danielson readability program served as an adequate tool for determining the readability levels of technical news releases from Martin Marietta Energy Systems and the resulting newspaper stories. However, because the Danielson program was new and virtually no documentation about its accuracy, validity and reliability was available, the program was critically examined to assess its strengths and weaknesses when applied to a corporation's news releases. Thus, the purpose of this study was to determine the valuable aspects and the limitations of the Danielson computerized readability program as applied to Martin Marietta Energy Systems' technical news releases.

Chapter I provides background information on readability by presenting the definition of terms and the review of literature.

Chapter II focuses on the procedures used in the study, describing the selection of the news releases, categorization of the releases, the text sampling, the methods used to run the news releases through the Danielson program, the use of the grade and scale score predictors, and the process used to match news releases to the resulting newspaper stories. Also included in the chapter are an introductory statement of the problem that necessitated the use of the Danielson program, an overview of the readability study conducted at Martin Marietta Energy Systems and the hypotheses that guided the study.

Chapter III presents the findings from two perspectives:

1. The general findings as presented to the Martin Marietta Energy Systems public relations staff

2. The specific findings that made it possible to draw some conclusions about the strengths and weaknesses of the Danielson computerized readability program.

Chapter IV offers the conclusions that can be drawn from this study, providing some valuable information for Martin Marietta Energy Systems' public relations staff and identifying the strengths and weaknesses of the Danielson program.

CHAPTER I

BACKGROUND ON READABILITY

Introduction

In order to understand the use of readability formulas today and the underlying principles of Danielson's computerized readability program, it is necessary to consider background information on readability. Chapter I defines the terms and reviews the literature germane to this study.

Definition of Terms

Readability: The ease with which written text can be read and comprehended.

Readability Formula: A scientific device, based on arithmetic equations, for measuring the relative success or difficulty of reading and understanding written material. Readability formulas use measurable elements of writing style such as sentence length, number of syllables, number of polysyllabic words, number of monosyllabic words and words that begin with certain letters.

Flesch Reading Ease Formula: A readability yardstick based on average sentence length in words and the average word length in syllables.

Farr-Jenkins-Paterson Formula: A simplification of the Flesch Reading Ease Formula, accomplished by substituting the number of one-syllable words for Flesch's syllable count.

Gunning Formula: A readability yardstick based on average sentence length in words and the percentage of words having three or more syllables.

Gunning Fog Index: The reading grade level, as derived from using the Gunning formula, required to understand a written passage.

Danielson-Bryan Formula: A computer-oriented readability yardstick based on average sentence length and word complexity as derived from a character count.

Grade Score Predictor: A number assigned to the written material analyzed by the Danielson computerzied readability program. Grade scores from 2 to 10 indicate the text's degree of difficulty; with 10 being interpreted as an "extremely difficult" text.

Scale Score Predictor: A number assigned to the written material analyzed by the Danielson computerized readability program. Scale scores from 0 to 100 indicate the text's degree of difficulty; with zero being interpreted as an "extremely difficult" text.

Martin Marietta Energy Systems, Inc.: A division of Martin Marietta Corporation that operates five major energy-related production and research facilities for the U.S. Department of Energy.

Martin Marietta Energy Systems News Release: Principal form of written communication for reporting developments of interest to Martin Marietta Energy Systems, Inc.'s internal and external publics.

Nontechnical News Releases: Those Martin Marietta Energy Systems news releases that deal with personnel matters--employee promotions, appointments and awards.

Technical News Releases: Any of the Martin Marietta Energy Systems news releases that are not employee-related. Subject matter includes discoveries, developments, research projects, results of research projects, mishaps, environmental issues and programs/events available to the public.

Review of Literature

Introduction

Klare (1963) published The Measurement of Readability, a comprehensive review of readability, including a developmental history of readability formulas. Because Klare's book was so frequently cited in the articles reviewed for this study, it provides the basis for the following summary of the evolution of the four readability formulas used by Danielson.

Klare pointed out that since the early 1940s, more than 30 readability yardsticks have been developed, some merely recalculations of others. Common to most of these formulas, however, is the consideration of two measurable elements of writing style--sentence length and word complexity.

Danielson's (1986) computerized readability program used four formulas to make general predictions about how hard or easy written text would be to read. Designed primarily to evaluate newswriting, the program used formulas that were developed to measure the same two textual characteristics--sentence length and word complexity.

Following is an overview of the development of the four readability formulas used. The chapter also summarizes the literature on readability studies in various fields and computerized readability programs that have been developed since the appearance of Danielson's first computerized program in 1963.

Developmental history of readability formulas. Klare (1963) gave credit to Lively and Pressey as the first researchers to conduct quantitative research in readability. Their 1923 method was designed to predict vocabulary difficulty, based on 1000-word samples systematically selected throughout a book and compared to Thorndike's list of the 10,000 most common words. Thorndike tabulated the frequency with which words occur in print, providing the "basis for the work of Lively and Pressey" (Klare, 1963, p. 30).

Lively and Pressey's work triggered others to develop readability yardsticks, but it appears that the research by W. S. Gray and Bernice Leary laid the groundwork for the development of the formulas that are widely used today. Starting with 289 factors believed to contribute to readability, Gray and Leary conducted a series of tests, narrowing the number of factors to 44. Finally, they concluded that 20 of these factors were significantly related to readability (Klare, 1963, pp. 48-49). Robert Gunning (1968) categorized the factors "weighted" by Gray and Leary as (1) "those that deal with sentence length and the relationships within sentences" and (2) "those that relate to word load" (p. 34).

The Flesch Reading Ease Formula. After the work of Flesch (1948), interest in readability soared. Klare (1963) attributed the popularity of Flesch's formula, in part, to its simplicity. Unlike many of the readability yardsticks developed in the 1920s, Flesch's first formula focused on sentence length, the number of affixes, and the number of personal references. In addition, through a series of articles, Flesch

> brought his formula, his views on readable writing, and the whole notion of readability to the attention of many writers in journalism, business, government, etc. Prior to Flesch's time, readability was a little-used word except in the educational circles, but he made it an important concept in most areas of mass communication (p. 56).

Originally, his procedure was to:

1. Systematically select samples of 100 words throughout the material to be rated;
2. Compute average sentence length in words (x_s);
3. Count the number of affixes (x_m);
4. Count the number of personal references (x_h);
5. Average the results and insert in the formula:

$$.1338x_s + .0645x_m - .0659x_h - .7502$$

After receiving comments and criticism from other researchers, Flesch developed two new formulas, one of which is widely used today--the Flesch Reading Ease Formula. The steps for determining the reading ease of written material are:

1. Systematically select 100-word samples from the material to be rated;

2. Compute the number of syllables per 100 words (wl);

3. Figure the average sentence length in words (sl);

4. Find the "reading ease" score by inserting the number of syllables per 100 (wl) and the average sentence length (sl) in the following formula:

Reading Ease = 206.835 - (.846 x wl) - (1.015 x sl)

Thus, the revised Flesch formula uses sentence length and word complexity to calculate readability. Table 1 shows score ranges of the Flesch Reading Ease formula, interpretations of the scores and examples of applications of the Flesch measures.

Table 1. Interpretations and Examples of Ease of Readability.

Flesch Reading Ease Score	Reading Level	Examples
90-100	Very easy to read	Comics
80-90	Easy	
70-80	Fairly Easy	Fiction
60-70	Standard	
50-60	College	Popular Magazines
	Level	Academic Journals
30-50	Difficulty	
0-30	Very hard to read (Graduate Level)	Scientific Journals

The Farr-Jenkins-Paterson formula. Further simplification of Flesch's work is seen in the Farr-Jenkins-Paterson formula (1951), which replaced the syllable count used in the Flesch Reading Ease formula with a count of one-syllable words. This substitution reduced the time required for analysis. Application of the Farr-Jenkins-Paterson formula requires the following steps:

1. Systematically select 100-word samples from the material to be analyzed;

2. Determine the number of one-syllable words per 100 words (nosw);

3. Determine the average sentence length in words (sl);

4. Apply in the formula:

New Reading Ease Index = 1.599nosw - 1.015sl - 31.517

The Gunning Fog Index. Gunning (1968), like Flesch and Farr, Jenkins and Paterson, used the same factors in his readability formula. Calculations using Gunning's formula result in a number known as the Fog Index. That number is assigned a reading level by grade, with 13 (freshman in college) being his "danger line."

Hand calculations using the Gunning formula are done as follows:

1. Take systematic samples of 100 words;

2. Divide the number of words by the number of sentences (sentence length);

3. Count the words with three or more syllables per 100 words. Do not count words that are proper names, combinations of easy words

(such as "afternoon" or "newspaper") or verb forms made three syllables by adding -ed or -es (like "resulted" or "reduces"). This results in the percentage of hard words.

4. Total the two numbers from steps two and three and multiply by .4.

Table 2 compares the Fog Index with reading levels by grade and by magazine.

Table 2. Comparison of Fog Index with Reading Levels by Grade and by Magazine.

	Fog Index	Reading Level by Grade	By Magazine
	17	College graduate	(No popular magazine this difficult)
	16	College senior	
	15	College junior	
	14	College sophomore	
Danger Line	13	College freshman	
	12	High-school senior	Atlantic Monthly/ Harper's
	11	High-school junior	Time/Newsweek
	10	High-school sophomore	Reader's Digest
	9	High-school freshman	Saturday Evening Post
Easy-Reading Range	8	Eighth grade	Ladies' Home Journal
	7	Seventh grade	True Confessions
	6	Sixth grade	Comics

The Danielson-Bryan Formula. Concerned with creating a readability computer program that would alleviate the tedious counting of words and syllables, Danielson and Bryan (1963) attempted to automate the Farr-Jenkins-Paterson formula to run on a UNIVAC 1105.

Taking into account the factors that are considered in the Farr-Jenkins-Paterson formula (average sentence length in words and the number of one-syllable words), Danielson and Bryan had to program the computer to recognize a sentence, a word and a monosyllabic word. Initially, considerable difficulties were encountered in writing computer instructions "which would produce accurate answers" (p. 202). The programmers solved those problems, for the most part, but the program remained slow and awkward.

It was these deficiencies that prodded the programmers to develop a new formula that would be better suited to the capabilities of a computer. A new Danielson-Bryan formula used elements computers can recognize quickly and easily. They are:

1. the average number of characters per space, a value found by "counting all characters (except sentence bounds) in the content to be analyzed and dividing by the number of spaces between words" (p. 205).

2. the average number of characters per sentence, a value found by "dividing the total character count found in the preceding operation by the total number of sentences" (p. 205).

The Danielson-Bryan formula was presented in two forms, with the first being a pure regression equation for predicting grade scores:

Danielson-Bryan #1 = 1.0364 CPSp + .0194 CPSt - .6059

Where: CPSp = characters per space

CPSt = characters per sentence

The second version of the Danielson-Bryan formula resulted in scaled scores covering a range of about 100 points. The range is about the same as those covered by the Flesch formula and the Farr-Jenkins-Paterson formula.

Danielson-Bryan #2 = 131.059 - 10.364 CPSp - .194 CPSt

Table 3 shows the interpretations of the scores produced by Danielson's program for the UNIVAC 1105:

Table 3. Readability Scores and Interpretations of Danielson's UNIVAC 1105 Computerized Readability Program.

Score	Level
90-100	Very easy, third grade level
80-89	Easy, fourth grade level
70-79	Fairly easy, fifth grade level
60-69	Standard, sixth grade level
50-59	Fairly difficult, Junior high school level
30-49	Difficult, high school level
0-29	Very difficult, college level

Since the mainframe computer automation of the Farr-Jenkins-Paterson formula and the Danielson-Bryan formula, Danielson (1986) has rewritten his program to run on an IBM Personal Computer.

