

INDUSTRIAL INFORMATION SYSTEMS

A Manual for Higher Managements and Their
Information Officer/Librarian Associates

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with a Chapter by
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Dowden, Hutchinson & Ross, Inc.
Stroudsburg Pennsylvania

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Library of Congress Catalog Card Number: 78-15890.
ISBN: 0-87933-328-6

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80 79 78 1 2 3 4 5
Manufactured in the United States of America.

Library of Congress Cataloging in Publication Data

Jackson, Eugene Bernard, 1915–
Industrial information systems.
Bibliography: p
Includes index.

1. Industrial management—Information services.

I. Jackson, Ruth L., joint author. II. Kennedy, Robert A., joint author. III. Title.
HD30.35.J3 027.6'9 78-15890
ISBN 0-87933-328-6

Distributed world wide by Academic Press,
a subsidiary of Harcourt Brace Jovanovich,
Publishers.

INDUSTRIAL INFORMATION SYSTEMS



**PUBLICATIONS IN
THE INFORMATION SCIENCES**

Rita G. Lerner, Consulting Editor

TWO CENTURIES OF FEDERAL INFORMATION/*Burton W. Adkinson*
**INDUSTRIAL INFORMATION SYSTEMS: A Manual for Higher Managements
and Their Information Officer/Librarian Associates**/*Eugene B. Jackson and
Ruth L. Jackson*
LIBRARY CONSERVATION: Preservation in Perspective/*John P. Baker and
Marguerite C. Soroka*

Dedicated to the Memory of Our Parents

A painful work it is I'll assure you, and more than difficult,
wherein what toyle hath been taken, as no man thinketh, so
no man believeth, but he that hath made the trial.

Anthony A. Wood

(as quoted by Karl Pearson,
FRS, in *The Incomplete Γ*
Function, 1922)

Preface

All organizations accumulate information. Some organizations underutilize it for meeting major corporation objectives and a few organizations use information to maximize profit return.

It is our purpose to provide guidance to industrial higher management and to their information officers/librarians. We wish the former to be able to identify those elements of an information service they already have on hand, what reorganization and enhancement is required and what expense in materials, facilities, and (most important of all) information service leadership is needed to achieve an optimum degree of information utilization. For the latter we wish to provide policies and procedures that are heavily based on our experience on the corporate staffs of two major industrial corporations that operate internationally.

Our justification for the bi-level approach is that higher managers typically know very little about the issues in providing a professional information service (perhaps basing their impressions on the public library of their youth, for example) and information officers/librarians are going to have to develop higher management skills in the future as they are using a scarce commodity—that is, company resources—while providing a professional service function. We are convinced that the more each “side” knows about the other’s perceptions, plans and procedures, the better off both are.

Then there are the students of information science, librarianship, and management who aspire to careers in the industrial sphere. We would hope that this book could serve as a graduate text in courses in information systems/services, in industrial special librarianship, and as collateral reading in seminars on management of industrial enterprises.

We are accustomed to the industrial practice of hearing suggestions or questions of clarification as the presentation proceeds. Since that facility is not currently available to us as authors, we fall back on the device of soliciting comments, suggestions, and/or criticisms by mail to P. O. Box 7576, Austin, Texas, 78712.

Eugene B. Jackson
Ruth L. Jackson

Acknowledgments

The authors recall stimulating years at the General Motors Technical Center, Warren, Michigan, and especially appreciate the helpful discussions with John Campbell and Arthur Underwood, then of the GM Research Laboratories, and with B. J. Kelly, then of the GM Engineering Staff. Their colleagues from other staffs and divisions around the United States and Canada on the GM Committee on Technical Literature formed an excellent forum and reaction panel to ideas. Also the junior author recalls a broadening association with the late Florence Armstrong of the Ford Motor Company Central Office, Dearborn, Michigan.

The International Business Machines Corporation's headquarters at Armonk, New York, provided the locale for the IBM Engineering, Programming and Technology Staff and unparalleled communication links with other corporation facilities throughout the Free World. Both Jerrier A. Haddad and Homer Sarasohn were enlightening orientators and advisors for the senior author. The opportunities provided to visit frequently the domestic and Canadian libraries and information centers and to meet annually with the European members of the IBM library community added immeasurably to the potential of the position held as Director of Information Retrieval and Library Services.

