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User-Programmer Dialogue: Guidelines for Designing Menus and Help Files for Interactive Computer Systems

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USER-PROGRAMMER DIALOGUE:
GUIDELINES FOR DESIGNING MENUS AND HELP FILES FOR INTERACTIVE COMPUTER SYSTEMS

by

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ABSTRACT

This document is a set of guidelines to aid a programmer in making the various decisions necessary for a clear user-programmer dialogue. Its goal is to promote an effective and efficient transfer of information between programmer and user. These guidelines are divided into four sections: (1) Format, (2) Sequence, (3) Audience, and (4) Aim.

Format, in terms of this study, means the spatial and structural presentation of information. In short, this section deals with formal aspects of organization and examines the issues of eye span and information processing, routine placement of information on the CRT screen, and meaningful use of blank space in panel displays.

Although the first section covers the formal qualities of a panel display, in practice--except for menus--panels appear most often in series. Sequence deals with the procedural aspects of multiple panel displays. This section looks at the issues of timeliness of presentation, modularization of information, and patterns of user behavior.

The persons to whom a message is addressed--the audience--are not passive receivers. When they decode the message, they create meaning. Audience looks at the relationship among "programmer," "user " and "message." It covers the issues of analyzing the audience's knowledge, attitudes, and needs, anticipating the audience's inferences, and identifying textual ambiguities.

The person who sends the message determines many more things about the communication than just the content. The programmer's aim or intention shows up in everything from tone to format. Aim considers the programmer's purpose and covers issues of persona/voice, tone/style, and reader based prose.

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USER-PROGRAMMER DIALOGUE: GUIDELINES FOR DESIGNING MENUS AND HELP FILES FOR INTERACTIVE COMPUTER SYSTEMS

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INTRODUCTION

Increasingly, one hears about "user-friendly" computers. This new awareness in modeling procedures for the user, particularly for the novice user, comes about for many reasons. The diversification of the user pool, the rapid expansion of the small business and home computer market, and the concurrent advancement and sophistication in the study of human behavior and in the discipline of computer science are just a sample. Clearly, one can no longer rely on intuition and ad hoc methods in designing. Interactive systems must be developed around--not in spite of-- the capabilities and characteristics of a user community.

These human factors concerns are sometimes expressed by the demand for a meaningful "human-machine dialogue." But this phrase is misleading: the personification asks an inanimate object to accept responsibility for its own design. In this context, the machine is only a vehicle for the exchange of enhanced information from human to human. So the statement boils down to a need for establishing a dialogue between the programmer and the user.

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To think of the user-programmer interface as a dialogue is useful for several reasons. It reflects the dynamic nature of communication. It identifies the three major elements in the communication triangle: sender, receiver, and message. And it admits that the process of communication is a product of the relationship of these three. Figure 1 is a model based upon communication theory. It diagrams the various actions and agents involved in sending a message and serves as a process model for organizing this document.

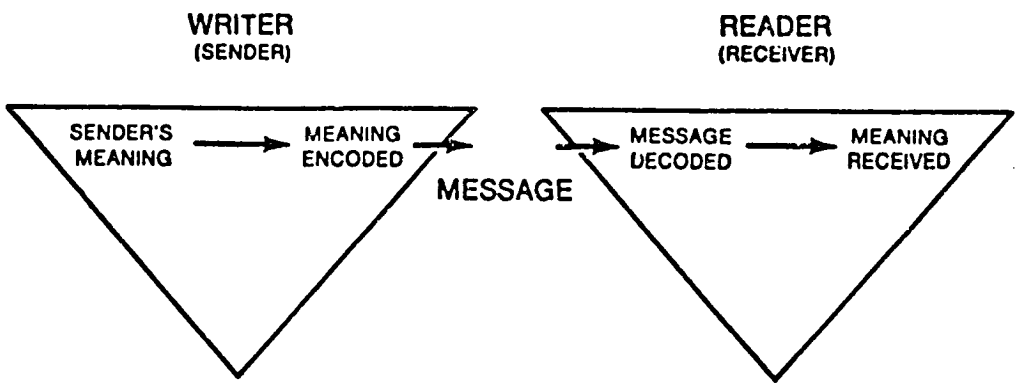


Figure 1. - Model of the Communication Process

As you undoubtedly know from everyday experience, sending a message requires a series of choices: not only about the message content, but also about such things as sentence structure, organization, word choice, tone, and voice. To make things complicated, in most cases these choices must be made concurrently. To make things even more complex, these decisions are seldom clear choices; usually they are trade-offs which require the "sender" to exercise judgment.

This set of guidelines will aid you in making the various decisions necessary for a clear user-programmer dialogue. The document contains four sections: (1) Format, (2) Sequence, (3) Audience, and (4) Aim. These divisions are not just a matter of convenience; they are functionally related to the communication model presented in Figure 1.

This document uses something of a case study approach in its development and applies the general guidelines to a single specific system, the Transportable Applications Executive (TAE), which is an interactive software package developed at the Goddard Space Flight Center by the Information Extraction Division (IED). TAE is a multi-purpose executive, which may be installed on a variety of computers. It provides standard software and user interfaces, and is intended to be a common foundation for future systems supporting the analysis of data from advanced satellite instruments.

The "User's Manual" describes TAE as "a collection of 'executive' programs which interact with a user to manage the execution of applications programs" [added emphasis]. Clearly, successful use of the TAE depends on effective communication. User-programmer dialogue for TAE takes place in four areas: (1) menu selections, (2) tutor display, (3) help files, and (4) error messages.

In the menu mode, the user selects from a set of numbered choices. This activates either another menu or the tutor mode. In the latter, the user provides a set of numbers or words in a prescribed format. By doing this, the user enters the parameters for that particular program or procedure. Help files give detailed instructions or explanations for all menu and tutor items. Error messages appear in response to incorrect user actions; they indicate what has gone wrong and how to recover.

FORMAT

Format, for our particular purposes, means the spatial and structural presentation of information. In short, this section deals with organization. Its goal is to promote clear and readable transfer of information between programmer and user. In terms of the communication model we are working with, the issues of this section fall into the "encoding" and "message" areas.

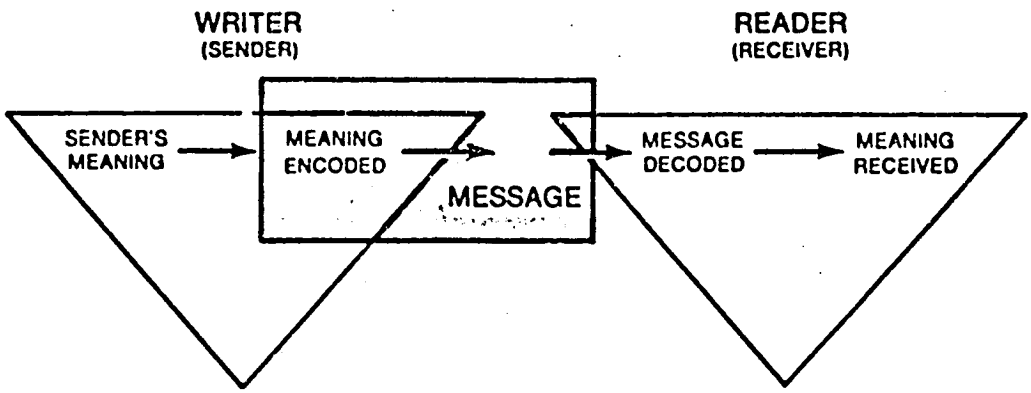


Figure 2. - Model of the Communication Process (Format domain)

The ideal state for effective and efficient communication requires that the sender and the receiver share a "schema" or image of how information will be structured. It falls to the programmer to package the information in a format that is meaningful to the user. To some degree, the user can be trained to recognize and process even the most erratic of patterns, but it is far easier to make use of pre-existing schema. The sender can identify these pre-existing formats in two ways The more general assessment takes into account the basic psychological and physiological capabilities of humans. The

second, more specific level, requires the sender to anticipate a specific user-community's knowledge, needs, and attitudes. This section considers the first level; the section on Audience considers the second.

