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DATA/INFORMATION AVAILABILITY

Edited by
RALPH I. COLE



The American University
Technology of Management Series
PAUL W. HOWERTON, *General Editor*

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FOREWORD

In a recent Institute held under the auspices of the Center for Technology and Administration of the American University, the subject of the "Availability of Data/Information" was treated in appreciable depth. Those papers which tended to highlight the issues of information availability have been edited and related to one another in a forceful way by Ralph I. Cole, Director of Institutes and Special Programs in the Center.

The meeting has stimulated "thinking in depth" in the subject area as is demonstrated by the returns we had from the participants. By participants we mean both the distinguished group of speakers and the highly articulate attendees. The speakers brought a wide variety of well-informed backgrounds and interest to the consideration of the subject. We owe them a debt of gratitude for their meaningful contributions to the information sciences.

We do not represent this collection of opinions as an agreed position on how to manage the availability of Data/Information, because we feel that there is no one demonstrably superior method. We try to present the issues both existing and potential with some indication of tested solutions to identified problems.

Paul. W. Howerton
General Editor

PREFACE

The papers selected for presentation herein represent but a few of the more important aspects of data generation, format, storage retrieval and utilization which concern the management of technology.

The first two papers in Part I treat the history and growth of data handling, particularly those aspects which concern *structuring* explicit meanings to chemical and biological data Elements when used in conjunction with electronic methods for Filing and Retrieval. The third paper of Part I attempts to look into the future of "computerized" information handling and commands considerable attention.

Part II consists of two papers dealing with the science of management and the relationships that exist to both technological advances and decision-making, all referenced against the oncoming rush of knowledge.

Part III deals with Data/Information sources and their Utility and represents the experience of five distinguished speakers each selecting but one aspect to explore.

Part IV includes three papers each treating a different and difficult aspect of improving the structure, content, and usefulness of data.

Without question the field of Data/Information suffers from a lack of formal structure and guidance that will be benefited from a study of these discussions. Judging from the laments of managers, greatly increased effort in this particular area is sorely needed.

Ralph I. Cole
Editor

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ISAAC D. WELT

Center for Technology and Administration

Libraries have traditionally assumed responsibility for most of the important functions of Information Centers in many areas of science, particularly in biomedicine. Plans for such centers are therefore mainly concerned with the handling of documents. Acquisition, processing, abstracting, indexing, and dissemination of documents are certainly proper functions of Information Centers, although the needs of research personnel cannot be fully met by this type of operation. Methods must therefore be evolved for the detailed analysis and evaluation of document *content* in whatever depth is necessary.

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F. ELLIS KELSEY

Public Health Service, Department of Health, Education and Welfare

Efforts to relate chemical structure to biological activity, originating in the work of Erlich, have depended on accurate knowledge of chemical structure and reactivity. Although the characteristics of most biological processes are as yet ill-defined, many relationships to well-understood chemical compounds have been established. Future developments depend on the capacity to organize both chemical and biological knowledge in a form that will permit the use of electronic methods for filing and finding. A long step in this direction is the plan to provide a completely computerized file of all known chemical structures, and

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CHARLES DE VORE

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Washington, D.C.*

Acquiring essential engineering data promptly and organizing it for most effective retrieval is understandably of great concern to the Department of Defense, from the standpoint of developing possible solutions to engineering problems as well as with the operational use of such solutions. An outstanding example of a long-range program, involving a multiuse computer network, is Project MAC—for Multiple-Access Computer and Machine Aided Cognition.

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C. STARK DRAPER

Massachusetts Institute of Technology

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HAROLD F. LANIER

Goodyear Aerospace Corporation

Much of our information-handling structure is predicated on the assumption that technical information is either (1) secretly held for exploitation by the owner, or (2) fully authenticated and published for the general use of the technical community with, however, recourse to patent safeguards, or (3) that which is selectively distributed as part of the combined industry/government research and development program planning. In this latter area, technical information is usually neither complete nor authenticated, rather a "sample" that is but a prediction of the real "flow" to come. Such is the data that is exchanged between customers and vendors as they make their response to the government's request for new research and development projects. The acquisition, verification, and utilization of semiavailable technical information is discussed, particularly as it concerns those phases of R & D from program inception through preliminary systems engineering.

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G. S. SIMPSON, JR.

Battelle Memorial Institute

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7. Patents: A Valuable Information Source for Research 87

PAUL W. HOWERTON

Center for Technology and Administration

The American University, Washington, D. C.

Patents constitute the most compact and easily identifiable technical literature resource available in which cause and effect are shown with minimum verbiage. One-sixth of all U. S. patents of a chemical or chemically related nature granted in 1963 were assigned to foreign companies and countries. Technical information on methods of manufacture, results of experimentation and utility of inventions is frequently revealed only in the pertinent patents and does not get into the usual journal literature. This point is particularly important in connection with patents granted in foreign countries to organizations within these countries. Examples of the richness of patents as a technical information source illustrate their potentialities.

