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STAFF PAPER

TRAINING USERS OF INFORMATION SYSTEMS:

SOME SUGGESTIONS

by

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PREFACE

This paper was written in response to a request from the STINFO Division, Army Research Office, for suggestions regarding the training of users of Technical Information Centers, Technical Information and Analysis Centers, and any systems which might exist for the purpose of providing communication between Centers.

The problem of user training has been made apparent from the results of a number of recent "user surveys" which showed that many scientists and engineers do not know of the existence of DDC and other DOD-supported information centers. Moreover, technical librarians are constantly complaining about the inability of library users to properly utilize the facilities available to them. As an example of a fairly typical quote, . . . "The sheer ignorance of how to work in a library by most students, graduate as well as undergraduate, and by young instructors is quite appalling." Rumor has it that you cannot obtain a degree in librarianship unless you "solemnly swear to be appalled." They do have a good point, however.

A good portion of our work in STINTRAC will deal with various aspects of user training. Some of this work will involve the examination of how to train users to utilize new information techniques and tools. In a more prosaic vein, some other work will involve the development of "publicity" programs designed to make the user aware of information centers and facilities, and to direct the users' use of these centers/facilities once he gets inside of them. This latter work may be done

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in connection with the Army Technical Library Improvement System Project (ATLIS). This project is now under the aegis of the Chief of Engineers, DA. We have recently been queried regarding two training tasks connected with the ATLIS Project. The first task deals with the training of users to use standard library facilities and reference materials. The second task deals with the training of library personnel to use automated procedures for ordering-reordering serials, for cataloging, for checking items in and out of library, etc.

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TRAINING USERS OF INFORMATION SYSTEMS: SOME SUGGESTIONS

The User Problem:

The literature and the survey data on the use of information centers and systems strongly suggests that researchers and engineers either do not fully utilize or else inappropriately utilize the information sources and techniques at their disposal. With respect to the scientific and technical information explosion problem, such findings pose a dilemma. We are not sure if the information explosion problem is primarily due to the inadequacies of our existing information techniques and systems, or due to the apathetic behavior toward and outmoded approaches to the collecting and processing of information which seem to be taken by many of our scientists and engineers.

One has no difficulty finding a wide variety of reasons why people do not use information centers. In many instances, these centers are not required. Researchers and engineers who are specializing in a rather narrow subject area generally keep up with and often possess most of the literature in their chosen field. Engineers who are primarily engaged in test and evaluation work may receive practically all of their information in the form of schematics, diagrams, and data tables from the manufacturer of the equipment which they are testing and evaluating.

Researchers and engineers do have ways to acquire information. These ways may be slow; they may be only partially adequate but, after a fashion, they do work. However, in the past few years new centers and new techniques for processing and collecting information have been developed. How

do we get the researcher and the engineer to learn about and to try out these new techniques and systems? This is the problem to which this Memorandum addresses itself.

Why Don't Users Use Information Centers?

Some commonly stated reasons for not using information centers and/or information processing techniques are:

1. There is a lack of knowledge regarding the existence of the Centers and/or techniques.
2. There is a lack of knowledge regarding how to use the Centers and techniques, and of the advantages to be gained from this usage.
3. There is a general apathy toward taking the time and effort required to use the new Centers and techniques.
4. There exists a widely held belief that information collecting and processing should not and cannot be delegated to others. This belief is fostered in our colleges and universities.
5. There is a general suspicion and/or distrust of information personnel. The competency of these persons is sometimes questioned, and there even seems to be an uneasy feeling that the Centers might try to withhold or manipulate information outputs.
6. There is a general dislike and lack of faith in information centers which often has arisen as the result of unfortunate interactions with technical librarians.
 - a. The researcher or the engineer may have been intimidated by a librarian because he could not precisely describe the information which he desired.
 - b. The researcher or engineer may have had his question

answered in an irrelevant fashion, or he may have received too few or too many documents in response to his query.

The reader, I'm sure, can provide additional personal reasons why he is or might be reluctant to utilize information centers and techniques. As we see it, all of these many reasons can be distilled into the following four statements: (1) There is a general lack of mis-information about the existence and use of information centers and techniques; (2) there is a lack of confidence in the capability of information centers and systems to provide information; (3) technical librarians often do not understand the capabilities and limitations of researchers and engineers, and vice versa; and (4) there is little motivation for using new information centers and techniques because often there is no noticeable pay-off for such usage.