EYE SPAN AND PROCESSING

If you turn a normal sheet of typing paper sideways and hold it parallel to your face, you will have some idea of the change in perspective the user has when s/he switches from conventional printed matter to the CRT screen. Obviously, certain accommodations in the placement of information on the visual screen must be made if comprehension is to be maintained or increased.

A CRT display is easier to read when there is neither too much nor too little information in each line of type. The reader's eye should move at a pace that it is used to and that is comfortable for the amount of information being taken in. Optimal line length for most text is 40 to 60 characters. (There is some variation, depending upon the size of the type-face and the amount of spacing between lines.) In general, this is a good range because experience has shown that it is not so long that it tires the eye, and not so short that the eye must keep jumping back and forth.

Example

Compare your reading-time for these two formats.

The parameters to be included in the parameter set being defined are listed on one or more parameter statements immediately following the associated PARAMS statement.

> The parameters to be included in the parameter set being defined are listed on one or more parameter statements immediately following the associated PARAMS statement.

For most people, the second version of the test takes less time to read. With long lines of text, the eye won't stay on course, but will tend to stray to another line. Also, long lines make the margins too small, which causes the whole panel to look crowded.

REGISTERS AND PROCESSING

The visual field you are working with has a potential capacity of 80 columns and 24 lines. However, not all columns and lines are of equal value. The CRT panel, something like the page of a book, can be divided into various registers or locations where information can be systematically placed. The prominence of each register is partially determined by the western tradition of reading print--that is, top-down and left-to-right.

As currently configured, the TAE screen has three stable registers: (1) the Main Heading Line, (2) the Message Block, and (3) the Response Lines.

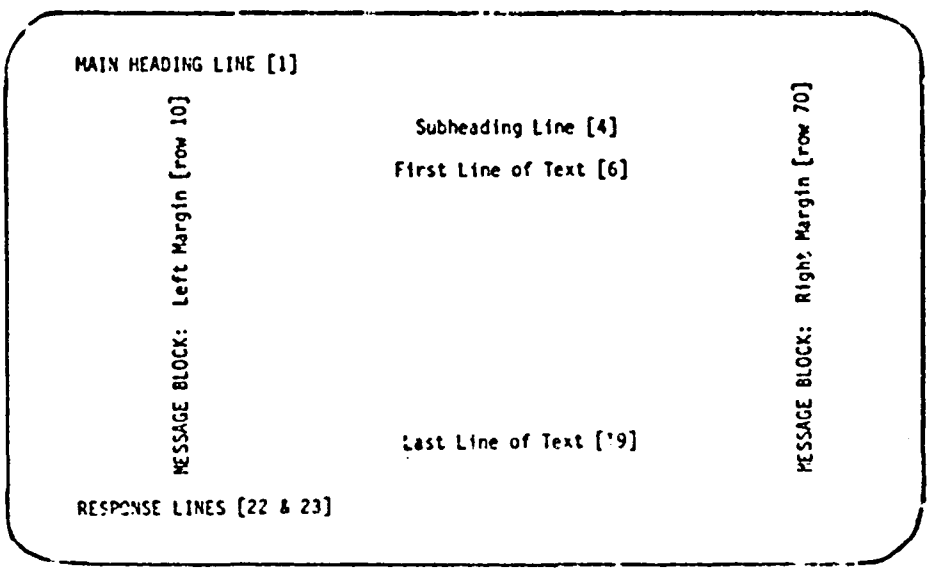


Figure 3. - Registers on the TAE Screen

The brief error messages that appear above the Response Lines are evoked by a user's incorrect action or choice. Their position is a permanent feature of the display, but their appearance should not be. In fact, the goal is to communicate clearly so that these messages do not appear. Therefore, the error message line is not treated as a visible register in this document.

Used with consistency, these registers can be powerful devices for presenting information. However, not all three registers are of equal power because the user does not attend to each in a uniform fashion. Perhaps because of previous experience with non-verbal video displays, most readers focus first around the center of the CRT screen. The most prominent area tends to be the zone around the vertical and horizontal center lines. Items displayed outside the zone, but not in one of the other two registers, may be minimized or masked by their position.

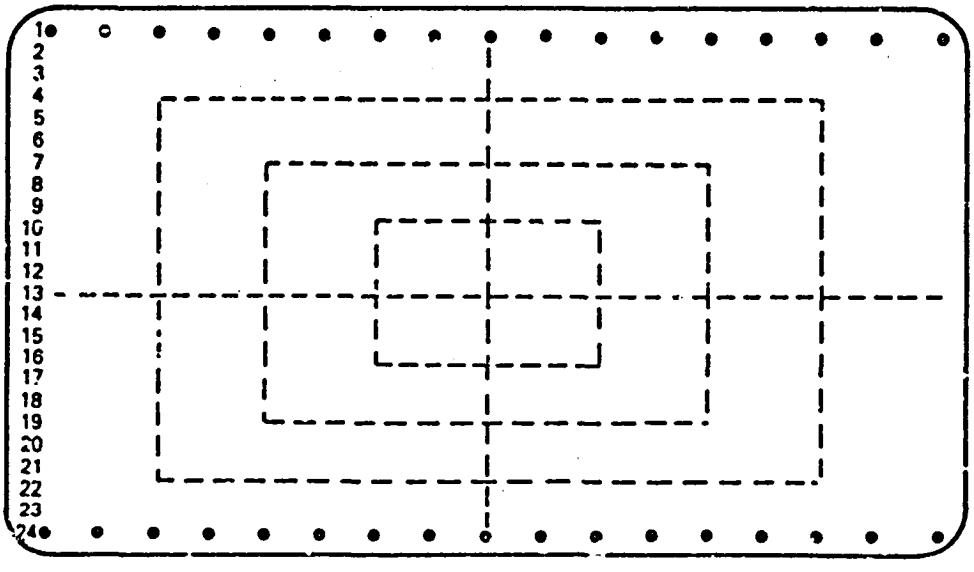


Figure 4. - Zones on the TAE Screen

BLANK SPACE AND PROCESSING

A practiced reader can process print in two very different modes: linear and holistic. In the linear mode, the reader attends to each word in the sentence. In the holistic mode, the reader scans over the array of information, picking up keywords from which s/he can infer the content. While linear processing is sequential and slow, holistic is imagistic and rapid. Research suggests that mature readers naturally start in the holistic mode and switch to linear only when their comprehension falters.

Writing for holistic processing requires that the programmer take great care in prose construction. In order to avoid misinterpretation, the writer must spend much more time in pre-processing the information than is necessary for a conventional text.

A controlled use of blank space aids considerably in the processing of information. In fact, as a rule-of-thumb there should be about as much or more space as print on a single display. Of course, this blank space is not placed indiscriminately on a panel, nor should it be used inconsistently from display to display. The discussion of registers has already established the general format for a typical panel and indicated the spacing requirement to maintain the integrity of the three registers (see Figure 3). This segment considers the spacing in the message block.

A common deterrent to clear communication is "saturation" or "overload." Saturation occurs when too much information appears on a single panel. A crowded panel, like Figure 5, is hard to read.

