Application of Battelle Technique to the Operation of Information Centers*

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This paper provides some of the details of how we apply the qualitative approach to the use of scientific information. The specifications already given by Mr. Simpson are basic to the understanding of the qualitative approach so they are repeated here but in a briefer form: (1) quality control by user; (2) minimize time spent by user in information processing; (3) convenient, nonrestrictive retrieval procedures; (4) rapid access to information; (5) no subject index; (6) prompt entry of current material.

To insure that the specifications are met insofar as possible, technical personnel coordinate the over-all research effort. Another person is chosen to head the technical information activities, but is responsible to the coordinator. The coordinator assigns his available technical staff to the tasks necessary for the accomplishment of technical facets of the activity. The chief of the information activities assigns information specialists to work the same technical areas as covered by the technical staff. Usually there are several technical people per information specialist but essentially a team is formed of technical persons and information specialists to be responsible for information needed to accomplish the technical task.

The information chief, after consulting with the coordinator and the technical staff, arranges with the Battelle Library for a flow of published literature to a central point, the information center. Thus the users have provided the initial guidance for the published literature input. Concurrent with the start of the published literature flow the information chief starts an aggressive information search for other sources of information. Also he asks each technical man on the project to recommend sources of information to the center. This leads to quite a load of material arriving at the center but a refinement is already taking place—the inputs are selected by the technical man.

The information specialist and necessary clerical staff function to relieve the user of the routine tasks of document handling. The information specialist then routes the literature to the technical man who chooses specific articles for retention in an information file. He further indicates which portions of the articles should be retained and he underlines technical words in the retained portions that he considers to be clues to the content of the article. These clue words are not predetermined but in each article any words are underlined that in the mind of the technical man are significant to the meaning of that article. He returns the article to the information specialist assigned to him. The information specialist marks the article so that a typist can prepare an offset duplicator master (Multilith) of the portion of the article extracted by the technical man. The information specialist may also extract additional information from the article to more or less round out the completeness of the extract and to provide further retrieval clues. If an abstract is received into the center there is no need to extract it but the technical man provides guidance as to which abstracts should be retained and which technical clue words should be underlined. In cases where technical men are on trips, tied up in the laboratory, or just too busy, the information specialist as he gains experience can do a greater portion of the selecting and extracting. The determination of how much technical assistance can be provided by the information specialist depends on many factors related to the nature of the information and to the astuteness of the individuals concerned.

The names of authors, coauthors, institutions, contract numbers, and the technical clue words are underlined on the reproducible masters.

Copies of the extracted information are filed by each underlined word. The names of persons and companies are alphabetically filed in two segments of a larger file, contract numbers are arranged numerically, the technical clue words are filed by any arrangement convenient, normally alphabetical. It is important to note that the full information is filed at every entry. The ideal situation is to prepare extracts that become independent of the original source.

Before discussing retrieval, it is necessary to describe a few mechanics that we have found to be very important to the file searcher, who is the technical man desiring information. (1) All information is filed on 5 × 8-inch cards for convenience of handling and study by the user. (2) All underlined words show on every set of cards in the file. These words serve as "see also" terms. (3) When more than one card is needed for an entry, they are arranged so that the clue word under which it is filed is always on the top card and underlined in red.

The method of retrieval is by direct approach. The file is used by the requester much as an encyclopedia would be used. Some word or words occur naturally to him as he thinks about the problem on which he desires information. He selects the cards filed by any one of these words. Because the word is in context, on the top card, and underlined, his mind immediately is stimulated to accept or reject each entry on the basis of its applicability in context to the peculiarities of his problem. Other lines of approach will be suggested to him because of the additional clue-word underlines. Authors and organizations doing work closest to his interest will be identified. The information for each identification is immediately available.

The author and organization files are an important adjunct to the technical clue-word files. The selection of a technical clue word is a subjective act both in the input and retrieval processes. As clues, however, they will permit a user of the file to identify individuals and organizations who are contributing to the technology of interest to him. Once this identification is made by the user, he then has access to filed information independent of the choice of clue words that appear on the cards. This search technique has avoided successfully the use of indexes and codes and the associated arduous task of working out subject headings.