We are indeed grateful to Robert A. Kennedy, a long time friend in the profession, for his perceptive summary look as a participant in the exemplary "Bell Laboratories Library Network" that forms Chapter 11 of this volume. We note that Dean C. G. Sparks provided certain administrative support in the preparation of this volume.

Finally, nearly a decade of association with fellow directors of Engineering Index, Inc., New York, was bound to have influenced our perception of users needs and their fulfillment. This is what information center service is all about.

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Chapter 1

An Overview: The Information Explosion and Its Implication for Management

E. B. Jackson

The phrase "information explosion" is both catchy and largely accurate. Webster defines an *explosion* as "a large-scale, rapid and spectacular expansion."¹ Perhaps the first factor to consider here is the extent of the "expansion."

Some authorities say that one-half the present body of knowledge has come into existence in the last twenty years. Another statistic quoted is that five to ten times more information is available in a given subject area than thirty years ago.² Yet another statistic is that five million scientific and technical articles are published annually in about one hundred thousand journals, yet my former company takes around five thousand journals or less than one twentieth of those available. In August 1975, many of us received the *Harvard Business Review's* mailing in which Mitchell Reade wrote, "The world's output of new books is around 1,000 titles *per day*. The United States Government publishes over 100,000 reports a year, plus over 450,000 articles, books, and papers. The world generates new scientific and technical information at the rate of about six million pages a year."

To get even closer to home, I participated in an Ad Hoc Group meeting in Washington that developed the estimate that approximately 20,000 items are issued in the field of information science (my own specialty) during the course of a year. I try to keep up with this through the aid of colleagues in

Adapted from the first Lincoln lecture presented at the Arizona State University, College of Business Administration and Center for Executive Development, Tempe, March 4, 1969.

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professional societies, indexing services, and a major academic library. Yet I do not feel confident that *all* important items in these 20,000 come to my attention.

If one studies the technical journals of today and those of thirty years ago, it is clear that the complicating factor is not that sheer volume alone is larger, but that the interaction with other more distant fields is greater than was true then. A trivial example of the change is that a major tobacco manufacturer now has to be concerned about marketing patterns for Chinese specialty foods, such as chop suey, while a more elegant example is the current considerations of the social implications of engineering processes that are involved in pollution and urban considerations. There are probably also areas in which *you* feel obliged to keep informed today that were foreign to your primary interests a short while ago.

It is a prime purpose of these pages to lead you to a greater awareness of the types and sources of information that could be employed in your operation and to gain a sense of the urgency in managing well your company's "information asset." One ex-Department of Defense official has pointed out: "Information is a resource whose generation consumes time and money, whose use conserves time and money, whose cost and value are not known to management."³ We will be most concerned with this last point. A Danish colleague makes the points that "knowledge is a commodity" and that "information service is the marketing of that knowledge."⁴

I have mentioned elsewhere that operations, staff, and research formed an intertwined trinity in informational needs and that it is virtually impossible to consider any one group's informational requirements as being its own prerogative. For example, a rise in the price of one metal triggers a research group effort to find a substitute for that metal in a particular application, and the resulting project could convince the staff of the desirability of substituting this new material. This in turn could cause production problems for operations, possibly even involving toxic conditions. The matter must be referred back to research for alleviation. The result could cause a staff decision on whether the safety precautions required are so expensive as to negate the tentative decision to substitute this cheaper metal.

I summarized information needs then as:

Staff requires information of many types: economic, legal, personnel relations, public relations, technological and others. Economic needs include prices of materials and services, rates, marketing studies, financial climate, insurance, taxation, and competitive position. Legal needs include such matters as regulatory information (codes, ordinances, statutes, decisions), extent of trade cooperation, taxation, and legislative liaison. Personnel needs include labor relations matters, management and supervision practices, industrial policies, recreation requirements, recruiting sources and tests. Public relations requires

knowledge of attitude of local or regional area toward the industry and/or its products, the responsibilities of the organization toward the local area, the regional area, the rest of the industry, the trade associations and the overall industrial complex. Procurement sources and design principles are other examples of needed information for staff.