Although no literature was found on Danielson's 1986 computerized readability program (with the exception of the user's manual), it

appears that Danielson's program for personal computers grew out of his work on readability formulas devised to run on the UNIVAC 1105. In the User Manual: Four Readability Formulas, Danielson pointed out that the formulas used in his program are adaptations of the Flesch formula, the Farr-Jenkins-Paterson formula, the Gunning Fog Index and the Danielson-Bryan formula. He explained that the "first three (formulas) originally used syllable counts in some way to measure vocabullary load" (p. 9). In the versions presented in his program, "syllables are estimated by counting letters because syllables are difficult for computers to recognize whereas letters are easy. The Danielson-Bryan formula was originally written for a mainframe computer and counted letters; conceptually at least it did not need to be changed" (p. 9).

Written in BASIC, Danielson's program allows the user to enter text from the keyboard or from a plain ASCI-II text file stored on a floppy disk or a hard disk drive. However, the program does not accept text containing word processing codes. Such codes are not correctly analyzed using the Danielson program.

After text is run through the program, the user is provided with calculations on 19 different items. They are:

1. No. of characters in text =
2. No. of words in text =
3. No. of words with 4 or fewer letters =
4. Percent of words with 4 or fewer letters =
5. No. of words with 9 or more letters =

6. Percent of words with 9 or more letters =
7. No. of sentences =
8. Characters per sentence =
9. Characters per word =
10. Words per sentence =
11. Estimated syllables =
12. Estimated syllables per 100 words =
13. Estimated Flesch Grade Score =
14. Estimated Farr-Jenkins-Paterson Grade Score =
15. Danielson-Bryan Grade Score =
16. Estimated Gunning Fog Index =
17. Estimated Flesch Scale Score =
18. Estimated Farr-Jenkins-Paterson Scale Score =
19. Danielson-Bryan Scale Score =

A "print" option allows the user to obtain a hard copy of the text's readability variables and scores.

Table 4 shows the interpretations of the scores produced from Danielson's program for the IBM Personal Computer.

Literature about Danielson's program or reports of studies using the program were not located for this study. Additionally, Danielson's user manual did not provide specific information about the program's development. Neither did it provide comments on the program's accuracy, reliability and validity.

Having found virutally no literature on Danielson's computer automation of four readability formulas, related materials that would be of value in the analysis of the Danielson program were sought.

Table 4. Interpretations of Grade and Scale Scores Produced by Danielson's Computerized Readability Program for Personal Computers.

Grade Scores	Scale Scores	Meanings Assigned
2	90-100	Extremely Easy
3	80-89	Very Easy
4	70-79	Easy
5	60-69	Easier Than Average
6	50-59	Average
7	40-49	More Difficult Than Average
8	30-39	Difficult
9	20-29	Very Difficult
10	0-19	Extremely Difficult

Evidence was found indicating that the use of readability formulas has grown steadily since the 1920s, when educators first saw the need to determine a text's level of difficulty. Not only has usage of the formulas risen sharply, but the number of fields in which the formulas are viewed as predictors of reading difficulty also has increased.

In a questionnaire sent to public relations departments of the 60 largest U. S. companies as listed by Fortune, McKee (1967) found that 12 companies had used readability formulas as instruments for evaluating writing. Among the 12 companies were Boeing, Borden's Caterpillar Tractor, Dow Chemical, Eastman Kodak, Lockheed Aircraft, Mobil Oil, Republic Steel and Standard Oil. Among the departments using the formulas were public relations, industrial relations, technical units and employee publications.

Sixty-five percent of the public relations people who answered the questionnaire rated readability formulas as valuable, 30 percent rated them of no value, and 5 percent rated them as hramful. The survey showed companies that used the formulas rated them as valuable.

Hoskins (1973) conducted a study to determine the average readability level of Associated Press and United Press International wire copy. Based on the Flesch Reading Ease formula, more than half of the selected stories from both wire services were considered "difficult" or "very difficult."

Barnett and Leoffler (1979) used the Flesch Reading Ease formula to measure the readability of selected accounting and auditing messages contained in financial reports. They found that financial statement notes were extremely difficult to read.

Christ and Pharr (1980) tested the readability of brochures produced by the state of Florida. Brochures of seven different departments were tested, with only one department producing brochures with a standard reading level.

Shuptrine and McVicker (1981) used the Gunning Fog Index to determine the readability level of advertisements in nine magazines. They found that magazines aimed at the more educated reader did not necessarily contain ads that were more difficult to read.

Fowler and Smith (1982) compared delayed-reward and immediate-reward items in Time and Newsweek. They found that delayed-reward items were significantly more difficult to read than immediate-reward items.

Fusaro and Conover (1983) compared the readability level of two non-tabloids with two tabloids. Their findings indicated a difference in the readability levels of the two publications' lead news stories, while the readability levels of the lead editorials were about the same.

Hoskins (1984) conducted a study using two different readability formulas to determine the readability of the annual reports of the 25 top corporations in the Fortune Directory of the 500 largest American industrial corporations. Both formulas indicated that the reports contained difficult reading material.

In a similar study, Heath and Phelps (1984) used the Gunning formula to analyze the annual reports of 20 companies randomly selected from the Fortune 500 list. The results showed that the readability

levels of the annual reports surpassed the reading level appropriate for the majority of the shareholders.

Johns and Wheat (1984) compared the readability of feature stories and straight news. Their findings indicated that the straight news articles were far more difficult than the feature articles.

In another newspaper study, Stempel (1981) found a substantial difference in readability among six categories of news content.

As cited by Andrews, Karlinsky and Koch (1984), government and the private sector are becoming more and more aware of the need for clear language.

> The Carter Administration encouraged the "Plain English" concept as part of a pro-consumer movement. Several states now require easy-to-read lease agreements, and numerous states have passed laws requiring insurance policies to be written in clear language. Real estate, labor, and other legal contracts have been re-examined for their readability. Several tax bills have also been proposed or passed with simplification (a corollary concept to readability) in mind. Even the Internal Revenue Service (IRS) is experimenting with individual tax form presentations and the Flesch Readability Index to see if schedules and instructions can be made more readable. Most recently, the Treasury has been issuing tax regulations in question-and-answer format rather than in its traditional legal style (p. 185).

Many articles have been written about readability studies, and this review cites only a few that are representative of the widespread use of readability formulas.

Because of the vast use of readability yardsticks, computer automation of the formulas seems like a logical direction for readability studies. Hence, of greater importance to this thesis was the

consideration of literature related to computerized readability programs. Following is a brief review of the available literature about predicting readability by computer counts.

In 1975, George R. Klare presented another comprehensive review of readability. In a lengthy report in Reading Research Quarterly (1974-1975, pp. 62-102), Klare discussed readability as it is categorized in the following way:

1. recalculations and revisions of existing formulas
2. new formulas, for general purposes or special purpose use
3. application aids, for both manual and machine use
4. predictions of readability for four languages (p. 62)

This study was concerned with application aids for machine use. Additionally, only the four formulas used in the Danielson program (the Flesch Reading Ease formula, the Farr-Jenkins-Paterson formula, the Gunning Fog Index, and the Danielson-Bryan formula) were considered for discussion.

Klare discussed approximately 20 computerized readability formulas, giving credit to Danielson and Bryan (1963) for developing the first formula specifically for automated use. As discussed in an earlier portion of this text, the Danielson-Bryan formula used two variables (characters per space and characters per sentence) to determine readability.

As cited by Klare (1974-1975) Fraser and Fang were the first to attempt the automation of the Flesch Reading Ease formula. They provided the first syllable counter. Using the work done by Fang,

Coke and Rothkopf and Klare, Rowe, St. John and Stolurow developed a syllable counter and an automated version of Flesch's formula. The work done by Coke and Rothkopf, however, was based on a simpler, less accurate method of estimating syllables. Others began to use letter counts to estimate the number of syllables. Felsenthal and Felsenthal, in their automated program (TEXAN) for the Flesch Reading Ease formula, used a letter count. General Motors provided a commercial computer program (STAR) for the Flesch Reading Ease formula. Finally, the University of Texas Instructional Materials Service used computer programs for Flesch's formula (Klare, 1974-1975, p. 88).

Computerization of the Farr-Jenkins-Paterson formula was first accomplished by Danielson and Bryan (1963). Computer versions of the Farr-Jenkins-Paterson program were also provided by Klare, Rowe, St. John and Stolurow and the University of Texas (Klare, 1974-1975, p. 89).

The Gunning Fog Index was also automated. Klare, Rowe, St. John and Stolurow and Felsenthal and Felsenthal developed computer programs for applying the Gunning Fog Index (Klare, 1974-1975, p. 89).

Since Klare's review of computerized readability formulas in 1975, other formulas have been provided. As with the development of the formulas themselves, many of the new computerized readability programs appear to be adaptations of the original computer programs.

Kincaid, Aagard, O'Hara and Cottrell (1980) developed a computer readability editing system (CRES) to assist authors in writing technical manuals and training materials that will be easily understood.

Written in Wang BASIC-2 to run on computer equipment costing about $25,000, the system does more than calculate a readability level. It is designed to give immediate suggestions to writers about ways to improve written material, a component that sets it apart from the Danielson program. CRES uses the Flesch-Kincaid Readability formula to provide a readability level of the sample text. In addition, the system alerts the writer to uncommon and misspelled words and long sentences. It can also suggest simple replacements for difficult words and phrases. The Flesch-Kincaid formula is based on the number of sentences, number of words and the number of syllables. A comparison of manual counts and computer counts of each of the three variables showed correlation coefficients above 0.99.

Barry and Stevenson (1975) developed a computer program written in FORTRAN. Designed to duplicate the Dale-Chall calculation, the program runs on a large computer.

Barry (1980) expanded the original program by automating on digital computers six readability formulas. Included are the Dale-Chall, the Spache, the Farr-Jenkins-Paterson, the Gunning Fog Index, the Flesch Reading Ease and Spaulding's Spanish Language. Similar to Danielson's program in the information given, the program provides the user with a final reading level as well as total results for each variable used in the particular reading formula.

Schuyler (1982) discussed a readability formula program which provides scores for eight different formulas. Included are the Dale-Chall, Holmquist, Fry, Fog, Flesch, Flesch-Kincaid, Coleman and

Devereaux (ARI). As in the Danielson computer program, the grade scores produced by the formulas in the package discussed by Schuyler indicate a wide range of variance. Schuyler questioned the validity of the formulas because of these differences.

Even though the automation of readability formulas opens up questions about validity, precision and accuracy, it does provide formula users with a quick, easy way to attain readability measures. With the growing concern about clear, concise writing, the need for readability yardsticks--especially easy-to-use yardsticks such as computerized formulas--is becoming increasingly recognized.

CHAPTER II

PROCEDURES

Introduction

One of the primary vehicles for distributing news of interest to Martin Marietta Energy Systems, Inc.'s internal and external publics is the news release. With regard to news releases from the public relations department, one of the questions that arose--perhaps the question that initiated the study at the Oak Ridge facility--was: To what degree do the news releases written and distributed by the public relations staff communicate the information they intend to communicate?

One measure of a publication's effectiveness is readability. Since no readability studies had been performed on news releases at the Martin Marietta Energy Systems facility, a readability study was proposed as an initial step in evaluating the communication function of Martin Marietta Energy Systems' public relations program.

The Danielson computerized readability program was used in each of the three parts of the study.

The study permitted some general observations about the strengths and weaknesses of the Danielson program.

This chapter includes an overview of the readability study performed at Martin Marietta Energy Systems, stating the hypotheses that were used in each part of the study. In addition, the chapter discusses the procedures used.

Overview of Martin Marietta Energy Systems Readability Study

Part I: An analysis of Martin Marietta Energy Systems' 1985 news releases--a comparison of the technical and nontechnical news releases. Initially, the study was to be used to determine the readability levels of all news releases prepared by the Martin Marietta Energy Systems public relations department for 1985 (January 1985 through December 1985).

Examination of the 118 news releases indicated that the releases fell into two broad categories--technical and nontechnical. By dividing the releases into these categories, a comparison of the readability levels of the two kinds of releases was achieved.

The hypothesis that guided Part I of the study was: The news releases that dealt with technical subjects would be more difficult to read than the nontechnical news releases.

Because the nontechnical releases contained employee-related information, with limited appeal and value to Martin Marietta Energy Systems' external public, the nontechnical releases were not used in Parts II and III of the study. Hence, the focus of Parts II and III was on the readability levels of the technical news releases.