What Can Be Done to Get Users to Use Information Centers?

We believe that information centers and techniques will be used to the extent that the user understands (a) how to use the centers/techniques; (b) what to expect by way of center/technique outputs; and (c) something about how the expected outputs are produced. We do not think that a detailed understanding of information centers and techniques is required of users. A quite general understanding should suffice. For example, we all use automobiles in our daily activities. We know how to use them in the sense of how to operate them. We know what to expect of them in terms of performance under various driving conditions; and we know when and why we would want to use them. Very few of us know in detail how an automobile functions and very few of us care to know this in detail. Likewise, most researchers and engineers desire only a general understanding of the internal workings of information centers, systems, and techniques; they do

desire a specific understanding of how to use them, when to use them, and what to expect as the result of using them.

A general understanding of how things work can be acquired from listening to a lecture or by reading training material. This type of "understanding" will not ensure that usage will occur. The potential user must acquire confidence in his ability to operate or use the information equipment, techniques, center, and he must acquire confidence that this utilization will produce an information output in a form which he expects, desires, and finds usable. Such confidence can come only from practice and favorable experience with usage of the information equipment, technique, or center in question. A somewhat similar point can be made with respect to Information Center publicity. It is important to publicize the existence of, and services and products of, information centers. This is an important form of user training. However, it is extremely dangerous to publicize unless you are ready and able to produce.

A general understanding of how an information center functions; practical experience with information center facilities and products; and the successful usage of information center facilities and products to satisfy an information requirement -- these are the three ingredients which are most apt to make researchers and engineers "users" of information centers and systems.

The Development of User Training Programs:

The development of training programs can be sub-divided into four general phases. Phase One concerns the determination of who needs to be trained. In Phase Two training content is determined. The third phase

concerns the preparation of training materials, and the fourth phase concerns the selection of training techniques which will be used to present the training material.

Who should receive "user training"? The determination of those groups of persons who should receive user training is based primarily on the types of information handled by the information center. Potential groups are:

- a. Bench scientists and engineers.
- b. RDT&E Directors and Supervisors (Middle Management) and STINFO Officers.
- c. Senior RDT&E Managers.
- d. Middle and upper grade STINFO Center Personnel.

STINFO Centers exist for the purpose of serving some special population of scientists and/or engineers. Obviously these persons should be fully cognizant of the Center and its services. In addition, the directors and supervisors of these bench workers should know how to use the Center. It is often these directors and supervisors who have to ensure that their personnel do use the Center. In addition, the Center may process certain types of management information which would be specially useful to directors and/or supervisors.

Senior RDT&E managers are not apt to have a need for detailed scientific and technical information and, therefore, would not need to know in detail how to use an Information Center. On the other hand, senior managers would want to know of the Center to include how their personnel could benefit from use of the Center.

Finally, there are the operators of the information center itself.

Certainly the more senior of these people should have an overall understanding of how the Center functions. In this regard, they undoubtedly would profit by the same type of familiarization training as given the users of the Center. This training would seem particularly appropriate for newly hired personnel.

How Should the Training Content be Packaged? Training material can be packaged in many ways. If presented by a lecturer, no packaging is required unless handouts are deemed desirable. If the trainee is supposed to study the material on his own, a training brochure or a programmed instruction booklet can be used. We feel that the training brochure form is most suitable for user training. The advantage of such a brochure is that it can be easily combined with a variety of training techniques and additional training material. The brochure can serve as a self-contained instructional package and be distributed for self-study. The same brochure can serve also as a reference source and as a job aid. For example, the brochure can contain a list of the reference sources located at the Center. It can contain instructions regarding the procedures for submitting questions to the Center, and so forth. In short, in addition to being an instructional brochure, it can be a how-to-do-it manual which the user can refer to as required.

We would like to stress the use of flow diagrams and other types of pictorial material in the training brochure. In fact, the brochure should probably be developed by first devising flow diagrams and other charts to explain the operations and services of the Center. Explanatory material can then be provided to cover these diagrams and charts.