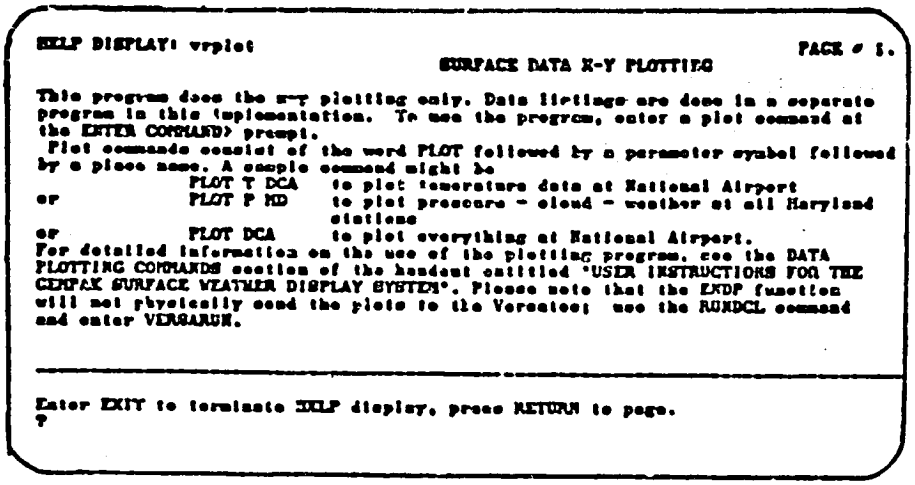
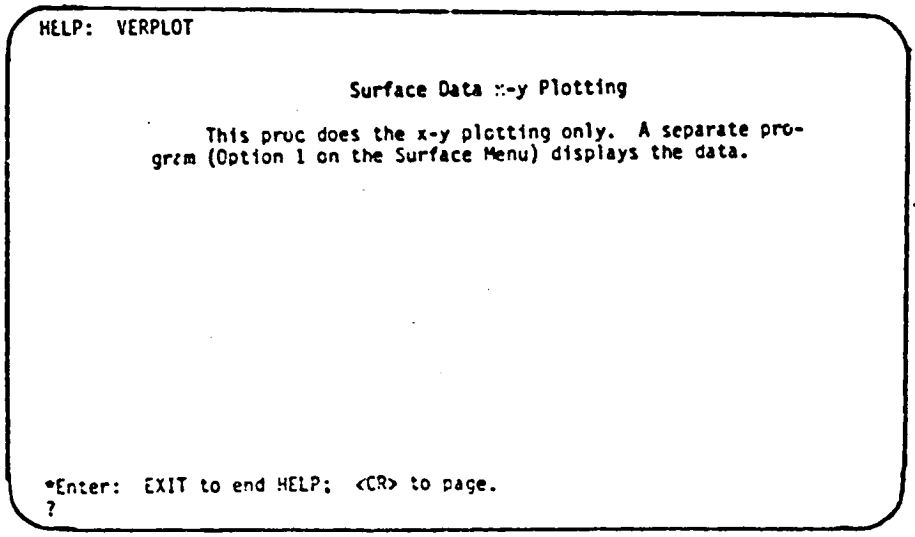


Figure 5. - Sample HELP Display - Crowded Panel

The panel has too much material; its density overwhelms the reader. In addition, the types of information appearing on the panel--instructions, illustrations, and qualifying remarks--are not arranged in a way that indicates their relative importance. Blank space has not been used as a means of guiding the reader's awareness. The panel should be broken down and repackaged--this time using margins, indentations, tabular arrays, paragraphing, and appropriate headings.

Example



```
HELP:  VRPLOT

                              Plot Commands

          To use this proc, enter a plot command at the command
        prompt.  A plot command consists of the word "plot," followed
        by a parameter symbol, followed by a place name.

             e.g.:  Plot T DCA  -- To plot temperature data at National
                                   Airport

                    Plot P MD   -- To plot pressure - cloud - weather
                                   at all Maryland stations

                    Plot DCA    -- To plot everything at National Air-
                                   port


*Enter:  EXIT to end HELP; <CR> to page.
?
```

```
HELP:  VRPLOT

                          Additional Information

          For detailed information on the use of the plotting pro-
        gram, see the data plotting commands section of the handout
        entitled "User Instructions for the GEMPACK Surface Weather
        Display System."

          Please note that the ENDP function will not physically
        send the plots to the Versatec; use the RUNDCL command and
        enter VERSARUN.




*Enter:  EXIT to end.
?
```

Three panels have been substituted for the original. At first, this might seem time-consuming because the user must page more often. In reality. the user will be able to process the revised sequence in about one half the time as for the single panel. Blank space now informs the reader about what is important in the panel and where its parts begin and end.

Eye-catching headings clearly identify the content of each panel. Consistent and adequate indentation shows where paragraphs (and thus, new thoughts) begin. Examples are set off by a framing technique and are clearly labeled. The reader's attention is carried through the information in a way to assist in processing. The writer has planned not only what s/he has to say, but how the user will read that material.

But blank space cannot be used to facilitate reading unless some standards are agreed upon so that the practice does not vary from writer to writer. Blank space is either vertically or horizontally placed. Think once more about the CRT field with its 24 horizontal lines and its 80 columns (see Figure 3). The Message Block, as previously defined, begins on line 4 and ends on line 19. Its left-hand margin is justified and begins at column 10 and ends approximately at column 70 to accommodate eye span. Many readers find ragged right margins easier to read than texts with even margins. When each line looks different, the eye is less likely to stray to another line because it can quickly separate and identify each line. Also, the eye does not have to adjust to the different spacing between words which is necessary to right-justify lines.

Within the Message Block, distribute print and blank space in the format suggested by Figure 6. In general, vertical spacing should move in -- stair-step fashion--with increments of 5 columns dividing each level of

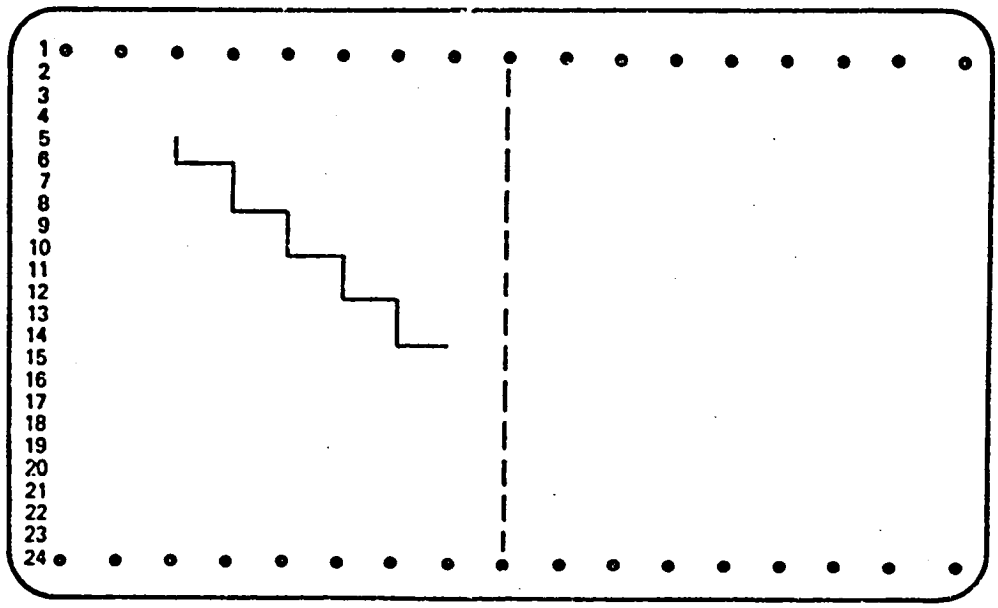


Figure 6. - Vertical and Horizontal Spacing

information. In horizontal spacing, separate elements should be indicated by leaving one line blank. For easy reference, use the following table.