Part II: A comparison of the readability levels of the technical news releases and the resulting newspaper stories. The second part of the study was a comparison of the readability levels of the 46 technical news releases and the resulting news stories they

generated in the Oak Ridger, the Knoxville News-Sentinel and the Knoxville Journal, three newspapers published within close proximity of Martin Marietta Energy Systems' Oak Ridge facilities. Three questions were asked during this part of the study:

1. How many news releases were published by the three newspapers?

2. How many news releases were run exactly as they were written?

3. If the newspaper story indicated changes from the original news releases, did the change result in a more readable article (based on the readability scores of the Danielson computer program)?

The hypothesis for the second part of the study was: The newspaper stories would be more readable than the Martin Marietta Energy Systems news releases because of editorial changes made by the newspapers.

Part III: An analysis of the technical news releases and the resulting newspaper stories after subcategorization. During the third and final portion of the readability study, several aspects of the technical news releases were investigated after they were grouped into four subcategories. The 46 technical releases were subcategorized as follows:

1. Discoveries/Developments/Research Projects;
2. Mishaps;
3. Environmental Issues;
4. Announcements of Programs/Events for the Public.

The reason for breaking the technical news releases into subcategories was twofold:

1. To determine what kind of technical news release the newspapers were most likely to use;

2. To compare the readability levels of the news releases and the resulting newspaper stories, based on subcategorization.

Two hypotheses entered into the final part of the study:

1. The newspapers would run a greater percentage of news releases that dealt with mishaps than any other single type of news release--discoveries/developments, environmental issues or programs/events for the public;

2. The technical news releases that dealt with mishaps would be more readable than any other single type of news release--discoveries/developments, environmental issues and programs/events for the public.

The Martin Marietta Energy Systems Readability Study

As stated in the Overview of this chapter, all news releases prepared by the Martin Marietta Energy Systems public relations staff for 1985 (January 1985 through December 1985) were selected and run through the Danielson computerized readability program.

The releases were separated into categories. The first was made up of employee-related news releases. These releases dealt primarily with employee promotions, awards, and appointments and were considered nontechnical.

The second dealt with discoveries, developments, research projects, results of various projects, mishaps, environmental issues, and announcements of programs/events for the public. These releases were considered technical.

Of the 118 news releases that originated from Martin Marietta Energy Systems in 1985, 71 (60.2 percent) were classified as nontechnical, while 47 (39.8 percent) were classified as technical. (One technical release was disregarded because of the large content of proper nouns, bringing the total number of usable technical releases to 46 for purposes of this study.)

The entire text of each of the 46 technical releases was keyboarded into an IBM PC XT personal computer and analyzed by the Danielson program. Guidelines for Danielson's computer program, as well as those for determining readability by hand calculations, require a text sampling of at least 100 words. Because the most reliable scores would be produced by using all copy in each of the releases, the entire text was put into the computer.

Of the 71 nontechnical releases, 29 (40.8 percent) were subjected to computer analysis. Because the nontechnical releases dealt primarily with employee promotions/awards, were similar in vocabulary and were not going to be used in Part II and Part III of the study, the analysis of a random sample was considered sufficient. The researcher did, however, analyze the entire text of each of the selected nontechnical releases in order to increase the reliability.

After typing the texts into the computer and running them through Danielson's program, the four grade score predictors and the three scale score predictors were used to derive a readability level for each release. Next, mean values for the 46 technical releases and the 71 nontechnical releases were determined. This process made it possible to compare the readability levels of the technical and nontechnical releases.

In order to carry out Part II of the Martin Marietta Energy Systems readability study (A Comparison of the Readability Levels of the Technical News Releases and the Resulting Newspaper Stories), an attempt was made to match each of the 46 technical news releases with the resulting stories from the Oak Ridger, the Knoxville News-Sentinel and the Knoxville Journal. A 1985 clipping file maintained by the Martin Marietta Energy Systems public relations staff was used to pair each newspaper story with the news release from which it stemmed.

To ensure the same degree of reliability in Part II and Part III of the study as in Part I, the entire text of each story was put into the computer and analyzed with the Danielson readability program.

Once again the four grade score predictors and the three scale score predictors served as the means for determining the readability levels. The readability levels (based on mean values of grade score predictors and scale score predictors) were then compared with those of the resulting newspaper stories.

Part III of the study was simply an extension of Part II, requiring no additional calculations from the Danielson program.

The calculations from Part I and Part II were used for this portion of the study but were organized differently.

Originally, the news releases were divided into technical and nontechnical categories. The category technical releases had four distinct subcategories. These subcategories were discussed in the overview of this chapter. Subcategorization enabled the examination of the technical releases and, thus, the resulting newspaper stories in more detail.

Once the newspaper stories were paired with the news releases, each newspaper story was assigned to the appropriate subcategory. This resulted in answers to the following questions:

1. What percentage of each newspaper's total number of Martin Marietta-related stories fell into each category?

2. What percentage of the total number of releases within a subcategory was picked up by each newspaper?

After subcategorization of the newspaper stories, the grade score predictors and the scale score predictors from Danielson's computer calculations were pulled to assist in the assignment of readability levels to the four subcategories for all three newspapers. This procedure helped to determine the treatment of news releases by Martin Marietta Energy Systems' public relations staff and the three newspapers, based on the subcategories.

CHAPTER III

FINDINGS

Introduction

In order to draw insightful conclusions from this study and determine the strengths and weaknesses of the Danielson computerized readability program, it is essential to look at the findings from two perspectives. The first part of this chapter discusses the findings in a very general way, in much the same way they were presented to the public relations staff of Martin Marietta Energy Systems. The second part of the chapter looks at specific findings drawn from the readability levels of the technical news releases and evaluates the Danielson program.

The first section of this chapter, which discusses the general findings, is divided into three parts. They are the findings from:

Part I: An Analysis of Martin Marietta Energy Systems' 1985 News Releases--A Comparison of the Technical and the Nontechnical News Releases;

Part II: A Comparison of the Readability Levels of the Technical News Releases and the Resulting Newspaper Stories;

Part III: An Analysis of the Technical News Releases and the Resulting Newspaper Stories After Subcategorization.

General Findings: (As presented to Martin Marietta Energy Systems)

Part I. With each written passage that was typed into the computer, the Danielson readability program provided seven different readability predictors. Four adaptations of readability formulas (the Flesch formula, the Farr-Jenkins-Paterson formula, the Danielson-Bryan and the Gunning Fog Index) were used to generate grade score predictors (ranging from 2 to 10, with 10 begin considered "extremely difficult"). Three scale score predictors (ranging from 0 to 100, with 0 being considered "extremely difficult") were also assigned to each text that was run through the program. Danielson uses adaptations of the Flesch Reading Ease formula, the Farr-Jenkins-Paterson formula and the Danielson-Bryan formula to produce scale score predictors. The Gunning formula was not used.

For the purpose of presenting the findings of Part I of the study to the public relations staff of Martin Marietta Energy Systems, hundreds of calculations were reduced to two readability levels for each of the two kinds of news releases.

The first readability level given was based on the mean value of three of the grade score predictors of 46 technical releases and 29 nontechnical releases. (The Gunning Fog Index was not included in this average because Danielson did not use the Gunning formula to produce a scale score predictor. In the event that further research is done based on these findings, it is reasonable to assume that a correlation between scale score predictors and grade score predictors could

be explored. In that case, only the three formulas used to provide both scale scores and grade scores should be averaged.) Appendix A (Tables A-1, A-2, A-3 and A-4) shows the raw data from which the averages were derived.

The second readability level given was the mean value of the three scale score predictors of 46 technical releases and 29 nontechnical releases.

Following are the general findings of the Martin Marietta Energy Systems readability study as presented to the public relations staff.

Technical news releases.

The mean value of the three grade score predictors (excluding the Gunning Fog Index readings) of all 46 technical news releases was 8.1. According to the Danielson program, a value of 8.1 means that the reading material is "difficult."

The mean value of all scale score predictors of all 46 technical news releases was 27.3. This value indicated that the technical news releases were "very difficult."

Danielson's program indicated that the average sentence length of the technical news releases was 25.5 words (see Appendix B). Gunning (1968) believes that an acceptable average sentence length for "average" readability is 20 words.

Danielson's program showed that the average "percent of words with nine or more letters" of the 46 technical releases was 18.2 (see Appendix B). Gunning (1968) believes that a hard-word count of more than 12 percent is too difficult for the average reader.

Nontechnical news releases.

The mean value of three grade score predictors (excluding the Gunning Fog Index readings) of 29 nontechnical news releases was 7.5. A value of 7.5, according to Danielson's program, means that the reading material is "more difficult than average."

The mean value of all scale score predictors of the 29 nontechnical news releases was 34.2. Based on Danielson's interpretation, Martin Marietta Energy Systems' nontechnical releases were "difficult."

Danielson's program showed that the average sentence length of the nontechnical news releases was 20.9 (see Appendix B).

The average "percent of words with nine or more letters" of the 29 nontechnical releases was 17.5 (see Appendix B).

Thus, the Danielson computerized readability program confirmed the hypothesis for Part I of this study. As indicated by the mean values of the grade score predictors and the scale score predictors, the technical news releases were more difficult to read than the nontechnical releases. However, the difference in the degree of difficulty was slight. Based on the mean values of the grade score predictors and the scale score predictors, both the technical and the nontechnical releases were too difficult for the average reader. All 118 news releases were categorized by Danielson's program as "more difficult than average," "difficult," "very difficult," or "extremely difficult." Appendix C (Tables C-1, C-2, C-3 and C-4)

shows a breakdown of the releases by degree of difficulty. Discussion of some of this data is found in the second section of this chapter.

Part II. As mentioned in the overview of this chapter, the second part of the readability study was conducted to determine how many of the technical news releases were published by the three newspapers, the Oak Ridger, the Knoxville News-Sentinel and the Knoxville Journal. Quite obviously, this portion of the study strayed from readability, but such an approach was a logical step for the comparison of the news releases and the resulting newspaper stories. Additionally, the extra step taken here lends itself to further research, as discussed in the final chapter of this thesis.

The findings indicated that the Oak Ridger picked up the greatest number of releases. Of the 46 technical news releases that went out from Martin Marietta Energy Systems' public relations department, 22 (47.8 percent) of them resulted in stories in the Oak Ridger.

The Knoxville Journal came in second using 13 (28.3 percent) of the 46 releases.

Using the fewest news releases, the Knoxville News-Sentinel ran only 12 (26.1 percent) of the 46 releases. Appendix D (Table D-1) shows a breakdown of the Martin Marietta Energy Systems news releases that were run by the three area newspapers. None of the published stories used for this study went beyond the scope of the news release.

With regard to the second question--How many news releases were run exactly as they were written?--the findings indicated that the Oak Ridger was the only newspaper that ran the releases verbatim.

Even so, only six (27.3 percent) of the 22 releases picked up by the Oak Ridger were run exactly as they were sent out.

Neither the Knoxville News-Sentinel nor the Knoxville Journal ran any of the 46 releases verbatim.

Finally, the study compared the readability levels of the news releases and the resulting newspaper stories. Based on the mean values of the grade score predictors (averages of the Flesch, the Farr-Jenkins-Paterson and the Danielson-Bryan), the newspaper stories were more readable than the releases in all four instances. (As in Part I of the study, the Gunning Fog Index was excluded in this calculation.) An average of the mean values of the grade score predictors showed that the Martin Marietta Energy Systems news releases averaged 8.1 ("difficult"); the Oak Ridger stories averaged 7.7 ("difficult"); the Knoxville News-Sentinel averaged 7.3 ("more difficult than average"); and the Knoxville Journal stories averaged 7.1 ("more difficult than average").

The findings were quite similar using the scale score predictors. Based on the mean values of the Flesch, the Farr-Jenkins-Paterson, and the Danielson-Bryan scores, the newspaper stories were more readable than the releases in all three cases. The average of the mean values of the three scale score predictors showed that the Martin Marietta Energy Systems news releases were "very difficult," with a score of 27.3; stories from the Oak Ridger and the Knoxville News-Sentinel were "difficult," with scores of 33.3 and 38.2, respectively; and the Knoxville Journal stories were "more difficult than average," averaging 41.0.