Use of Training Teams and Training Exercises: It is one thing to prepare training material, it is something else again to get people to read this material or to attend classes and to pay attention while a lecturer is describing the material. This is where training techniques and procedures enter the picture. The simplest procedure we have just eluded to -- to present the trainee with a training brochure and ask him to read it. At certain designated times and places, someone from the information center can be made available to answer questions about the material. Self-study procedures should probably be combined with short, formal instructional sessions. Each Center should establish a small user training team which can visit the user sites and conduct short, instructional sessions. A single morning or afternoon session should suffice to cover all necessary material. The advantage of such a session is that the instructors can conduct various types of practical exercises which can demonstrate the capabilities, limitations, and the proper use of the Center.

We would like to place special emphasis on the use of practical exercises. Such exercises are used for the purpose of consolidating training and for allowing the trainee to acquire experience and skill. It is this experience and skill which gives the user confidence in the total information system. As an integral part of the training brochure, a set of practical exercises covering the use of various products and services of the Center should be developed. These exercises can be cast in a programmed instruction format.

We are all familiar with the use of film to introduce a new activity, organization or technique to a group of users. Films on the use of information centers are quite widely used in industry and apparently, work quite successfully.

The Sequence of User Group Training: There is some reason to believe that training regarding the use of information centers and systems should begin with senior personnel and work down to the researchers and engineers at the bench level. This approach is based on the observation that people at the bench level are most apt to do and to use those things which are approved by their research directors and supervisors. An individual researcher or engineer should not be placed in a position where his supervisor asks him why he is using a particular center or information collecting technique. Rather, the situation should be one where the supervisor or director asks, "Has this Center been used and if not, why hasn't it?" In application this means that for each RDT&E organization one should first train the directors and supervisors of that organization and then train the bench workers. It would seem to be of some advantage to train at least the directors and supervisors at the Center. If they so desired, these directors and supervisors could then return to their organization and conduct their own training sessions. At the very least, they should be more apt to look with favor on those workers who attempted to find out about, and to use the Center.

As indicated previously, senior RDT&E managers are not in need of specific information regarding the use of information centers. It would seem that these managers would be interested more in the various information centers that exist throughout the country and perhaps something about the system that ties these centers together. User training conferences at selected CONUS locations should take care of this training requirement.

Newly hired STINFO Center personnel form another group which could probably use the user training brochure. These personnel can be given this training as required.

The Continual Nature of User Training: It can never be assumed that users are completely trained. There always will be certain changes in the procedures followed by the Center and these have to be made known to the Center users. In addition, there will be users who attempt to use the Center in some inappropriate fashion. These and many other situations will have to be handled by Center personnel and, in a sense, this is a type of user training.

Many authors of articles regarding information centers have pointed out the importance of establishing strong feedback loops between the user and the Center. It is important to establish procedures for assessing the difficulties which users may be having, to include the reasons for these difficulties. It has been suggested that each Center establish troubleshooting teams whose specific job it is to immediately look into any major user complaint and to correct or to alleviate the reasons for these complaints (4). One corrective measure to consider is additional user retraining.

From time to time, the Center may create or eliminate some product or service. Information regarding this must be distributed to all users. The usual procedure of distributing change notification can handle minor changes in Center operations and services. If major changes occur, then sections of or perhaps even all of the training brochure material will have to be rewritten.

System Design versus User Training

During recent years, hundreds of "users" studies have been conducted in order to ascertain the information requirements and usage patterns of various groups of scientists and engineers. These studies have been conducted on the premise that "users are unquestionably the principal figures in the information storage and retrieval picture. Their needs are permanent; and the success of any system depends on how well they adapt to it, how well they like it, and how efficiently and thoroughly it serves their needs." (1) Unquestionably, information centers and systems should be user oriented, but this does not mean that the modus operandi of the user must remain inviolate. There is some reason to believe that "users" are not perfect when it comes to the collection of and use of information.

It seems easy to forget that users are an integral part of any information system which provides them services. When viewed in this fashion, it is seen that "designing" human components, to include those typically called "user groups," must be considered by information system and center designers. We believe that human components are conceptually very little different from machine components, procedural components, or any other type of system component. All system components must first be designed and then they must be constructed. Human components are designed in terms of physical and mental capabilities — in terms of information commonly called Human Factors information. The design of human components includes the design and construction of the various job aids or work tools which

can be used to supplement and/or extend human capabilities. Once designed, a human component is then "constructed" by the use of training techniques. Training can be viewed as a set of procedures for constructing a system component which is primarily composed of people.