Table 1. - Vertical and Horizontal Spacing

Syntactic Feature	Horizontal	Vertical
Main Heading	Line 1	Begins at Left Margin
Subheading	Line 4	Centered
First Line of Text in Message Block	Line 6	Column 15
First Line of a Paragraph	Skip Line	Column 15
First Line of a List	Skip Line	Indent 5

SEQUENCE

The previous section concentrated on the format qualities of a display panel. In practice--except for menus--panels frequently appear in series. This section deals with the procedural aspects of multiple panel display. Looking back to the basic communication model, the issues of this section fall into the "message" and "decoding" areas.

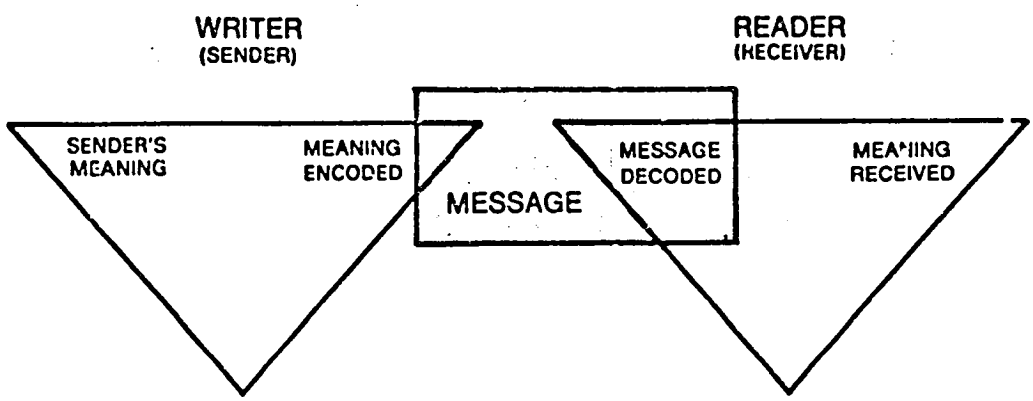


Figure 7. - Model of the Communication Process (Sequence domain)

TIMELINESS

In a good display, the information comes in a form that can be used. In other words, the display is arranged so that the user can make correct decisions or take appropriate action. Therefore, all displays should be constructed around the central idea of being functional. This means that information must be timely: nothing should appear that is not meaningful or

usable by the reader at that specific time.

To present information in a timely fashion, you must take into account the needs of the user. In short, put yourself in the reader's place and simulate a response. For example, in the HELP: VRPLOT file series (pages 9 and 10), the panels are constructed and sequenced according to how the reader will process the material. Panel 1 identifies the whole sequence and suggests an alternative or supplement to the program being described. Panel 2 defines the program and gives illustrations. Panel 3 suggests sources for more detailed information and gives whatever qualifications are needed.

As a second example, consider the HELP: MENU MODE INFORMATION file series.

Example

```
HELP:  MENU MODE INFORMATION

                        General and Specific HELP

        This is general information on MENU mode.  For more
      specific HELP, use the following:

           HELP n     -- Where n equals a particular menu entry
                         number.

           HELP 0     -- Where 0 indicates the current menu.

           HELP proc  -- Where "proc" indicates a particular pro-
                         gram or procedure.




*Enter:  EXIT to end HELP;  <CR> to page.
?
```

```
HELP:  MENU MODE INFORMATION

                              General Comments

          Each entry on a menu is

               o  Another menu

               o  A proc (a procedure or a program).

          Selecting a menu activates that menu.  Selecting a proc
     activates TUTOR mode so that parameters can be supplied before
     executing the proc.




*Enter:  EXIT to end HELP;  <CR> to page.
?
```

```
HELP:  MENU MODE INFORMATION

                              Responses in Menu Mode

          a number          -- Specifies entry selection.

          BACK              -- Returns to the previous menu.

          MENU              -- Re-plots the current menu.

          MENU menu-name    -- Directly activates the named menu.  A
                               menu's name is located in the upper-
                               right of the screen.  If the menu name
                               contains punctuation, place the name in
                               quotation marks.




*Enter:  EXIT to end HELP;  <CR> to page.
?
```

```
HELP:  MENU MODE INFORMATION

                    Responses in Menu Mode (con't)

          TOP      -- Returns to the main menu (the root).

          HELP     -- Displays the current help information.

          HELP n   -- Displays information on the menu number
                      entered.  If n is zero, help information
                      on the current menu is displayed.

          COMMAND  -- Causes TAE to exit menu mode and enter com-
                      mand mode.  If menu mode is subsequently re-
                      activated, the menu at the time of the mode
                      change becomes the active menu.

          LOGOFF   -- Ends the current TAE session.

*Enter:  EXIT to end HELP; <CR> to page.
?
```

```
HELP:  MENU MODE INFORMATION

                          Conventions

     Menu responses may be abbreviated to their shortest, un-
ambiguous form.

          e.g :  C   for COMMAND

                 T   for TOP

                 H n for HELP n

          Lower case may be used.



*Enter:  Exit to end.
```

"Timeliness" of information is the guiding principle behind the sequencing of the message. The first panel identifies the information that will follow and indicates alternatives. Panels 2, 3, and 4 contain definitions of possible actions. Panel 5 gives qualifications for the materials on the previous three displays.

Generally speaking, a series of panels should follow the three functions outlined in the examples:

Function 1: Identification/Introduction

Function 2: Definition(s)/Illustration(s)

Function 3: Qualification(s)/Extension(s)

This sequence represents the natural order in the reader's ability to use the information.

MODULES

A user can understand information more quickly if it comes in meaningful units or modules. In some forms of writing, units are almost self-contained and are arranged in a linear fashion--something like beads on a string. However, the modules for panel displays should be thought of as embedded, much as a set of Chinese boxes is nested within one another. As an illustration, the sequence HELP: MENU MODE INFORMATION contains three prime modules: Introduction (panel 1), Definitions (panels 2, 3, and 4) and Qualifications (panel 5). Each of these segments is, in turn, broken down into subunits of paragraphs, sentences, and lists. Whether on a macro or micro level, each module is a functional unit and should be written for a clear purpose.

o Paragraphs

A paragraph is a working structure organized around a single unit of thought. In constructing a paragraph, you should keep three principles in mind:

1. Centrality: The kernel of the paragraph should be stated as the topic sentence. Other elements in the paragraph should relate directly to this central idea.
2. Logic: The paragraph should be developed on a functional organization--such as cause-and-effect, multiple example, or process analysis.
3. Economy: Each paragraph should be short and to the point. Delete non-essential information.

o Sentences

The building block of a HELP file is the sentence. Basically, these units should be concise, grammatically correct, and logical. They should be patterned on the traditional simple sentence: SUBJECT -- VERB -- OBJECT. Translated into functional terms, these three elements can be labeled as AGENT -- ACTION -- GOAL. Since they are the most prominent positions in the sentence, place keywords and important terms in these slots.

Example

Original: There are two surface data programs available in this version

Revision: This version contains two surface data programs

Aside from the obvious shortening of the structure, the sentence has been

strengthened and tightened through word choice--as Table 2 demonstrates.

Table 2. - Editing for Key Words

Function	Original	Revision
SUBJECT = AGENT	there	version
VERB = ACTION	are	contains
OBJECT = GOAL	two surface data programs	two surface data programs

In two cases out of three, weak and vague words have been replaced by key terms.

o Lists

Lists are compact ways of presenting materials, but they must be used with some discretion. Observe these cautions when composing lists.

1. A list should not stand alone on a panel. It should be introduced by a subheading or a comment, or it should be followed by an explanatory note.