Specifically, of the 47 newspaper stories that stemmed from the news releases, 41 were changed in some way. Based on Danielson's readability scores, 38 (92.7 percent) of the 41 stories were considered more readable than the Martin Marietta Energy Systems news releases. Only three (7.3 percent) of the resulting stories were considered more difficult than the news releases.

As mentioned in Chapter I, two criteria are used in the Danielson program to determine the readability of a passage. In the stories of all three newspapers, the average sentence length and the average percent of difficult words (words with nine or more letters) were lower than the averages for the technical news releases.

Thus, the hypothesis was correct--the newspaper stories were more readable than the Martin Marietta Energy Systems news releases. Appendix D (Tables D-2, D-3, D-4, D-5, D-6 and D-7) shows the specific findings from Part II of the readability study.

Part III. The majority of the technical releases from Martin Marietta Energy Systems focused on discoveries, developments, research projects and new programs at the Martin Marietta Energy Systems facilities. Of the 46 technical releases, 23 (50 percent) dealt with discoveries or developments.

Martin Marietta Energy Systems' coverage of mishaps accounted for 26 percent of the total number of releases.

During 1985, only five news releases fell into the category of environmental issues, accounting for 11 percent of the total number of releases.

Finally, Martin Marietta Energy Systems' public relations department sent out six releases announcing programs for the public. This category accounted for 13 percent of the total number of technical news releases.

The three newspapers' coverage of the subjects within the four categories had a low correlation with Martin Marietta's treatment of the subjects. Appendix E (Figure E-1) shows a detailed breakdown of the coverage by each newspaper. The general and obvious findings, however, are as follows:

1. All three newspapers picked up a greater percentage of releases about mishaps than any other category.

2. The Knoxville News-Sentinel and the Knoxville Journal ran more releases about environmental issues than the Oak Ridger. (The Oak Ridger did not use any of the releases about environmental issues.)

3. The Oak Ridger showed a greater interest in the releases that announced programs or events for the public than the Knoxville News-Sentinel or the Knoxville Journal. The Oak Ridger ran four of the six releases that were categorized as announcements of programs or events for the public. The Knoxville News-Sentinel and the Knoxville Journal did not use any of the releases.

4. Even though half of the total number of technical releases from Martin Marietta Energy Systems dealt with discoveries/developments, the releases in this subcategory were used least by the newspapers (based on the percent of the total number of releases within a specified subcategory).

Throughout Part III of the readability study, the readability levels of the news releases were determined after they were grouped in the four subcategories in order to see if articles about mishaps would be more readable (based on the Danielson scores) than the articles about discoveries and developments, environmental issues and announcements of programs for the public.

With regard to categories of Martin Marietta Energy Systems' technical releases, the readability scores indicated that the releases about programs and events for the public were the most difficult to read, with the releases about environmental issues running a close second. It was interesting to note that even though the category of announcements of programs and events for the public was ranked as the most difficult to read, the Oak Ridger ran four of the six releases.

The readability scores of the releases about discoveries/developments showed that the releases were more readable than those releases about environmental issues. The difference in the degree of difficulty, however, was slight.

As had been hypothesized, the releases about mishaps had the highest readability levels. For whatever reason, these releases were the most readable, on the average. However, the average of the predictors revealed that the releases were still too difficult for the average reader.

The readability ranking of the subcategories among the three newspapers was basically the same as the rankings of the Martin Marietta Energy Systems news releases.

Most important in the findings was that the mean values of the grade score predictors and the scale score predictors of the newspaper stories in all four subcategories showed that the subsequent stories had higher readability than the news releases that were sent out. Even so, the newspapers' readability scores revealed that the stories were too difficult for the average reader.

Specific findings from Part III of the study are in Appendix E.

Specific Findings Leading to an Analysis of Danielson's Program

In addition to using the data from the Danielson program to make some general observations about the readability of Martin Marietta Energy Systems' 1985 news releases, the study evaluated some of the data in a more detailed manner so that a general analysis of Danielson's computerized readability program could be made. The following section focuses on the data gathered from the analysis of the 46 technical releases. Findings from this section helped to pinpoint some of the strengths and weaknesses of the Danielson program.

Several findings became obvious. Simply stated, the program is not precise. It does not produce consistent, reliable and valid data, as indicated in the following:

1. Comparisons of the computer-generated data and the data produced by hand counts (see Appendix F, Table F-1).

2. Comparisons of the readability levels of the four grade score predictors (see Appendix A, Table A-1).

3. Comparisons of the readability levels of the four scale score predictors (see Appendix A, Table A-1).

4. Comparisons of the grade score predictors and the scale score predictors (see Appendix A, Table A-1)

5. Comparisons of the rank order (by degree of difficulty) of the grade score predictors and the scale score predictors (see Appendix A, Table A-1)

First, a comparison of hand-counted data from nine news releases to computer-generated data from the same releases indicated inconsistencies in the total number of words, number of complex words, percentage of complex words and words per sentence (see Appendix F). While some of these discrepancies can be attributed to counting and typing errors, the differences indicate other, more basic problems.

In hand calculations, using the Flesch Reading Ease formula, the Farr-Jenkins-Paterson formula and the Gunning formula, the number of syllables within a word is used to determine "hard words." In Danielson's program, a word is considered difficult when it contains nine or more characters. Hence, a word considered simple in the original formula (Gunning, for example) might be considered complex in the Danielson program. For example, using Danielson's program, "afternoon" is considered a difficult word because it is composed of nine letters. Doing a hand count, however, "afternoon" is counted as two simple words and thus disregarded as a hard word, even though it contains three syllables (an acceptable syllable count for a hard word).

Conversely, a word considered simple using the original formula in a hand count, might be considered complex by Danielson's program. Since "energy" is a three-syllable word, it is counted as a hard word

when performing hand counts. Danielson's program, on the other hand, counts "energy" as a simple word of six characters.

In one release, the Danielson program indicated 89 complex words, while a hand count (using the Gunning formula) indicated 127 complex words. Since complexity of words is an integral criterion for determining readability, the variance in hand counts and computer counts raises some concern. It seems that Danielson's shift from syllable counts to character counts skews the results. Even though the example cited here is extreme, differences such as these suggest problems inherent in the Danielson program.

Other discrepancies became apparent during a comparison of the four grade score predictors. Throughout the study, inconsistencies in the readability levels produced by the four formulas were observed (see Appendix A, Table A-1). The following example is indicative of this discrepancy:

Formula	Grade Score	Meaning Assigned
Flesch	8.2	Difficult
Farr-Jenkins-Paterson	7.4	More difficult than average
Danielson-Bryan	7.7	Difficult
Gunning	6.4	Average

Similar inconsistencies appear among the scale score predictors. Using the same release as mentioned in the previous example, the scale score readings are as follows:

Formula	Scale Score	Meaning Assigned
Flesch	22.3	Very difficult
Farr-Jenkins-Paterson	17.7	Extremely difficult
Danielson-Bryan	48.4	More difficult than average

Such inconsistencies lead the researcher to question the validity of the Danielson program. It seems that if the formulas continuously produce different readability levels, and they do, then the validity is open to question. Not all the scores can be correct.

In fairness, it should be noted than Danielson has not presented his program as a precision instrument. He wrote in the User Manual:

> Don't expect the formulas to give the same readings. They were written at different times using different underlying criteria. They probably will give fairly similar readings most of the time. Taking a mental average of the formulas might not be a bad idea (p. 10).

Going a step further to compare the grade score predictors and the scale score predictors, additional problems were observed. For example, in one story in which Danielson's version of the Flesch Reading Ease formula was applied, the grade score was 8.4, which is considered "more difficult than average." The scale score of 22.6 was considered "very difficult."

The same inconsistency was seen using the Danielson-Bryan formula. The grade score in one release was 9.0, which indicates a "very difficult" readability level. The Danielson-Bryan scale score for the

same release was 34.6, which indicates a "difficult" level of readability.

While Danielson cautioned that differences between the readability levels of the four formulas could be expected, he did not account for the differences between grade score and scale score when using the same formula.

Finally, comparisons of the rank order (based on degree of difficulty) of the grade score predictors and the scale score predictors also revealed some inconsistencies. This discrepancy can be understood best by looking at Table 5 and by referring to Appendix A, Table A-1. (Gunning is not shown because the Danielson program does not produce scale scores using the Gunning formula.)

Table 5. Rank Order of Grade and Scale Score Predictors of One News Release.

Formula	Grade	Rank	Scale	Rank
Flesch	9.0	(1)	10.8	(2)
Farr-Jenkins-Paterson	8.1	(3)	9.6	(1)
Danielson-Bryan	8.7	(2)	38.3	(3)

With regard to the grade scores, the Flesch score of 9.0 indicated the most difficult reading level (1); the Danielson-Bryan grade score of 8.7 was ranked second in degree of difficulty (2); the Farr-

Jenkins-Paterson score of 8.1 indicated the least difficult reading level of the three (3). It follows then that the rank orders of the scale scores should be the same. Such is not the case, however.

The Farr-Jenkins-Paterson scale score of 9.6 indicated the most difficult readability level of the three formulas (1); the Flesch score of 10.8 was ranked second (2) in degree of difficulty; and the Danielson-Bryan scale score of 38.3 was considered the least difficult (3) of the three scale score predictors.

Hence, there was little correlation between scale scores and grade scores.

Findings such as these indicate that there are many discrepancies and inconsistences in the Danielson program. Such deficiencies make it difficult, if not impossible, to place heavy reliance on the precision of Danielson's computerized readability program.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Conclusions of this study were drawn on two levels. Included in this chapter are the general conclusions as presented to the Martin Marietta Energy Systems' public relations staff and the conclusions about the reliability of the Danielson computerized readability program.

General Conclusions from Parts I, II and III of the Martin Marietta Energy Systems' Readability Study (As presented to Martin Marietta Energy Systems' Public Relations Staff)

Part I.

If Martin Marietta Energy Systems' aim was to reach the "average" reader through its news releases, it missed the mark. Based on the mean values of the scores from Danielson's program, both the technical and nontechnical releases were too difficult for the average reader.

Martin Marietta's news releases were more difficult to read than the average material found in pulp fiction, movie magazines, newspapers, Reader's Digest, and intellectual magazines, such as Harper's. There may be room for improvement

of the readability level of Martin Marietta Energy Systems' news releases.

According to Robert Gunning (1968), an acceptable sentence length for "average" readability is 20 words per sentence. Based on Gunning's contention, the average sentence length in the Martin Marietta Energy Systems news releases was too long.

Gunning believes that any written material with a hard-word count of more than 12 percent is too difficult for the average reader. Martin Marietta Energy Systems' technical releases averaged 18.2 percent of words with nine or more letters. The nontechnical releases averaged 17.5 percent of words with nine or more letters. Using Gunning's figure of 12 percent as a benchmark, the percent of difficult words of Martin Marietta Energy Systems' news releases was too high.

Parts II and III. Conclusions from Parts II and III of the study had to be drawn carefully because of the many variables that enter into determining why a news release does or does not run in a particular newspaper. Because investigation into those variables was not part of this study, the number of conclusions presented to the public relations staff was limited.

The researcher should also point out that the purpose of this study was not to determine the accuracy of the content of the newspaper stories where changes were made. Nor did the researcher attempt to determine if newspapers carried the items that were considered most important by Martin Marietta Energy Systems.

Most of Martin Marietta Energy Systems' news releases were not picked up by the Oak Ridger, the Knoxville News-Sentinel, or the Knoxville Journal.

The resulting stories in the three newspapers averaged fewer words per sentence than the Martin Marietta Energy Systems news releases. The Oak Ridger had an average sentence length of 24.4; the Knoxville News-Sentinel averaged 20.4; and the Knoxville Journal averaged 20.3. The news releases from Martin Marietta Energy Systems had an average sentence length of 25.5 words. Using shorter sentences would increase readability and could increase the likelihood of releases being used (see Appendix D, Table D-7).