8. NODC: An Experiment in Response to a Need for Scientific Integration 103

THOMAS WINTERFIELD

National Oceanographic Data Center

Washington, D. C.

The National Oceanographic Data Center (NODC) is designed to act as an integrating force in oceanography both nationally and internationally. First, it is an interagency activity integrating certain oceanographic activities of a number of government agencies and private industry. Through exchange agreements with more than thirty countries it furnishes a link between the national and international oceanographic efforts. Second, by acquiring, processing, archiving, and indexing nearly the entire spectrum of oceanographic data, it serves to integrate the various scientific disciplines which constitute oceanography. Third, through quality control, promotion of standardized formats and techniques, and formatting of the basic archives, it serves to integrate the data-producing with the data-consuming activities.

9. Availability and Creative Uses of Topographic Data113

MORRIS M. THOMPSON

Geological Survey, Washington, D.C.

Topographic information, consisting of quantitative and qualitative data on the nature of the earth's surface, is used creatively in the planning of major enterprises. Such information is usually presented in continuous form on maps. Potentially, automatic data-processing techniques can be used for the retrieval of topographic data.

10. EPIC: Economic Progress Through International Communications133

ALBERT N. ABAJIAN

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The American University, Washington, D.C.*

Expansion of exports is believed vital to the achievement of United States goals. Failure to increase exports sufficiently is a matter of urgent national policy. While world trade volume has increased more than 300 percent since 1946, the United States share has declined substantially. Potential American exporters lack pertinent information on foreign markets and will not risk capital on questionable ventures. A scientifically worldwide information-processing system is described which is believed essential for international business.

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AUGUSTUS C. JOHNSON

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ROBERT L. BIRCH

Scientific Library, U. S. Patent Office

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JOHN I. THOMPSON

John I. Thompson and Company, Washington, D.C.

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PART I

CURRENT DEVELOPMENTS IN DATA SOURCE, TECHNIQUE, AND FUTURE TRENDS



BIOLOGICAL DATA/INFORMATION CENTERS AND THE FUTURE

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A rigorous definition of the terms "data" and "information" is needed before we venture to talk about them. Very few words have been as badly misused as this popular word *information*. Information science, information theory, information storage and retrieval are used synonymously with a total lack of regard for precision of language. The most flagrant abuse of the term is probably in describing a document storage and retrieval system. Here, there is a confusion between ends and means.

Ideally, the aim of an information center is to provide information. In practice, however, the vast majority of these organizations provide nothing more than unevaluated documents which, presumably, contain information. It is up to the user to extract pertinent information from this pile of printed material.

Document storage and retrieval systems have been discussed quite amply in the published literature of documentation as well as at numerous meetings, symposia, conferences, and workshops. In recent years mechanized methods for the handling of documents have come to the fore, involving either magnetic tape or photographic film as the storage medium for indexes to documents. Photographic film possesses the added economic advantage of being available, in microform, as a storage medium for documents as well.

The relationship between true data and information storage and retrieval, which is the subject of the present Institute, and what is generally described in the literature under that name, is close enough to have provided opportunity for confusion. There is a spectrum of activities, of a

continuous nature, which embraces a good part, if not all, of the processes involved in scientific communication. It begins with data and ends with data.

First, we have the experimental data developed by the scientist and engineer in his laboratory, much of them in tabular or graphic form. Convention dictates that the results of research be written up for presentation at meetings or for publication in scientific journals. As a result, a superstructure of language is built around the data. Thus we have the historical introduction to the work, a description of apparatus and techniques, the actual data, a discussion of what the author thinks they mean, some polemics, a summary and a list of citations or references. This constitutes the conventional scientific paper.

Some time after its publication most scientists and engineers decry the time lag. The paper is abstracted by, we hope, a competent subject-matter authority. If the abstract is at all informative, it must contain something about methodology and conclusions. It does not usually contain the actual data. Still later on, the abstract, or perhaps the original paper itself, is indexed for accurate and efficient retrieval. Retrieval of what? Of the paper. In other words, this is indexing for document retrieval. An efficient document-retrieval system will greatly facilitate the writing of review articles, both critical and uncritical. To do so, the reviewer should read all of the pertinent documents, thereby becoming familiar with the data contained in them. He is actually synthesizing facts which are scattered among many journals in the literature. At this point in the spectrum, data collections become feasible and true information storage and retrieval appears. Laboratory data bearing on a particular problem can now be collected, published in the form of a handbook, or stored on magnetic tape or photographic film. Critical evaluation of the data by competent scientists and engineers is possible. We have arrived at the far end of the communication spectrum and once again are dealing with data rather than with documents. We can thus provide a service which is badly needed by almost all scientists and engineers—namely, specific answers to specific questions, such as the melting point of a chemical substance or the coefficient of expansion of a new alloy.

DATA/INFORMATION

The definition for data—or rather for datum—as given in Webster's *Second International Dictionary*, is perhaps adequate for our needs. Datum is defined as “a fact or principle granted or presented.” In the field of science, it is most frequently of a quantitative nature, although not