A most significant circumstance that we anticipated and that we have found to exist is that every scientific searcher is stimulated along different retrieval sequences

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even in the same field. That this was expected developed from conclusive evidence that a scientist or engineer is unable to describe with precision the parameters of the subject in which he is interested. Our observations regarding the literature search mechanisms of a scientist or research engineer obviously cannot be expressed with "engineering precision." We have observed that many users think first in terms of the outstanding specialists of the day; others think in terms of the outstanding research organizations, whether government, academic, or industrial. These thoughts constitute the users' knowns or points of departure. But when the users are *not* aware of the people or the facilities, their search mechanisms are irregular. While we would like to have been able to observe that a user's search pattern could be said to follow directly from one point to another, taking the shortest distance, we observe, rather, that the user's thought process is more like the Brownian movement. We suspect that this circumstance will become recognized in time as the very crux of the information-retrieval problem, and that it will be described as the identification mechanism—a personal-individual action.

Those who make the most valuable and timely identifications are the creative scientists and research engineers. Evidence of our observations is revealed by the circumstance that in the many searches made each day over a period of 9 years, or more than 2,300 days, or in excess of 10,000 searches, the same retrieval sequence never has been duplicated.

To summarize our experiences in developing and operating scientific-information centers, we have found it essential not to contaminate the information input or restrict the user's imagination. Information processed into an information system should be, so far as possible, in the words of the original author or abstracter and not a coded version of what someone thought the author said. We have found that the user must not be expected to define precisely the parameters of his interests. Rather, the user should be able to proceed quite naturally and with ease from one thought to another, selecting and rejecting information, based on the information itself, which must be provided in a thought-stimulating environment. We expected and found that, if the user is recognized as an integral part of the information system, the quantitative aspects of the problem of storage and retrieval of huge numbers of information inputs disappear. The solution of our information problem was obtained by acquiring a better understanding of the qualitative needs of the user of information and by a study of the nature of scientific information.

Mechanics of Answering a Technical Inquiry*

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This paper is directed to those who have had the experience, or may face the experience of seeking all available information on a specific subject—"as soon as possible." When we get these urgent requests we may find ourselves in a peculiar position, like the person who has mislaid some important documents. We know that the information exists, but where can we go to find it quickly enough. You may be interested to hear how an urgent technical inquiry was answered using an information center at Battelle.

Seeking Information for the Inquiry.—Prompt dissemination on manufacturing processes for new and established materials is a task continually faced by engineers, metallurgists, and chemists. This is especially true in the aircraft and missile industry. Here, the pressure for increased performance and greater reliability is ever present. It is here where newly developed high-strength, thermal-resistant materials with only limited production experience must be used for components facing unusual temperatures, pressures, and perhaps corrosive environments.

A case in point is the fabrication of high-pressure gas containers for aircraft and missiles. Typical examples of these pressure vessels are shown in Fig. 1 as a group of spheres and cylinders. The spheres are fabricated by joining machined hemispheres which previously had been forged, or deep drawn, or spun into preliminary shapes.

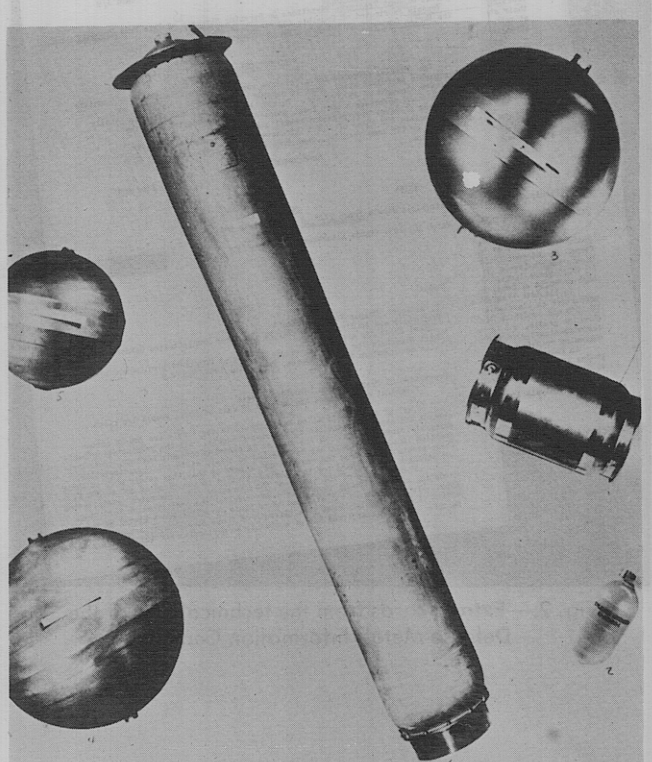

Fig. 1.—Examples of pressure vessels (courtesy of Menasco Manufacturing Company).

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