The resulting stories in the three newspapers averaged fewer words with nine or more letters (complex words) than the Martin Marietta Energy Systems news releases. The average percentage of words with nine or more letters of the stories appearing in the Oak Ridger was 17.5; the Knoxville News-Sentinel was 16.9; and the Knoxville Journal was 14.0. Martin Marietta Energy Systems' news releases contained an average of 18.2 percent of words with nine or more letters. Once again, using fewer complex words, when possible, could increase readability (see Appendix D, Table D-7).

Even though the resulting stories in the Oak Ridger, the Knoxville News-Sentinel and the Knoxville Journal were considered more readable than the Martin Marietta Energy Systems

news releases, the majority of stories were still too difficult for the average reader.

If the number of releases within a category is an indicator of the importance of the information, Martin Marietta Energy Systems must consider the releases about discoveries and developments of utmost importance. By far, most of the technical releases were about discoveries and developments. Yet, the newspapers treated these releases in a relatively unimportant way. (They used a small percentage of the releases about discoveries and developments.) It is possible that shorter sentences and fewer complex words would increase the readability of the releases about discoveries and developments.

Conclusions About the Danielson Computerized Readability Program

From the analysis of the data obtained for this study, it may be concluded that the Danielson program has merit in helping students to gain general readability scores for their writing work.

As evidenced by the conclusions stated in the first section of this chapter, Danielson's program is also a sufficient instrument for analyzing (in a general way) the readability of a corporation's news releases. It produces a number of grade scores and scale scores, suggesting that it can be used to generate rough measures for various kinds of writing, notably news releases as were used in this study. In addition, it is inexpensive ($35), easy to use and efficient.

The obvious inconsistencies of the Danielson program, shown in the analysis of the data, make it an imprecise instrument when exact measures are important. As in the study of the Martin Marietta Energy Systems news releases, however, precision was not an overriding concern. In that case, the Danielson program was employed as a measuring device that would give a rough and relative estimate of the readability of Martin Marietta Energy Systems' news releases. In that respect, the program served its purpose well. It acted as a warning device for the public relations staff. It signaled "caution" with regard to sentence length and word complexity.

Regardless of the problems inherent in the program and despite the fact that the scale scores and grade scores were in disagreement throughout the study, the Danielson program provided a realistic picture of Martin Marietta Energy Systems' news releases: The releases were considered "more difficult than average" or harder by the Danielson program. And based on the two primary criteria (sentence length and word complexity) used in most readability formulas, the releases would have been considered "more difficult than average" or harder by any standard.

It should be clear that in adapting the readability formulas to the personal computer, Danielson made some arbitrary changes that altered the validity of the readability scores. This researcher was able to overlook that problem, however, as the question of validity arises with readability formulas in general.

Schuyler (1982) addressed this question of validity by asking:

> Is one readability formula more valid than the others, or is the concept of reading grade level a spurious one? This is certainly a legitimate question for debate. A conclusion already reached by some educators is that readability formulas "have limited pedagogic usefulness" (Coke and Rothkopf, 1970, p. 209). Discovering the one, true readability formula may be akin to shooting at a moving target. Vocabulary changes along with "approved" sentence structure. Well over 50 readability formulas have been developed, each claiming applicability to special situations or claiming an improvement over all the others (p. 573).

Even advocates of readability formulas point out their limitations and the dangers in using them. The limitations of readability formulas are discussed in many articles. Redish (1982) did a good job of summarizing the limitations as seen in the following:

1. Readability formulas can only be used on prose passages. Charts or illustrations that aid the reader in comprehension are not taken into account.

2. Readability formulas assume that the text is well organized and grammatically correct.

3. Gibberish and nonsense words may indicate high readability but, in actuality, are not easy to understand.

4. Relevance of the content to the audience cannot be measured.

5. Readability formulas reward the writer for reducing the number of words in a sentence. If the writer eliminates "unnecessary verbosity" (p. 47), comprehension is likely to increase. However, shorter sentences, for the sake of being short, may not always be clearer.

6. The formulas do not measure typographic features, which also can affect a reader's comprehension.

Schuyler (1982) said that the formulas cannot measure a reader's level of interest or motivation--two important variables in comprehending written material.

It is obvious from the literature and from the findings of this study that readability formulas (whether in the original forms designed for hand counts or automated for computer) produce some general guidelines for a writer or author. Readability scores do not identify good and bad writing, but instead show how specific material meets or fails to meet several criteria.

All readability formulas in use have drawbacks. For the sake of efficiency, not all factors considered pertinent can be employed if the formula is to be capable of implementation. In short, that means that virtually all formulas are imprecise in some respects.

Danielson, in adapting formulas for his program, further altered the accuracy of these yardsticks because formulas do not lend themselves easily to computer automation. Despite the shortcomings and the imprecise nature of the Danielson computerized readability program, it is an adequate tool for measuring readability when applied to a corporation's news releases.

Recommendations for Further Research

Concluding comments of most readability studies indicate that more work needs to be done. Certainly, with regard to the project

discussed in this thesis, more work, including various statistical tests, could be done to determine precise measures of validity, accuracy and reliability of the Danielson program. However, the purpose of this thesis, as stated in the introduction, was to make some general observations about the strengths and weaknesses of the Danielson computerized readability program. That objective was met, and, in that respect, further research is not indicated.

Using another approach to evaluate the need for additional research, this researcher finds one area that lends itself to further investigation. Part II of the Martin Marietta Energy Systems readability study dealt, in part, with "gatekeeping," focusing on the number, kinds and treatment of the technical news releases by area newspapers. Having included the data from this part of the study, the reseacher believes that the subject of gatekeeping is an area ripe for further investigation.

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APPENDIXES

APPENDIX A

Table A-1. Danielson's Computer-Generated Grade Score and Scale Score Predictors of Technical News Releases.

Identification of the Technical News Releases	Grade Score Predictors				Scale Score Predictors		
	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan	Gunning Fog	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan
HTML Contract	8.9	7.9	8.7	7.6	11.5	15.1	38.2
Intruder	7.0	6.7	6.6	6.1	46.1	39.2	59.3
New Dating Technique	7.7	7.5	7.4	6.7	32.9	23.4	51.1
North Carolina A & T	8.9	7.9	8.5	7.4	11.4	12.7	39.9
Dam Closing	8.1	8.1	7.9	7.0	27.3	12.4	46.3
New ORNL Ion Source	8.4	8.0	8.2	7.2	22.6	15.9	43.0
Symposium	8.7	7.8	8.4	7.3	15.4	16.5	41.3
Rust Workers	7.9	7.3	7.6	7.0	28.2	23.9	49.2
Eminent Astronomer	8.8	8.1	8.6	7.6	17.3	16.2	38.7
Chemistry Conference	8.7	7.0	8.0	7.0	12.7	24.7	45.2
Media Advisory	7.5	7.0	7.0	6.2	36.0	29.0	55.1
Cray Supercomputer	7.9	7.3	7.5	6.4	28.9	24.6	50.2
Acid Rain Study	8.4	7.8	8.1	6.9	20.4	15.6	44.2
Response to Inquiry	8.0	7.9	7.8	7.0	30.7	21.8	46.8
HTML Inauguration	9.3	8.0	9.1	7.8	3.8	12.6	34.4
Alan Guth	9.2	8.9	9.3	8.2	13.8	8.4	32.3
Home Study	7.9	7.4	7.5	6.6	27.8	22.0	50.0
Building Energy	9.0	8.1	8.7	7.6	10.8	9.6	38.3
DOENews Payroll	8.2	7.4	7.7	6.4	22.3	17.7	48.4
Heart Program	7.7	7.1	7.2	6.5	31.3	25.3	52.5
Superconducting Magnet	8.2	7.8	7.9	6.7	24.3	17.6	45.8
DOENews	9.1	8.7	9.0	7.9	9.9	.5	34.6
Academic Outreach	8.7	7.8	8.4	6.9	14.4	14.8	41.5
R & D Magazine	9.0	8.1	8.7	7.7	11.9	10.6	37.6
Deer Tissue	8.3	7.7	8.0	6.9	23.8	19.6	45.4
Sewage Treatment	8.3	7.6	7.9	6.7	21.7	16.1	46.1
Fusion Facility	8.5	8.1	8.3	7.3	20.7	13.3	42.2
Waste Management	10.0	9.5	10.3	8.9	-0.5	-2.0	21.9
Van Thief	8.1	7.6	7.8	6.8	26.7	21.5	47.3
Biotechnology Symposium	9.8	8.1	9.3	7.9	-5.8	6.1	31.7
New York State	9.6	8.8	9.6	7.9	1.5	-1.1	29.5
Cancer Treatment	8.2	7.5	7.7	6.9	23.7	17.3	47.7
Environmental Audits	8.4	7.6	8.0	7.1	21.3	20.4	44.9
Cummins Engine	9.1	8.5	9.0	7.7	8.9	4.5	35.1

Table A-1 (continued)

Identification of the Technical News Releases	Grade Score Predictors				Scale Score Predictors		
	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan	Gunning Fog	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan
Radioactivity (a)	7.8	7.8	7.5	6.8	34.3	19.8	50.1
Radioactivity (a.1)	7.7	7.9	7.5	6.7	35.0	18.0	50.2
Radioactivity (b)	7.9	7.9	7.6	6.7	31.1	12.8	49.4
Radioactivity (b.1)	7.7	7.7	7.4	6.8	33.9	20.2	50.9
Krypton-85	7.6	7.4	7.2	6.2	33.9	21.3	52.9
More Strontium	8.3	8.0	8.0	7.1	24.0	11.0	45.4
Spectrometer	9.1	8.2	8.9	7.8	8.6	9.1	36.0
Rust Engineering	8.2	7.0	7.5	7.1	21.7	25.3	49.8
Car Efficiency	7.7	7.2	7.4	6.4	33.6	28.9	51.4
Licensing Agreement	9.0	8.0	8.6	7.7	10.0	9.7	38.9
Heart Health Screening	7.6	7.1	7.1	6.4	32.1	26.2	53.7
CEUSP	8.6	7.9	8.2	7.1	18.1	13.4	42.6

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table A-2. Danielson's Computer-Generated Grade Score and Scale Score Predictors of Nontechnical Releases.

Identification of the Nontechnical News Releases	Grade Score Predictors				Scale Score Predictors		
	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan	Gunning Fog Index	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan
C. T. Travis	8.0	7.4	7.5	6.5	27.7	21.8	49.6
Pyke Johnson Award	7.8	7.3	7.4	6.4	30.8	24.8	51.2
W. E. Eldridge	7.7	7.4	7.3	6.5	33.0	22.8	52.4
G. W. Evans	7.2	6.9	6.7	6.0	39.2	27.4	57.7
W. E. Porter	8.2	7.5	7.8	7.1	24.2	20.0	46.7
Three New Managers	6.9	6.5	6.3	5.7	44.7	35.1	61.9
R. H. Ritchie	7.8	7.7	7.6	7.0	32.0	20.1	49.5
P. T. Thornton	8.1	7.4	7.6	6.4	24.6	19.8	48.8
T. L. Donaldson	8.6	7.5	8.2	7.5	15.4	18.2	43.1
M. M. Osborne	7.2	6.8	6.7	6.2	41.0	33.0	58.0
R. L. Livesey	7.5	6.9	6.9	6.0	33.4	28.3	55.6
American Phys. Society	7.0	6.9	6.5	5.8	44.7	30.8	59.8
ANS Accomplishment	7.6	7.0	7.2	6.6	35.4	30.7	53.4
C. B. Landguth	8.1	7.1	7.5	6.4	24.4	24.5	49.6
B. G. Eads	8.0	7.2	7.5	6.7	27.7	26.6	49.7
D. E. Ferguson	7.6	7.2	7.3	6.6	34.6	28.3	52.4
J. T. Ensminger	8.6	7.6	8.1	7.2	16.5	17.7	43.6
Dailey and Honea	8.3	7.6	7.9	6.8	22.0	19.5	45.6
D. S. Griffith	8.1	7.2	7.6	6.8	23.5	22.8	49.2
Travis/Getsi	7.7	6.9	7.1	6.7	29.6	27.1	53.7
AAAS Fellows	7.3	6.7	6.8	6.0	38.9	33.4	57.3
C. J. Cromwell	7.7	7.1	7.2	6.2	31.9	24.4	53.5
Lawrence Award	8.3	7.8	8.0	7.1	22.3	14.9	44.8
S. E. Lindberg	8.2	7.5	7.8	6.8	23.8	21.3	46.7
M. L. Emery	7.9	7.5	7.4	6.5	27.7	18.0	51.2
W. Siemens	10.0	8.8	10.0	8.6	-6.0	-0.9	25.0
P. Mazur	8.1	7.8	7.8	6.9	28.2	18.1	47.3
J. H. Greene	7.3	6.7	6.7	6.0	36.3	31.1	57.6
T. Hylton	8.1	7.5	7.5	7.0	23.4	15.6	49.8

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table A-3. Readibility Predictors for Technical Releases.