2. The transition from prose to list--and back again--should be smooth and natural.

3. Lists within lists are acceptable. But think twice before moving down to the tertiary level.

4. Avoid two disconnected, prime-level lists on a single panel.

The lowest level of modularization--be it sentence or paragraph--should be completed on a specific panel before moving on to a subsequent frame, if at

all possible. In particular, avoid "widows," or single words that carry over from one frame to the next.

RITUALS AND ROUTINES

Rituals are rules that you want the user to observe in operating the system. Rules can be taught in two ways. You can list the rules and ask the user to memorize them. Or you can teach the user the rules through practice. The second method is better in the long run because it is performance-based.

The TAE has several rituals which help the user to perform in a consistent manner. As an illustration, there are four types of "messages" appearing in the system: menus, help files, parameter selections, and errors. Each has its own characteristic form and style. Each is distinct enough in position and pattern that little, if any, crossover takes place.

Some ritualization in a system is important for smooth operation; however, when a whole system is composed of rituals, the user becomes nothing more than a slave. Some designers believe that the fewer the choices the user has to make, the more effective s/he will be. Research suggests the contrary: an over-mechanization produces boredom and fatigue.

Routines, in most cases, are more effective ways of managing procedures in a system's operation. Routines are techniques that the user has learned through experience. They are strategies rather than rules for accomplishing tasks. They are useful in any kind of human behavior because they are flexible enough to adapt to the unexpected, yet they are habitual enough to provide stability. For example, when faced with a problem, most people devise a plan of action based upon what has worked in similar situations. In

computer applications, routines accommodate the user's innate desire for control over the process; at the same time, they provide the uniformity that is the heart of any system. In short, routines allow for a sharing of power.

Users can learn routines surprisingly fast, if the routines reflect the learner's automatic tendency toward chunking. Because of the limitations of short-term memory, readers organize miscellaneous information into categories or classifications that are more easily processed. In other words, people sort information into "chunks" that they can manage. This capability has enormous benefit for the human thinking process. But for our purposes, this restructuring capability needs some guidance.

Here are three observations on how the reader uses chunking. Beside each is a suggestion on how the writer can provide adequate control for the process.

Table 3. - The Chunking Process

User/Reader	Programmer/Writer
1. Tries to fit new information into an old or previously known framework.	1. Supply the framework or control what it will be.
2. Develops expectations which affect the processing and understanding of a text.	2. Determine and meet these expectations.
3. Sorts and organizes information into hierarchical structures built around a few key concepts.	3. Define and control the major concepts.

Contemporary models of human memory include three components:

Short-term Memory: Processes the external stimuli and holds from five to seven units of meaning for about 30 seconds.

Long-term Memory:	Stores -- with relative stability -- facts and previous experience which are referenced and accessed with same ease.
Working Memory:	Allows information from short and long term memories to interact; generates plans of action and pre-tests them for effectiveness.

In constructing panel routines for the TAE, one of your goals is to ensure the smooth and easy transfer of information from the short-term memory to the long-term memory. Repetition, reinforcement, and consistency will accomplish this. But merely transferring information from short-term memory to long-term memory will not ensure a user's success with the TAE. An equally important goal for the programmer is to nurture the operational strategies that are generated in the working memory. You can embed routines in the working memory by using these techniques.

Controlled Vocabulary
. Establish a limited set of key words which, through repetition, become emblems for patterns of action.

Link New Information with Old
Define new concepts in terms of previously established concepts.

Hierarchical Structure
Use deductive logic or top-down procedures in demonstrating the order of information or routines.

Analogy
Use correspondence in function and position to reinforce similarities in various stages of TAE operation.

AUDIENCE

The persons to whom the message is addressed--the audience--are not passive receivers. When they decode the message, they create meaning. This section looks more closely at the relationship among "receiver," "decoding," and "meaning." In the basic communication model, this area is represented by the smaller triangle on the right side of the diagram.

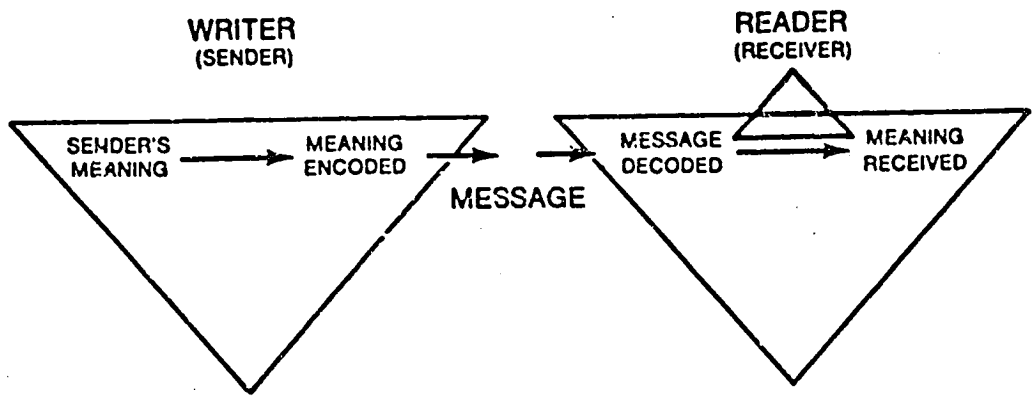


Figure 8. - Model of the Communication Process (Audience domain)

ANALYZING KNOWLEDGE, ATTITUDES, AND NEEDS

The goal in writing TAE menus and help files is to create a momentary common ground between the user and the programmer. The first step in closing the gap is to gauge the distance between the two of you. There may be obvious differences in age, sex, and background, but the critical differences usually fall into three areas: the user's knowledge about the topic; his or her

attitude toward it; and his or her personal and professional needs.

Adapting your information to the audience is often crucial to the success of the communication. While assessing the audience is an important task, it does not have to be an elaborate analysis. A brief table is frequently sufficient.

Table 4. - Critical Features of the TAE User

Knowledge	Attitude	Needs
Scientific background	Views TAE as a tool	Convenience
Has a general knowledge of computers	Impatient with a system that appears to be a gimmick	Comfort Closure
Has an alternative means of accomplishing the task TAE facilitates	Demands efficiency Intolerant of ambiguity	Control

ANTICIPATING READER INFERENCES

To infer is to draw a conclusion or make a deduction based on facts or indications. Extracting meaning in the reading process depends upon inferences. Poorly constructed prose can lead to false inferences or misinterpretations. Whether TAE users understand a message in exactly the way you intend depends on how well you guide their inferences. Effective methods for controlling the reader's interpretations are logical organization and judiciously placed signposts.

o Use Logical Order

To understand and use a panel or a sequence of panels, your audience must be able to relate the information and ideas to one another. How you order the thoughts--what you put first, second, third--can either make it easier or more difficult for readers to figure out what these relationships are.

Although the definition of what is logical depends on the information and the circumstances, here are four suggestions for ordering the content of a TAE message.

1. Discuss things that affect many users before those that affect few.
2. Discuss the general before the specific.
3. Discuss permanent provisions before temporary ones.
4. Put content in a time sequence.

o Use Appropriate headings

It isn't sufficient to organize the content of a TAE communication, you must also show that organization to the users. You can do this by using informative headings and subheadings.

Well-written headings and subheadings are a way to help the reader get what s/he needs from a panel--or series--quickly and easily. Well-written headings tell the reader: the nature of the information contained in the text following the heading; the organization of that text; and the location of particular content.

1. Headings that are Informative

   You can make headings informative by using enough words to describe the content that follows. There is an optimal point between using too few and too many words.

   Abstract headings without a frame of reference are difficult for the reader to interpret. Overly precise headings, on the other hand, bog the reader down.

2. Headings that Show Organization

   In long or complex panel sequences, headings and subheadings should serve as a kind of outline. The user should be able to page through and tell what major points and subtopics are discussed in the text just by reading the headings.