"Whenever one speaks of user needs as they relate to the design of information storage and retrieval systems, it is necessary to think in terms of compromise The problem is one of deriving the definition of compromise in such a way as to minimize biases, and also of bringing together combinations of system ingredients that are likely to produce solutions combining broad user-acceptance and maximum economy. This is what we are trying to do when we set out to determine and define information-use patterns and requirements." (3)

We agree with this statement. However, such a statement does not imply that user requirements and usage patterns must be met exactly as they are perceived and/or desired by the user.

In the process of examining information requirements it is quite probable that new and useful sources of information will be discovered and/or created. The nature and use of these sources must be taught to the user. In addition, during this examination it is almost inevitable that new formats for presenting information will be suggested. If adopted, the user must be taught how to comprehend data and information presented in these new formats.

The incorporation of new information sources, processing techniques, presentation formats, etc., into an information center/system is apt to lessen the user-acceptability of that center/system. These new sources and devices will be foreign to the user — he won't know how to use them nor comprehend the value to be gained from their use. A solution is to conduct a series of user training programs, but this may not be a completely acceptable solution. Such training may require a large expenditure of time, effort, and funds. Moreover, there undoubtedly will be

user resistance if the training program is lengthy and arduous. This is where the compromising mentioned by Herner begins.

Information centers and systems should be designed so that, whenever possible, extensive user training will not be required in order to use the new and possibly non-conventional techniques and procedures adopted by the center/system. Extensive user training should be considered only when the objectives of the center/system cannot be met by the redesigning of equipment and procedures. This means that one should first determine what the information objectives of the center/system should be. These objectives should be stated in terms of user requirements, and preferably these requirements should be devised by a small group of highly qualified subject-experts, not by surveying a group of users, few of which have thought much about their information needs.

One should attempt first to design a center/system which will meet certain specified information objectives and also have high-user acceptability (be easy to use). As one devises the equipment, procedural, human, etc., components of this center/system, it will become apparent that certain features of the design necessitate extensive user training. One should then attempt to redesign the equipment and procedural components of the system so as to eliminate this training requirement. If this does not seem possible, one should next examine the user training possibilities in order to estimate their feasibility. A small group of knowledgeable users and RDT&E managers can be used to ascertain the acceptability of the proposed training. It is only after this second course of action has been examined and discarded that one should consider lowering the objectives of the center/system. After the objectives have been redefined, the machine-human interface problems can be re-examined first with respect

to handling the problem through equipment/procedural redesign and then in terms of user training.

RDT&E products and outputs are produced by scientists and engineers who are integral components of the one or more information centers and systems which serve them. Most of us believe that these RDT&E efforts will be furthered in proportion to the quality, quantity, and timeliness of the informational outputs of our information centers and systems. Thus, we try to devise new and better ways of collecting, processing, forming, disseminating, etc., information. But we know that things and procedures are often easier to change than people. Therefore, when we must consider the redesigning of an information center or system, we look first at the equipment and other non-human portions of the system; if the problem still remains, we consider the redesign of the human components of the system; if that does not seem feasible, we reluctantly consider the lowering of the performance objectives of the center/system.

Summary:

In concluding this Memorandum, let us reiterate the main premises upon which we have based our suggestions regarding user training. First, we feel that all Center users should have a general understanding of how the Center processes information and queries about information.

Secondly, we have made the obvious assumption that a specific effort should be made to ensure that users do know how to obtain and to use the products and services of the Center.

Thirdly, we have assumed that users will use information centers to the extent that they have confidence in the Center's ability to meet STINFO requests. We believe that this confidence must initially come through supervised practice.

Fourthly, we feel that bench scientists and engineers are not apt to use information centers unless their research directors and supervisors are favorably inclined toward their use. We believe, therefore, that RDT&E directors and supervisors are the first ones who should be made aware of the joys and rewards of using information centers and systems.

Finally, we believe that information centers and systems should be so designed that they are easily usable by, and immediately acceptable to, the user. However, this is an ideal goal which can seldom be attained. When center-user interface problems do occur or can be predicted, we believe that redesign of the center hardware, procedures, etc., should first be considered. But a possible solution through user training should not be overlooked; one should merely remember that people are sometimes difficult to change.

Information scientists perform many functions, not the least of which is the design and/or redesign of all components of an information center and/or system so that information can be collected, processed, stored, and utilized in an efficient manner, and Users are integral components of information centers and systems.

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