News Release Identification	No. of words in text	Percent of words with 4 or fewer letters	Percent of words with 9 or more letters	No. of sentences	Characters per word	Words per sentence	Average grade score predictor*	Average scale score predictor
HTML Contract	372	46	22	14	6.0	26.6	8.5	21.6
Intruder	130	58	11	6	4.9	21.7	6.8	48.2
New Dating Technique	641	50	15	26	5.3	24.7	7.5	35.8
North Carolina A & T	362	43	23	15	6.1	24.1	8.4	21.3
Dam Closing	166	45	15	6	5.4	27.7	8.0	28.7
New ORNL Ion Source	550	48	16	19	5.5	28.9	8.2	25.9
Symposium	252	46	21	10	5.9	25.2	8.3	24.4
Rust Workers	113	49	20	5	5.5	22.6	7.6	33.8
Eminent Astronomer	254	50	18	8	5.6	31.8	8.5	24.1
Chemistry Conference	290	46	25	17	6.3	17.1	7.9	27.5
Media Advisory	364	50	15	19	5.4	19.2	7.2	40.0
Cray Supercomputer	373	49	14	17	5.5	21.9	7.6	34.6
Acid Rain Study	905	45	17	37	5.7	24.5	8.1	26.7
Response to Inquiry	465	53	12	15	5.1	31.0	7.9	33.1
HTML Inauguration	362	44	25	14	6.3	25.9	8.8	16.9
Alan Guth	287	51	16	7	5.4	41.0	9.1	18.2
Home Study	619	47	17	29	5.6	21.3	7.6	33.3
Building Energy	333	42	23	13	6.0	25.6	8.6	19.6
DOENews Payroll	270	43	17	14	5.9	29.3	7.8	29.5
Heart Program	412	48	17	21	5.5	19.6	7.3	36.4
Superconducting Magnet	666	47	14	26	5.6	25.6	8.0	29.2
DOENews	346	40	21	11	5.9	31.5	8.9	15.0
Academic Outreach	593	44	18	25	6.0	23.7	8.3	23.6
R & D Magazine	306	44	22	11	5.9	27.8	8.6	20.0
Deer Tissue	506	48	16	20	5.6	25.3	8.0	29.6
Sewage Treatment	336	44	17	15	5.8	22.4	7.9	28.0
Fusion Facility	510	46	18	18	5.6	28.3	8.3	25.4
Waste Management	304	46	21	7	5.8	43.4	9.9	6.8
Van Thief	299	49	16	12	5.5	24.9	7.8	31.8
Biotechnology Symposium	296	38	29	13	6.7	22.8	9.1	10.7
New York State	409	39	21	13	6.2	31.5	9.3	10.0
Cancer Treatment	616	44	20	29	5.8	21.2	7.8	29.6
Environmental Audits	342	48	19	14	5.7	24.4	8.0	28.9
Cummins Engine	408	41	21	14	6.0	29.9	8.9	16.2

Table A-3 (continued)

News Release Identification	No. of words in text	Percent of words with 4 or fewer letters	Percent of words with 9 or more letters	No. of sentences	Characters per word	Words per sentence	Average grade score predictor*	Average scale score predictor
Radioactivity (a)	226	50	13	8	5.1	28.3	7.7	34.7
Radioactivity (a.1)	313	49	12	11	5.1	28.5	7.7	34.4
Radioactivity (b)	226	44	13	8	5.1	28.3	7.8	31.1
Radioactivity (b.1)	131	49	15	5	5.2	26.2	7.6	35.0
Krypton-85	154	47	12	7	5.3	22.0	7.4	36.0
More Strontium	259	43	18	10	5.6	25.9	8.1	26.8
Spectrometer	555	43	23	20	6.0	27.8	8.7	17.9
Rust Engineering	99	46	26	6	6.0	16.5	7.6	32.3
Car Efficiency	456	53	12	19	5.3	24.0	7.4	38.0
Licensing Agreement	407	41	26	17	6.1	23.9	8.5	19.5
Heart Health Screening	394	48	17	21	5.5	18.8	7.3	37.3
CEUSP	601	44	19	24	5.8	25.0	8.2	24.7

*Average grade score predictor does not include the estimated Gunning Fog Index.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table A-4. Readibility Predictors for Nontechnical Releases.

	No. of words in text	Percent of words with 4 or fewer letters	Percent of words with 9 or more letters	No. of sentences	Characters per word	Words per sentence	Average grade score predictor*	Average scale score predictor
C. T. Travis	215	47	16	10	5.6	21.5	7.6	33.0
Pyke Johnson Award	391	49	15	18	5.5	21.7	7.5	35.6
W. E. Eldridge	107	48	15	10	5.4	22.1	7.5	36.1
G. W. Evans	299	48	14	17	5.3	17.6	6.9	41.4
W. E. Porter	256	47	20	11	5.7	23.3	7.8	30.3
Three New Managers	428	51	14	29	5.2	14.8	6.6	42.2
R. H. Ritchie	422	49	16	16	5.3	26.4	7.7	33.9
P. T. Thornton	163	45	16	8	5.7	20.4	7.7	31.1
T. L. Donaldson	219	45	26	10	6.0	21.9	8.1	25.6
M. M. Osborne	110	52	15	6	5.2	18.3	6.9	44.0
R. L. Livesey	200	48	15	12	5.6	16.7	7.1	39.1
American Physical Society	454	51	11	24	5.1	18.9	6.8	45.1
ANS Accomplishment	422	53	16	19	5.3	22.2	7.3	39.8
C. B. Landguth	245	47	17	13	5.8	18.8	7.6	32.8
B. G. Eads	215	50	18	10	5.6	21.5	7.6	34.7
D. E. Ferguson	299	52	15	13	5.3	23.0	7.4	38.4
J. T. Ensminger	202	45	22	9	5.9	22.4	8.1	35.9
Dailey and Honea	404	47	17	17	5.7	23.8	7.9	29.0
D. S. Griffith	208	46	21	11	5.8	18.9	7.6	31.8
Travis/Getsi	326	47	22	20	5.7	16.3	7.2	36.8
AAAS Fellows	789	52	14	44	5.3	17.9	6.9	43.2
C. J. Cromwell	171	47	15	9	5.5	19.0	7.3	36.6
Lawrence Award	930	45	19	37	5.7	25.1	8.0	27.3
S. E. Lindberg	236	48	17	10	5.6	23.6	7.8	30.6
M. L. Emery	133	43	18	7	5.7	19.0	7.6	32.3
W. Siemens	407	39	28	13	6.4	31.3	9.6	6.0
P. Mazur	455	48	15	17	5.4	26.8	7.9	31.2
J. H. Greene	124	49	16	8	5.5	15.5	6.9	41.7
T. Hylton	109	41	24	6	5.9	18.2	7.7	29.6

*Average grade score predictor does not include the estimated Gunning Fog Index.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

APPENDIX B

Table B-1. Comparison of Readability Principles of Technical and Nontechnical Releases.

Principles	Technical	Nontechnical
Words per sentence	25.5	20.9
Percent of words with 9 or more letters	18.2	17.5

The above figures are the mean values of 46 Technical Releases and 29 Nontechnical Releases.

APPENDIX C

Table C-1. Breakdown of Grade Score Predictors of Technical News Releases by Readability Formulas.

Grade Scores and Interpretations	Readability Formula							
	Flesch		Farr-Jenkins-Paterson		Danielson-Bryan		Gunning Fog	
	n*	col %**	n*	col %**	n*	col %**	n*	col %**
9.5-10.0 Extremely Difficult	3	6.5	1	2.2	2	4.3	-	-
8.5-9.4 Very Difficult	16	34.8	4	8.7	12	26.1	1	2.2
7.5-8.4 Difficult	26	56.5	29	63.0	24	52.2	11	23.9
6.5-7.4 More Difficult Than Average	1	2.2	12	26.1	8	17.4	27	58.7
5.5-6.4 Average	-	-	-	-	-	-	7	15.2

*Total n for each column = 46.
**Column percent may not equal 100 because of rounding error.
Note: Refer to Table 4 on page 16 for interpretation of grade score predictors and scale score predictors.

Table C-2. Breakdown of Scale Score Predictors of Technical News Releases by Readability Formulas.

Scale Scores and Interpretations	Readability Formula					
	Flesch		Farr-Jenkins-Paterson		Danielson-Bryan	
	n*	col %**	n*	col %**	n*	col %**
Extremely Difficult (0-19)	18	39.1	30	65.2	-	-
Very Difficult (20-29)	16	34.8	15	32.6	2	4.3
Difficult (30-39)	11	23.9	1	2.2	12	26.1
More Difficult Than Average (40-49)	1	2.2	-	-	20	43.5
Average (50-59)	-	-	-	-	12	26.1

*Total for each column = 46
**Column percents may not equal 100 because of rounding error
Note: Refer to Table 4 on page 16 for interpretation of grade score predictors and scale score predictors.

Table C-3. Breakdown of Grade Score Predictors of Nontechnical News Releases by Readability Formulas.

Grade Scores and Interpretations	Readability Formula							
	Flesch		Farr-Jenkins-Paterson		Danielson-Bryan		Gunning Fog	
	n*	col %**	n*	col%**	n*	col %**	n*	col %**
9.5-10 Extremely Difficult	1	3.4	-	-	1	3.4	-	-
8.5-9.4 Very Difficult	2	6.9	1	3.4	-	-	1	3.4
7.5-8.4 Difficult	20	69.0	10	34.5	14	48.3	1	3.4
6.5-7.4 More Difficult Than Average	6	20.7	18	62.1	13	44.8	16	55.2
5.5-6.4 Average	-	-	-	-	1	3.4	11	37.9

*Total n for each column = 29.
**Column percent may not equal 100 because of rounding error.
Note: Refer to Table 4 on page 16 for interpretation of grade score predictors and scale score predictors.

Table C-4. Breakdown of Scale Score Predictors of Nontechnical News Releases by Readability Formulas.

Scale Scores and Interpretations	Readability Formula					
	Flesch		Farr-Jenkins-Paterson		Danielson-Bryan	
	n*	col %**	n*	col %**	n*	col %**
Extremely Difficult (0-19)	3	10.3	7	24.1	-	-
Very Difficult (20-29)	12	41.4	16	55.2	1	3.5
Difficult (30-39)	11	37.9	6	20.7	-	-
More Difficult Than Average (40-49)	3	10.3	-	-	9	31.0
Average (50-59)	-	-	-	-	2	6.9
Easier Than Average (60-69)	-	-	-	-	2	6.9

*Total for each column = 29
**Column percents may not equal 100 because of rounding error
Note: Refer to Table 4 on page 16 for interpretation of grade score predictors and scale score predictors.

APPENDIX D

Table D-1. Breakdown of Martin Marietta Energy Systems' News Releases That Appeared in Newspapers.

Newspaper	Number of Releases Used for Stories	Percent of Total Number of Technical News Releases
Oak Ridger	22*	47.8%
Knoxville News-Sentinel	12	26.1%
Knoxville Journal	13	28.3%

*Of the 22 news releases picked up by the Oak Ridger, six appeared in the paper exactly as they were sent out.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table D-2. Readability Predictors of Resulting Newspaper Stories That Appeared in the Oak Ridger.