   You should use several different levels of headings to show the relationship between major points and subtopics, much the way a good outline does.

3. Headings that Show Location

   Headings can be used as guideposts to help the user keep track of his or her place in a long sequence of panels. This technique is especially helpful if analogous headings are given to parallel levels of the system so that the user can identify his or her location in the organizational tree of the entire system.

   Headings can also be used to tell the user where specific topics are located by keying the headings in a location guide to identical headings within the panel sequence.

o Use Highlighting Techniques

Highlighting techniques are visual ways of calling attention to some part of a display. These devices make a text look better by providing visual relief in an otherwise uniform body of print. These techniques include underscoring, non-alphanumeric demarcations, and capital letters.

However, overuse of highlighting can make the panel cluttered or confusing. If you overuse one highlighting technique or use too many different ones, you will defeat your purpose. When too many parts of the

display are made to look important or distinct, no one part will seem especially important or distinct. Too many different highlighting techniques in one text will also give it a crowded look.

Your readers will also be confused if you don't use highlighting consistently. For example, if you underscore some headings and put others in capitals, the reader will wonder what the difference means. If there is not any difference, you have confused your reader.

1. Underscoring

   In a manuscript prepared for a publisher, the underscoring of a word is an instruction to the printer to italicize it. Before you use underlining in a TAE panel, ask if you would really want it to appear in italics in a paper document.

   On many terminals, underlining per se is not possible. However, other capabilities may be substituted. For example, some terminals allow you to cause designated characters, words, phrases, or areas on the screen to blink. Another feature will cause the white of the print and the gray of the background to reverse for a specific area.

   Two important uses of underscoring in a TAE panel are to emphasize new terms and to construct tables. Technical terms that you want the reader to remember as key words may be underlined on the first use for emphasis, but they should not be underscored on subsequent appearances. Elements in a table can be delineated by underscoring. However, the apparatus should not get in the way of the information. In most cases, blank space is a more effective way to differentiate the elements of a table.

2. Non-alphanumeric Demarcations

   Symbolic demarcations should be used sparingly. When they do appear, the use should follow conventions the reader is familiar with. Very few such symobls are necessary in a TAE display.

Non-alphanumeric Demarcations

Symbol	Use
o	Indicates bullets in list-like displays where priority is not an issue.
--	Indicates items under bullets.

These symbols are most effective when used in conjunction with indentation and blank space.

3. Capitals

As with the other highlighting techniques, capitals should not be overused. Capitalizing single letters should be in agreement with grammatical usage. One of the few places items should appear in all caps is in the Main Heading Line. Writing a block of text in all caps makes the text harder to read, and should be avoided in the Message Block.

ANTICIPATING TEXTUAL AMBIGUITIES

If there are two or more interpretations for a passage, then the meaning is ambigious. Ambiguity may result from confusing paragraph development, flawed sentence structures, improper word choice, or inadequate punctuation. Some of the more common sources of ambiguity--and suggested remedies--appear in this segment.

o Conditional Sentences

Conditional ("if...then") sentences are often very complicated and hard for readers to understand. This difficulty increases with the number of conditions. Yet conditional sentences are very convenient structures for giving instructions or for teaching procedures. You can make conditionals

easier to understand by listing each condition separately and by making them distinct. There are three rules-of-thumb for doing this.

1. If there is only one condition, state it first.

Example

If TAE does not recognize the first word of a command as a TAE command, it assumes that the first word is the proc name.

2. If there are several conditions, state the rule or consequences first and list the conditions or exceptions afterwards.

Example

The user can obtain the following kinds of information about the file:

- o The times for which data are in the files;
- o The number of stations that have reported at a given time;
- o The number of stations that have reported for the n latest times in the file;
- o The number of stations that have reported at all times in the file.

3. If there are different provisions for different cases, a table may be clearer than straight prose.

Example

Entering Tutor Mode:

From	Action
Menu Mode	Make a selection that requires execution of a proc
Command Mode	Enter TUTOR Enter "?" Enter TUTOR proc

o Multiple Negatives

Positive sentences are easier to understand than negative ones. Two or more negative words in a sentence become very hard for readers to interpret. There are three kinds of negative words.

1. Negative denotation: Words that are negative in meaning.

Examples

no, not, never, none, nothing

2. Negative affix: Words that are negative by denotation.

Examples

non--, dis--, il--, ir--, ex--, un--, de--

3. Negative connotation: Words that are negative by implication.

Examples

forbid, wrong, doubt, unless, fail, reject

A single negative in a structure seldom confuses the reader--unless it is misplaced. But when the negatives start coming in pairs (double negatives), the readers have much more difficulty in understanding.

Examples

Original	Revision
It is not illogical to assume...	It is logical to assume...
The proc will not be terminated if the mandatory parameters have been specified.	The proc will run only if the mandatory parameters have been specified.

or

The proc will run if you have specified the mandatory parameters.

Typing TUTOR is not unlike typing "?."

Typing TUTOR is like typing "?".

o Unnatural Truncations

Wordiness should be avoided, but be sure that the words you are leaving out are non-essential. Occasionally, in our efforts to cut out excess, we create structures that are inherently ambiguous. "Missing links" cause problems in logic.

1. Omitted Verbs: Express changes in verbs and verb forms.

Example

Original: Primitive man killed his own food and clothing.

Revision: Primitive man killed his own food and made his own clothing.

2. Omitted Nouns or Pronouns: Designate the things logically involved in the action.

Example

Original: John dried the table by rubbing with a towel.

Revision: John dried the table by rubbing it with a towel.

3. Omitted Connectives: Express changes in relationships by changes in connectives.

Example

Original: The worker moves the cutter closer or farther from the wheel.

Revision: The worker moves the cutter closer to or farther from the wheel.

4. Shortened Subordinate Clauses: Retain the "which is," "who were," "that are," etc. which make it easier for the reader to understand how the subordinate clause relates to the rest of the sentence.

Example

Original: Each menu has a name at the top of the screen used for "menu-name."

Revision: Each menu has a name at the top of the screen which is used for "menu-name."

Shortening terms by removing or leaving out parts is a convenient way of saving space and increasing efficiency. However, this shorthand is effective only if the user knows what the abbreviations mean. The first appearance of a shortened form should be accompanied by its full form, unless the abbreviation is self-explanatory. An abbreviation should agree with whatever previous shortening the reader associates with that term. Also, abbreviations should be consistent throughout the TAE displays--both in form and in placement.

o Punctuation

Punctuation ties together those elements that should be read together and separates those that need to be read separately. Punctuation helps to shape meaning in two ways: it labels words, and it eyegroups series of words in order to make structure visible.

1. Labeling of Words

Some marks of punctuation tell us how to read words in their context. Sometimes leaving out a small mark can create a serious misinterpretation, as in the case of a supervisor at a nuclear installation who ordered "10 foot long lengths" of radioactive rods. he received 10 pieces, each a foot long, instead of the 10-foot lengths required. In this case, the hyphen labels the number 10 as an adjective modifying the following noun.

Other marks of punctuation are useful for labeling words. Quotation marks are especially versatile; they can be used:

--for indicating the exact words of another;

--for word-marking, as when a word is used as the name of itself;

--for setting off punctuation, words, or structures used with special or unconventional meaning;

--for simple emphasis, as long as the technique is not overused.

Be careful that the user can tell when punctuation is to be included in the response string and when it is not.

Parentheses should be used to enclose unattached elements which divert the user's attention to another subject. The most common uses of parentheses in TAE messages are to set off explanatory remarks and to give locations for additional information.

2. Eyegrouping of Words

Punctuation aids reading by grouping words into patterns discernable to the eye. Three types of punctuation are common: end stops, stops, and pauses.