News Release Identification	Percent of words with 9 or more letters	Words per sentence	Grade Score Predictors				Scale Score Predictors		
			Flesch	Farr-Jenkins-Paterson	Danielson-Bryan	Gunning Fog Index	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan
HTML Contract	20	20.3	8.2	7.2	7.7	6.8	22.9	24.6	48.0
Intruder	15	21.5	7.5	7.0	7.1	6.4	36.1	29.8	54.2
New Dating Technique	15	24.7	7.7	7.5	7.4	6.7	32.9	23.4	51.1
Dam Closing	25	34.8	8.2	8.0	8.1	7.5	29.4	22.7	44.3
Symposium	21	25.2	8.7	7.8	8.4	7.3	15.4	16.5	41.3
Rust Workers	19	24.0	8.0	7.3	7.6	7.0	28.5	27.3	48.8
Eminent Astronomer	18	31.8	8.8	8.1	8.6	7.6	17.3	16.2	38.7
Chemistry Conference	25	17.1	8.7	7.0	8.0	7.0	12.7	24.7	45.2
Media Advisory	15	19.2	7.5	7.0	7.0	6.2	36.0	29.0	55.1
Acid Rain Study	15	25.0	8.0	7.6	7.6	6.7	29.2	21.5	48.9
HTML Inauguration	16	24.2	8.0	7.4	7.7	6.8	27.5	25.5	48.3
Alan Guth	16	41.0	9.2	8.9	9.3	8.2	13.8	8.4	32.3
Heart Program	17	19.6	7.7	7.1	7.2	6.5	31.3	25.3	52.5
Deer Tissue	15	24.0	8.2	7.5	7.8	6.6	24.3	20.9	46.6
Fusion Facility	18	28.4	8.4	8.1	8.2	7.3	22.4	13.3	43.2
Cummins Engine	15	23.6	7.7	7.3	7.3	6.6	33.9	26.0	51.8

Table D-2 (continued)

News Release Identification	Percent of words with 9 or more letters	Words per sentence	Grade Score Predictors				Scale Score Predictors		
			Flesch	Farr-Jenkins-Paterson	Danielson-Bryan	Gunning Fog Index	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan
Radioactivity (a)	15	22.3	7.3	7.3	6.9	6.5	40.3	25.8	55.8
Radioactivity (b)	15	20.6	7.3	7.3	6.9	6.3	38.7	22.7	55.8
Krypton-85	14	20.2	7.5	7.0	7.0	6.2	35.7	29.5	54.6
More Strontium	14	21.7	7.2	7.2	6.8	6.3	41.8	26.4	57.0
Rust Engineering	24	19.5	8.3	7.2	7.7	7.1	21.2	23.8	47.6
Licensing Agreement	18	23.9	8.0	7.4	7.6	6.9	28.2	23.0	49.1

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table D-3. Readability Predictors of Resulting Newspaper Stories That Appeared in the Knoxville News-Sentinel.

News Release Identification	Percent of words with 9 or more letters	Words per sentence	Grade Score Predictors				Scale Score Predictors		
			Flesch	Farr-Jenkins-Paterson	Danielson-Bryan	Gunning Fog Index	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan
HTML Contract	21	15.7	8.0	7.1	7.4	6.5	23.4	21.3	51.2
Rust Workers	18	18.8	7.3	6.6	6.8	6.5	38.9	37.4	57.0
Acid Rain Study	13	18.1	7.0	6.6	6.6	5.9	43.0	36.5	59.2
Waste Management	13	22.4	7.4	7.3	7.0	6.3	38.5	25.7	55.0
Van Thief	19	19.5	7.4	6.8	6.9	6.6	37.3	33.4	55.7
Cummins Engine	21	19.7	7.9	7.2	7.5	6.9	27.0	23.6	50.4
Radioactivity (a)	12	21.8	7.3	7.3	7.0	6.2	38.5	22.5	55.9
Radioactivity (b)	13	20.8	7.4	7.3	6.9	6.2	39.2	23.1	55.4
Krypton-85	16	24.0	7.7	7.3	7.4	6.7	32.7	27.3	51.1
More Strontium	14	21.6	7.4	7.2	7.0	6.3	38.5	26.5	55.3
Rust Engineering	20	19.3	7.9	7.1	7.4	6.7	28.2	25.7	51.4
Licensing Agreement	23	23.1	8.3	7.5	7.9	7.4	21.8	20.2	45.8

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table D-4. Readability Predictors of Resulting Newspaper Stories That Appeared in the Knoxville Journal.

News Release Identification	Percent of words with 9 or more letters	Words per sentence	Grade Score Predictors				Scale Score Predictors		
			Flesch	Farr-Jenkins-Paterson	Danielson-Bryan	Gunning Fog Index	Flesch	Farr-Jenkins-Paterson	Danielson-Bryan
Intruder	14	23.0	7.1	7.1	6.7	6.5	44.7	29.9	58.1
Dam Closing	14	17.8	6.9	6.6	6.4	6.0	45.0	36.8	60.6
Acid Rain Study	12	23.9	7.4	7.1	7.1	6.3	38.8	32.2	54.3
Sewage Treatment	16	14.6	7.6	7.0	6.9	5.9	31.3	22.4	55.5
Waste Management	14	21.9	7.4	7.0	7.1	6.4	37.4	31.0	54.4
Van Thief	12	19.2	7.2	6.8	6.7	6.0	41.0	32.2	57.6
Cancer Treatment	18	20.3	7.8	7.4	7.3	6.6	30.5	19.8	51.8
Cummins Engine	18	21.9	7.9	7.2	7.4	6.8	29.8	27.8	50.6
Radioactivity (a)	12	22.1	7.5	7.4	7.1	6.2	37.2	22.8	54.4
More Strontium	12	19.1	7.0	7.0	6.6	5.9	43.7	29.1	59.0
Rust Engineering	14	19.0	7.5	7.1	7.0	6.1	35.3	24.4	55.1
Car Efficiency	8	19.8	6.9	6.6	6.5	5.6	47.1	39.5	60.5
Licensing Agreement	18	21.8	7.5	7.1	7.1	6.8	35.8	29.5	53.6

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table D-5. Comparison of Readability Levels of the Martin Marietta Energy Systems News Releases and the Resulting Stories in the Oak Ridger, the Knoxville News-Sentinel and the Knoxville Journal.

	Grade Score Predictors (Averages)				Scale Score Predictors (Averages)			
News Release Identification	Martin Marietta News Release	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal	Martin Marietta News Release	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
HTML Contract	8.5	7.7	7.5		21.6	31.8	32.0	
Intruder	6.8	7.2		7.0	48.2	40.0		44.2
New Dating Technique*	7.5	7.5			35.8	35.8		
North Carolina A & T	8.4				21.3			
Dam Closing	8.0	8.1		6.6	28.7	32.1		47.5
New ORNL Ion Source	8.2				25.9			
Symposium*	8.3	8.3			24.4	24.4		
Rust Workers	7.6	7.6	6.9		33.8	34.8	44.4	
Eminent Astronomer*	8.5	8.5			24.1	24.1		
Chemistry Conference*	7.9	7.9			27.5	27.5		
Media Advisory	7.2				40.0			
Cray Supercomputer	7.6				34.6			
Acid Rain Study	8.1	7.7	6.7	7.2	26.7	33.2	46.2	41.8
Response to Inquiry	7.9				33.1			
HTML Inauguration	8.8	7.7			16.9	33.8		
Alan Guth*	9.1	9.1			18.2	18.2		
Home Study	7.6				33.3			

Table D-5 (continued)

News Release Identification	Grade Score Predictors (Avergaes)				Scale Score Predictors (Averages)			
	Martin Marietta News Release	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal	Martin Marietta News Release	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Building Energy	8.6				19.6			
DOENEWS Payroll	7.8				29.5			
Heart Program *	7.3	7.3			36.4	36.4		
Superconducting Magnet	8.0				29.2			
DOENEWS	8.9				15.0			
Academic Outreach	8.3				23.6			
R & D Magazine	8.6				20.0			
Deer Tissue	8.0	7.8			29.6	30.6		
Sewage Treatment	7.9			7.2	28.0			36.4
Fusion Facility	8.3	8.2			25.4	26.3		
Waste Management	9.9		7.2	7.2	6.8		39.7	40.9
Van Thief	7.8	6.7	7.0	6.9	31.8	45.0	42.1	43.6
Biotechnology Symposium	9.1				10.7			
New York State	9.3				10.0			
Cancer Treatment	7.8			7.5	29.6			34.0
Environmental Audits	8.0				28.9			
Cummins Engine	8.9	7.4	7.5	7.5	16.2	37.2	33.7	36.1

Table D-5 (continued)

News Release Identification	Grade Score Predictors (Averages)				Scale Score Predictors (Averages)			
	Martin Marietta News Release	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal	Martin Marietta News Release	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Radioactivity (a)	7.7	7.2	7.2	7.3	34.7	40.6	39.2	38.1
Radioactivity (a.1)	7.7				34.4			
Radioactivity (b)	7.8	7.2	7.2		31.1	39.1	40.0	
Radioactivity (b.1)	7.6				35.0			
Krypton-85	7.4	7.2	7.5		36.0	40.0	37.0	
More Strontium	8.1	7.1	7.2	6.9	26.8	41.7	40.1	43.9
Spectrometer	8.7				17.9			
Rust Engineering	7.6	7.7	7.5	7.2	32.3	30.9	35.1	38.3
Car Efficiency	7.4			6.7	38.0			49.0
Licensing Agreement	8.5	7.7	7.9	7.2	19.5	33.4	29.3	39.6
Heart Health Screening	7.3				37.3			
CEUSP	8.2				24.7			

*Indicates the article that appeared in the Oak Ridger was the same as the Martin Marietta Energy Systems news release.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table D-6. Predictors of Martin Marietta Energy Systems' News Releases Compared with Predictors of the Resulting Newspaper Stories.

Identification of Written Material	Flesch		F J P		D-B		Gunning	
	Grade Score	Scale Score	Grade score	Scale Score	Grade Score	Scale Score	Grade Score	Scale Score
Martin Marietta News Release	8.4	21.1	7.7	16.6	8.1	44.1	7.1	
Oak Ridger	8.0	28.2	7.5	23.0	7.6	48.6	6.8	
Knoxville News-Sentinel	7.6	33.9	7.1	26.9	7.2	53.6	6.5	
Knoxville Journal	7.4	38.3	7.0	29.0	6.9	55.8	6.2	

Above figures are the mean values of score predictors of 46 technical news releases from Martin Marietta Energy Systems, 22 stories that appeared in the Oak Ridger, 12 stories that appeared in the Knoxville News-Sentinel, and 13 stories that appeared in the Knoxville Journal.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table D-7. Comparison of Readability Principles of Martin Marietta Energy Systems' Technical News Releases and the Resulting Newspaper Stories.

Identification of Written Material	Words per Sentence (Average)	Percent of words with 9 or more letters (Average)
Martin Marietta Energy Systems' Technical News Releases	25.5	18.2
Oak Ridger	24.2	17.5
Knoxville News-Sentinel	20.4	16.9
Knoxville Journal	20.3	14.0

APPENDIX E

Martin Marietta Energy Systems	# of Releases	% of 46 Technical Releases
Discoveries/Developments	23	50%
Mishaps	12	26%
Environmental Issues	5	11%
Programs/Events for Public	6	13%

The Oak Ridger	# of Stories	% of 22 Stories Picked Up From News Releases	% of the News Releases in Specified Subcategory
Discoveries/Developments	9	41%	39%
Mishaps	9	41%	75%
Environmental Issues	0	0%	0%
Programs/Events for Public	4	18%	67%

Knoxville News-Sentinel	# of Stories	% of 12 Stories Picked Up From News Releases	% of the News Releases in Specified Subcategory
Discoveries/Developments	4	33.3%	17%
Mishaps	7	58.3%	58%
Environmental Issues	1	8.3%	20%
Programs/Events for Public	0	0 %	0%

Knoxville Journal	# of Stories	% of 13 Stories Picked Up From News Releases	% of the News Releases in Specified Subcategory
Discoveries/Developments	5	38.5%	22%
Mishaps	6	46.2%	50%
Environmental Issues	2	15.3%	33%
Programs/Events for Public	0	0 %	0%

Figure E-1. A Breakdown of News Release Coverage (by Subcategories) by the Martin Marietta Energy Systems Public Relations Department, the Oak Ridger, the Knoxville News-Sentinel and the Knoxville Journal.

DISCOVERIES/DEVELOPMENTS

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	8.5	8.0	7.8	7.5
Farr-Jenkins-Paterson	7.8	7.4	7.1	7.1
Danielson-Bryan	8.2	7.6	7.4	7.1
Gunning Fog Index	7.1	6.8	6.7	6.4

MISHAPS

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	7.8	7.6	7.5	7.2
Farr-Jenkins-Paterson	7.5	7.2	7.1	7.0
Danielson-Bryan	7.5	7.2	7.0	6.8
Gunning Fog Index	6.7	6.6	6.5	6.1

ENVIRONMENTAL ISSUES

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	8.8		7.4	7.6
Farr-Jenkins-Paterson	8.3		7.3	7.0
Danielson-Bryan	8.6		7.0	7.0
Gunning Fog Index	7.5		6.3	6.2

Figure E-2. Comparison of Grade Score Predictors of Martin Marietta Energy Systems' News Releases and Resulting Newspaper Stories After Subcategorization.

PROGRAMS/EVENTS FOR PUBLIC

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	9.0	8.8		
Farr-Jenkins-Paterson	8.0	8.0		
Danielson-Bryan	8.7	8.6		
Gunning Fog Index	7.6	7.5		

This comparison is based on mean values of Flesh, Farr-Jenkins-Paterson, Danielson-Bryan and Gunning Fog Grade Score Predictors.

Figure E-2 (continued)

DISCOVERIES/DEVELOPMENTS

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	19.3	28.1	28.8	36.4
Farr-Jenkins-Paterson	16.0	22.6	25.4	29.8
Danielson-Bryan	43.4	48.8	51.6	54.2

MISHAPS

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	31.5	34.2	36.2	41.2
Farr-Jenkins-Paterson	22.0	26.3	28.0	29.2
Danielson-Bryan	50.5	52.6	54.5	57.5

ENVIRONMENTAL ISSUES

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	16.6		38.5	34.4
Farr-Jenkins-Paterson	11.4		25.7	26.7
Danielson-Bryan	38.9		55.0	55.0

PROGRAMS/EVENTS FOR PUBLIC

Formula	Martin Marietta News Releases	Oak Ridger	Knoxville News-Sentinel	Knoxville Journal
Flesch	10.7	14.8		
Farr-Jenkins-Paterson	13.6	16.4		
Danielson-Bryan	37.9	39.4		

This comparison is based on mean values of Flesch, Farr-Jenkins-Paterson and Danielson-Bryan Scale Score Predictors.

Figure E-3. Comparison of Scale Score Predictors of Martin Marietta Energy Systems' Technical News Releases and Resulting Newspaper Stories After Subcategorization.

Table E-1. Mean Values of Grade Score Predictors and Scale Score Predictors of the 46 Technical News Releases from Martin Marietta (by Subcategory).

Subcategory	Martin Marietta News Releases		Oak Ridger		Knoxville News-Sentinel		Knoxville Journal	
	Grade Score	Scale Score	Grade Score	Scale Score	Grade Score	Scale Score	Grade Score	Scale Score
Discoveries/Developments	8.2	26.2	7.4	33.2	7.2	35.3	7.0	40.1
Mishaps	7.6	34.7	7.2	37.7	7.0	39.6	6.8	42.6
Environmental Issues	8.6	22.3			7.0	39.7	7.0	38.7
Programs/Events for Public	8.6	20.7	8.2	23.5				

Mean values of the grade score predictors and the scale score predictors are determined by averaging the results of the Flesch Reading Ease Formula, the Farr-Jenkins-Paterson Formula and the Danielson-Bryan Formula.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table E-2. Grade Score Predictors of Oak Ridger Stories That Stemmed from Martin Marietta Energy Systems' News Releases (by Subcategories).

	Grade Score
Discoveries/Developments	
Newspaper Story	
Fusion Facility	8.2
Deer Tissue	7.8
HTML Inauguration	7.7
Acid Rain Study	7.7
HTML Contract	7.7
Licensing Agreement	7.7
New Dating Technique	7.5
Cummins Engine	7.4
Heart Program	7.3
Mean	7.7
Mishaps	
Newspaper Story	
Dam Closing	8.1
Rust Engineering	7.7
Rust Workers	7.6
Intruder	7.2
Radioactivity (a)	7.2
Radioactivity (b)	7.2
Krypton-85	7.2
More Strontium	7.1
Van Thief	6.7
Mean	7.3
Programs/Events for Public	
Newspaper Story	
Alan Guth	9.1
Eminent Astronomer	8.5
Symposium	8.3
Chemistry Conference	7.9
Mean	8.5

For Environmental Issues, no releases were picked up by the Oak Ridger in this subcategory.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table E-3. Scale Score Predictors of Oak Ridger Stories That Stemmed from Martin Marietta Energy Systems' News Releases (by Subcategories).

	Scale Score
Discoveries/Developments	
Newspaper Story	
Fusion Facility	26.3
Deer Tissue	30.6
HTML Contract	31.8
Acid Rain Study	33.2
Licensing Agreement	33.4
HTML Inauguration	33.8
New Dating Technique	35.8
Heart Program	36.4
Cummins Engine	37.2
Mean	33.2
Mishaps	
Newspaper Story	
Rust Engineering	30.9
Dam Closing	32.1
Rust Workers	34.8
Radioactivity (b)	39.1
Intruder	40.0
Krypton-85	40.0
Radioactivity (a)	40.6
More Strontium	41.7
Van Thief	45.0
Mean	38.2
Programs/Events for Public	
Newspaper Story	
Alan Guth	18.2
Eminent Astronomer	24.1
Symposium	24.4
Chemistry Conference	27.5
Mean	23.6

For Environmental Issues, no releases were picked up by the Oak Ridger in this subcategory.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table E-4. Grade Score Predictors of Knoxville News-Sentinel Stories That Stemmed from Martin Marietta Energy Systems' News Releases (by Subcategories).

	Grade Score
Discoveries/Developments	
Newspaper Story	
Licensing Agreement	7.9
HTML Contract	7.5
Cummins Engine	7.5
Acid Rain Study	6.7
Mean	7.4
Mishaps	
Newspaper Story	
Krypton-85	7.5
Rust Engineering	7.5
Radioactivity (a)	7.2
Radioactivity (b)	7.2
More Strontium	7.2
Van Thief	7.0
Rust Workers	6.9
Mean	7.2
Environmental Issues	
Newspaper Story	
Waste Management	7.4

For Programs/Events for Public, no releases were picked up by the Knoxville News-Sentinel in this subcategory.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table E-5. Scale Score Predictors of Knoxville News-Sentinel Stories That Stemmed from Martin Marietta Energy Systems' News Releases (by Subcategories).

	Scale Score
Discoveries/Developments	
Newspaper Story	
Licensing Agreement	29.3
HTML Contract	32.0
Cummins Engine	33.7
Acid Rain Study	46.2
Mean	35.3
Mishaps	
Newspaper Story	
Rust Engineering	35.1
Krypton-85	37.0
Radioactivity (a)	39.2
Radioactivity (b)	40.0
More Strontium	40.1
Van Thief	42.1
Rust Workers	44.4
Mean	39.7
Environmental Issues	
Newspaper Story	
Waste Management	39.7

For Programs/Events for Public, no releases were picked up by the Knoxville News-Sentinel in this subcategory.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table E-6. Grade Score Predictors of Knoxville Journal Stories That Stemmed from Martin Marietta Energy Systems' News Releases (by Subcategories).

	Grade Score
Discoveries/Developments	
Newspaper Story	
Cancer Treatment	7.5
Cummins Engine	7.5
Licensing Agreement	7.2
Acid Rain Study	7.2
Car Efficiency	6.7
Mean	7.2
Mishaps	
Newspaper Story	
Radioactivity (a)	7.3
Rust Engineering	7.2
Intruder	7.0
More Strontium	6.9
Van Thief	6.9
Dam Closing	6.6
Mean	7.0
Environmental Issues	
Newspaper Story	
Waste Management	7.2
Sewage Treatment	7.2
Mean	7.2

For Programs/Events for Public, no releases were picked up by the Knoxville Journal in this subcategory.

Note: Refer to Table 4 on page 16 for interpretations of grade score predictors and scale score predictors.

Table E-7. Scale Score Predictors of Knoxville Journal Stories That Stemmed from Martin Marietta Energy Systems' News Releases (by Subcategories).

	Scale Score
Discoveries/Developments	
Newspaper Story	
Cancer Treatment	34.0
Cummins Engine	36.1
Licensing Agreement	39.6
Acid Rain Study	41.8
Car Efficiency	49.0
Mean	40.1
Mishaps	
Newspaper Story	
Radioactivity (a)	38.1
Rust Engineering	38.3
Van Thief	43.6
More Strontium	43.9
Intruder	44.2
Dam Closing	47.5
Mean	42.6
Environmental Issues	
Newspaper Story	
Sewage Treatment	36.4
Waste Management	40.9
Mean	38.7

For Programs/Events for Public, no releases were picked up by the Knoxville Journal in this subcategory.

Note: Refer to Table 4 on page 16 for interpretation of grade score predictors and scale score predictors.

APPENDIX F

Table F-1. A Comparison of Danielson's Computer Counts with Hand Counts Using the Gunning Formula.

News Release Identification	Number of Words		Number of Sentences		Number of Complex Words		Percentage of Complex Words		Words per Sentence		Gunning Fog Index	
	Hand Count	Cmptr Count	Hand Count	Cmptr Count	Hand Count	Cmptr Count	Hand Count	Cmptr Count	Hand Count	Cmptr Count	Hand Count	Cmptr Count
HTML Contract	388	372	144	14	82	82	21.1	22	27.7	26.6	19.5	7.6
Intruder	130	130	6	6	23	15	17.7	11	21.6	21.7	15.7	6.1
New Dating Technique	641	641	26	26	115	102	17.9	15	24.6	24.7	17	6.7
North Carolina A & T	358	362	15	15	90	84	25.1	23	23.8	24.1	19.7	7.4
Dam Closing	169	166	6	6	23	25	13.6	15	28.2	27.7	16.7	7.0
New ORNL Ion Source	534	550	19	19	127	89	23.8	18	28.1	26.0	20.8	7.1
Symposium	254	252	10	10	50	55	19.7	21	25.4	25.2	18.0	7.3
Rust Workers	114	113	5	5	27	23	23.7	20	22.8	22.6	18.6	7.0
Eminent Astronomer	246	254	8	8	29	48	11.8	18	30.8	31.8	17.0	7.6

VITA

Mary Kathryn McSpadden was born in Maryville, Tennessee on February 17, 1957. At the age of two, she moved with her family to Knoxville, Tennessee, where she attended public schools. She graduated from West High School in 1975, and, during the fall of that year, she entered The University of Tennessee, Knoxville. In March 1980, she received the Bachelor of Science degree in Education.

She began her teaching career in September 1980 as a first grade teacher in the Knoxville City School System. During her fourth and final year of teaching, she was selected as the Outstanding Teacher in the Knoxville City Schools by the Knoxville Rotary Club. In the fall of 1984, she returned to The University of Tennessee to pursue a master's degree in communications.

During graduate school, she participated in IBM Corporation's Marketing Sales Assistant program, a program designed for full-time college students. Following a two-year stay at IBM, she served as an intern at Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee. There she conducted a readability study of the public relations department's news releases, which laid the groundwork for her thesis.

The author has accepted a position as an Education Instruction Specialist and will serve as an independent consultant for IBM Corporation's Educational Business Unit.