End Stops (.!?): Signal the end of a sentence.

Stops (:;): Appear within a sentence and signal the end of a thought group equal to a sentence.

Pauses (--,): Appear within a sentence and bridge over interrupters, set off introductions, and indicate lists.

Not counting end stops, well-written sentences average only 1.5 internal punctuation marks each.

In business prose, punctuation appears in the following proportions:

Comma	50 per cent
Semicolon	5 per cent
Dash	4 per cent
Colon	1 per cent
End Stops	40 per cent

AIM

The person who sends the message determines many more things about the communication than just the content. The writer's aim or intention shows up in everything from tone to format. In considering the writer's purpose, this section looks more closely at the relationship among "sender," "encoding," and "meaning." In the basic communication model, this area is represented by the smaller triangle on the left-hand side of the diagram.

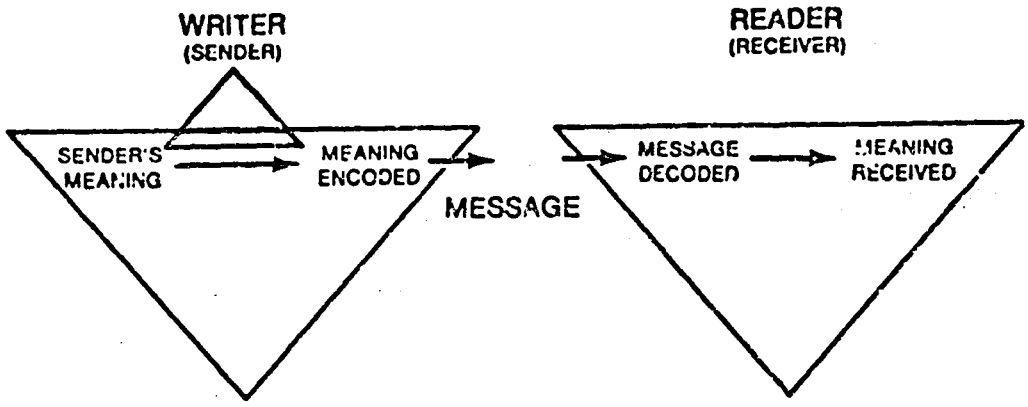


Figure 9. - Model of the Communication Process (Aim domain)

PERSONA/VOICE

The persona is the writer's projected self in a piece of prose. You always present some version of yourself in your writing; however, personae must be matched appropriately to various situations.

Some writers attempt to hide behind their prose to the point that their

persona disappears. Prose written with a hidden persona sounds bureaucratic and impersonal. It is difficult to read because it sounds as if some invisible hand is at work making decisions and implementing procedures. Writing without an author's presence can cause sentences to swell to the bloated state of the following passage.

Example

> All faculty-type and staff-type personnel are hereby given notification that they should perform the registration function to ensure that their private, multipurpose motor vehicular units are in a registration relationship with Middle State University during the period of time for the upcoming 1979-1980 academic year. Said year begins August 20, 1979. Each of the above-mentioned personnel categories should have a Middle State University registration decal in an affixed position on his/her vehicular unit prior to the above-mentioned date. The subject decal may be purchased beginning on the date of August 1, 1979. Subject decal, if and when purchased, will remain in a valid condition until the expiration date of August 15, 1980.

Your purpose in writing TAE messages is to instruct the user. Obviously, the information is the most important element in the communication process, and you should not intrude yourself between the reader and the message. But, being non-existent in the process causes you to lose control of the communication. While you should not be center stage, neither should you allow your persona to become a victim in the case of the disappearing author.

o Use the Active Voice

You can retain your presence as author in a piece of prose by using the active voice. Active sentences maintain the underlying logic of who did what to whom, helping the reader to keep the distinctions clear. Texts comprised mainly of active sentences give users the impression of prose that moves

along.

Passive voice causes the users to focus on the wrong element in the sentence--that is, on the person or thing that was acted upon rather than on the person or thing that performed the action. Furthermore, some passive sentences are hard to understand because they have lost the information about who did the action in the sentence.

Example

Original: Technical assistance will be provided by the staff for developing information needed to complete Table 1.

Revision: The staff will provide technical assistance for developing information needed to complete Table 1.

Another Example

Original: The menu is activated by . . .

Revision: Activate the menu by . . .

o Use Personal Pronouns

Personal pronouns in sentences are direct and specific. They make clear to the reader who does what in the sequence of actions or events you describe.

Example

Original: Benefits are paid if an insured employee or eligible dependent incurs covered charges because of blindness. Reimbursement for hospital and out-of-hospital rehabilitation charges will be made on the same basis as for any non-blindness related condition covered under the plan.

Revision: If you or one of your insured family members becomes blind, the Plan will pay for medical care in the same way that it pays for any other medical condition.

In TAE messages, you are instructing the user on procedures and applications. Your prose should fit that purpose. Use the pronoun "you" (either stated or implied) when telling the reader what actions s/he is to take.

Example

Stated pronoun

Original: The user can request that all data in the file at a given time or all data for a given station be obtained for him.

Revision: You can request all data in the file at a given time or all data for a given station.

Example

Implied pronoun (understood subject)

Original: No files should be created and named LAST.DAT.

Revision: Do not create any files named LAST.DAT.

While you should refer to the reader with a personal pronoun, do not refer to yourself as "I". You are trying to get the reader to do something or to understand something in TAE communication; therefore, s/he should be the only clearly identified agent in the message.

TONE/STYLE

The tone (or style) of a piece of writing may seem querulous, formal, friendly, sarcastic, melancholy, bitter, angry, joyous. All words that apply to a person's attitude are appropriate to use in describing the tone of writing. Tone and style are the product of every choice the writer makes. In

addition, both are crucial in determining how the reader will accept and act upon the message.

The discussion of persona touched upon tone/style; this segment gives more detail about types of styles and their effects on the TAE message. It is easier to start with styles and tones that are inappropriate for TAE and then end with a suggestion for an appropriate tone/style.

o Abrupt

In TAE communications, you should talk to the user as professional to professional. It is important that you indicate an appreciation for his or her expertise and that you do not appear to be impatient or rude. This is especially true in writing error messages. Although these messages must be brief and informative, they should not be short and sharp. Readers may be somewhat sheepish after making a mistake and may interpret what looks like an innocuous statement as sarcastic, snide, or judgmental. Remember, there are no absolutes in writing; you must decide how the message will sound in the particular situtation. A good rule-of-thumb is to avoid seeming indifferent to the reader by appearing abrupt. Briefer is not always better.

o Patronizing

Paying too much attention to the user's needs may be as offensive as paying too little. Don't patronize your readers by being condescending, overly solicitous, or unduly glib.

Example

> No doubt about it--when you smoke cigarettes you're running a scientifically-proved risk of lung cancer. That is, if you're a man. And if you're a woman, you're probably running a risk that's almost as certain.
>
> Fact is, the longer you've smoked, and the more cigarettes you smoke every day, the likelier you are to develop cancer. But scientific data demonstrate that you can lower that risk any time you care to--just stop smoking.
>
> If you smoke cigars or a pipe (or both), you're still risking cancer. But a good deal less than if you stick to those cigarettes.
>
> So why not cut out expensive, evil-smelling, disease-laden cigarette smoking for good? Like the Surgeon General says you should.

o Officious

Don't assume a role that you have not earned. Avoid lecturing to the user as if you are the Chairman of the Board. Not only is this tone irritating, it makes for dull reading.

Example

> X College admits undergraduates for the Bachelor of Arts degree only. For practical reasons of adjustment to college life and the proper arrangements of a program of study, X admits freshman students only in September, at the beginning of the fall semester. The freshman class is limited by the capacity of the dormitories. An early application is advised. It is expected that candidates who live within a reasonable distance of the College will visit X sometime before January of their senior year of secondary school.

In addition, don't use a megaphone to announce the obvious. Pompous language--especially when the subject is not equally grand--creates the

same effect as would calling out the last trumpets to announce that water runs down hill.

Example

> The question of the amateur's place in a society of professionals is one that has greatly been changed by the scientific and cultural revolutions of the nineteenth and twentieth centuries. The amateur, who was formerly criticized as a bungling idiot, today has gained the status of a person who is capable of advancing by improvement of his own primitive institution, without the glorified educational and financial backgrounds which have made the professional man a symbol of intellectual and vocational superiority.

o Concise

An appropriate tone/style for TAE messages can be described as "concise." Prose written for instruction has two main features of style. First, the writing is clear, precise, and correct. Because the tone is information-based, there is none of the indulgence in personal mannerisms that allows us to distinguish between the prose of Hemingway and Henry James. Second, the writing has a touch of persuasion--it seems friendly and motivated by a desire to help the reader.

Example

Consider the following three revisions of the "dangers of smoking" passage.

Concise: Version #1--factual but toneless

The risk of developing lung cancer increases with duration of smoking and the number of cigarettes smoked per day, and is diminished by discontinuing smoking.

Concise: Version #2--factual with friendly/formal tone

The longer one smokes, and the more cigarettes one smokes per day, the greater the chance of developing lung cancer. This risk is reduced when one stops smoking.

Concise: Verion #3--factual with friendly/informal tone

The longer you smoke, and the more cigarettes you smoke per day, the greater your chance of developing lung cancer. This risk is reduced when you stop smoking.

READER-BASED PROSE

As most of this document indicates, simply expressing information is not enough--it's no guarantee that you are communicating. In order to determine if your prose is designed for a reader, you must have a way to diagnose the readability of a message and a method for indexing improvement when comparing revisions with originals.

o Readability Scales

Scales intended to assess readability are not universally reliable and their results should not be taken as the last word on structuring prose. However, if you do not ask more from them than they can give, they are useful tools.

1. Richard Lanham: "The Lard Factor"

   This scale is expressed in percentages, found by dividing the difference between the number of words in the original and the revision by the number of words in the original.

Example

Original: A piece of prose may be considered sincere if, in some manner, it establishes its credibility to its audience.

Revision: Prose will seem sincere if it seems credible.

19 = number of words in the original
- 8 = number of words in the revision
11 = the difference

11 / 19 = .578 Lard Factor = 58%

2. Robert Gunning: "The Fog Index"

This scale gives the level of education necessary to read a particular piece of prose. Since people prefer to read well below their education level, this scale can be used as a means for indicating when the text is too complex.

To calculate the "Fog Index": (a) Find the average number of words per sentence in a small sample of writing -- treat clearly independent clauses as separate sentences. (b) Calculate the percentage of words having three or more syllables. Don't count capitalized words, easy combinations like "pawnbroker," or verbs that reach three syllables by adding -es or -ed. (c) Add the average sentence length to the percentage of big words and multiply the total by 0.4. The result is the years of schooling needed to understand the writing.

Example

The purpose of this program is to produce a map and a simulated station model of the surface data collected from the NWS 604 line. The Maps are pre-defined into geographic regions in a Surface Geographic File and contain a list of default parameters and station ids for the region.

25 = average number of words per sentence
.06 = percentage of big words
25.06
x.4
10.02 = years of schooling needed to understand the passage

o Editing for Economy

Reader-based prose conveys information to the audience in an efficient and effective manner. Unfortunately, most of us turn out writer-based prose on the first draft and must stringently edit in order to transform our first efforts into an audience-oriented product. Some areas to consider in your

editing process are sentence length, parallel structures, noun strings, and word choice.

1. Sentence Length

   Sentences become hard to follow when you try to cram too much information into them. Even with correct punctuation to guide the reader, too much information in a sentence makes the material hard to understand.

   The model of the simple sentence helps to examine what happens in an overloaded structure.

   SUBJECT -- VERB -- OBJECT

   This basic pattern is very versatile: it can be modified, explained, and expanded by adding words, phrases, and clauses at almost any point in the sentence. This makes it possible to say a great deal in a single English sentence; it also makes it possible to say too much.

   Look for excess information in four places:

   --between the subject and the verb

   --between the verb and the object

   --before the subject of the sentence

   --at the end of the sentence.

2. Parallel Structures

   In a sentence or paragraph or list, items or clauses that have the same relationship to a major idea should have parallel structure. In other words, the subordinate ideas should all have the same grammatical construction--all nouns, or all infinitives, or all active voice verb clauses, or all questions, etc. It is also a good idea to break up a long sentence with many parallel items into a list, set off by bullets (o) or some other typographical device.

Example

If the parameter is multi-valued, you must enter the values in order and separate them by commas and/or spaces.

When you have a sentence or paragraph with several parallel items or clauses, you can often make them easier to understand by listing them. The items in the list should be in parallel structure and set off by a bullet.

Example

TUTOR mode is entered:

- o When, in MENU mode, a selection is made that requires execution of a proc.
- o When, in COMMAND mode, the TUTOR or "?" command is typed.

3. Noun Strings

Noun strings--sequences of nouns (and occasionally adjectives) in which the first noun modifies later ones--are often difficult for readers to understand. They also give a bureaucratic tone to texts. Breaking long strings of nouns into shorter phrases will make your prose less stilted and easier to read.

Example

Original: The military agency published a host area bomb shelter production planning workbook.

Revision: The military agency published a workbook that tells people how to plan the production of bomb shelters in the host area.

4. Word Choice

Using inflated language does not impress your reader. In fact, using unnecessarily difficult or just plain unnecessary words will make your writing stilted and dull. Avoid the following:

--unnecessary words and hollow phrases: empty sentence introductions and redundant phrases

Examples

It is possible that . . .
This is to inform you that . . .
There are . . .
It may be necessary to . . .

--inflated words: difficult words that can be replaced by simpler words

Examples

Difficult	Simple
administer	manage
aggregate	total
effectuate	carry out
implement	carry out
issue	give
on behalf of	for
per annum	a year
prior to	before
procure	get
solely	only
subsequent to	after
terminate	end
utilize	use

--nominalizations: nouns created from verbs

Examples

Verb	Noun
promulgate	promulgation
remediate	remediation
rectify	rectification
verify	verification

Original: We conducted an investigation of the situation.

Revision: We investigated the situation.

SUMMARY

This document suggests ways for interactive documentation of software. But a successful user-programmer dialogue is largely the responsibility of the programmer. You must make an extra effort to assure that your writing is clear, correct, and concise. Use the following four-part summary as a checklist to determine how well you have adhered to the guidelines and to assess the effectiveness of your communication.

STEP 1 PLACEMENT OF INFORMATION ON THE CRT SCREEN

- o Observe the predefined positions on the screen.
- o Use consistent alignment of columns and lines.
- o Make blank space as meaningful as print.

STEP 2 SEQUENCE OF A SERIES OF PANELS

- o Order information in a timely manner.
- o Structure information in useful units.
- o Take into account patterns of user behavior.

STEP 3 INTERPRETATION BY THE AUDIENCE

- o Consider the knowledge, attitudes, and needs of the audience.
- o Anticipate various inferences the audience may make.
- o Avoid textual ambiguities that may lead to misinterpretation.

STEP 4 INTENTION OF THE WRITER

- Select an appropriate persona and maintain it throughout the message
- Use a tone that is proper for conveying information and is also friendly and motivated by a desire to be helpful.
- Edit your prose for economy and logic.

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