Operations needs "how-to-do-it" information on processes, materials handling, automation, standards, material properties, scheduling, foremanship, plus detailed information in many of the fields listed above.

It might be easier to list the kinds of information that research does *not* require than to list the kinds it does. As the possession of a burning curiosity and the abhorrence of the conventional are prime requirements for a successful researcher, then the horizons of his information needs are necessarily limitless in breadth and depth . . . [For example] some years ago I had to make extensive literature searches into pipe organ literature to find information that bore on the resonance of ram jet engines — both fields concerned vibrations in pipe which phenomena were subject to the same physical laws.⁵

Information is clearly a vital asset of the firm and, if properly employed, could rank in importance with the organization's personnel resources, physical facilities, and financial resources. Other assets that have an information content are patents, franchises, and good will. A basic principle is that information must be totally exploited in support of the company's mission.

What are the sources of this information asset? They may be from within the company or outside the company. In general, information is obtained from three sources. First, there is the internal information generated within the firm. The second and third sources are external: "closed" information, such as that from military security and trade associations; and "open" information, such as that from technical societies and commercial publishers. The relative volumes of these three areas of information would not only vary from one company to another, but from one company's particular installation or division to another. For example, a defense-related division of the enterprise would have a greater volume from the second source whereas the research division would probably receive more from the third source. Marketing would use all three. (It should be noted that "outside" information that is added to existing company information can result in new company information.)

Harnessing all the information at a given location in a company is complicated by the factor called "iceberg effect," which exemplifies the relative volumes of information available at this location and in the great outside world. At the top of the iceberg, the smallest part, would be the total information immediately available at a specific company location; next larger in amount would be the additional information elsewhere in the company; at the base of the iceberg is the third and largest source, the additional information outside the company.

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Each division or enterprise within a company must receive its own information flow from the three available source areas.⁶

It has been shown that the information for the company comes from a variety of sources. The *open* literature has certain characteristics, such as being a large mass; it is less obviously oriented to the company's mission and is of an uneven quality. Although the company's internal information may have great pertinence, it may not be known or available outside of the particular company unit that developed it.

As a technological lead in an industry is mainly the buying of precious time, the time should be used as effectively as possible through proper exploitation of the information upon which the lead is based. After all, competitors do have capable people and suitable facilities, and it is possible that your effective handling of proprietary information could be the edge you need.

Information can be considered as "perishable," and this contributes to the urgency of its handling. It is commonplace in technical fields that the value of information is the greatest in its first five years of existence, and falls off sharply thereafter. For example, 60 percent of the interlibrary loan requests that General Motors Research Library made on other libraries was for material up to five years old, and only 24 percent for material issued in the previous decade. One patent service in England capitalizes on this feeling of perishability by printing a special version of its service on newly issued foreign patents and airmailing it to North America at a sizable premium over that of the regular edition. Pharmaceutical firms among others are pleased to pay this premium. In nontechnical areas, nothing is so unhelpful as a superceded regulation of a regulatory body or a noncurrent labor contract.

There is a clustering of value in the "open" literature that has been repeatedly demonstrated. For example, one major industry that has a centralized photocopy service observes that 60 percent of all photocopies are requested from a list of fifty journal titles. That it would be a serious defect to ignore the other 40 percent in several hundred other journals is illustrated by the fact that Mendel's Laws of Heredity and the development of DDT were both unknown for years because of the obscure sources in which they were first published. Another illustration is that the first reporting in any detail of the Wright Brothers' Kitty Hawk flights was in a beekeeper's journal.

The "closed" literature would primarily include trade association information, draft responses to regulatory bodies, and proposed hearings statements. Company security is a consideration in the availability and utilization of this information. Individuals' access to it would vary with their work assignment. For example, being on the Corporate Headquarters Engineering Staff meant that I had far greater access to engineering information than to legal, personnel, or financial information. Of course there was some information in the latter categories I could have access to when my staff studies so required.

Formal restrictions on "closed" information may vary from one division to

another. For example, in a decentralized company, it is conceivable that the financial results of each division are only known in that division and in the central financial staff, but not in the other divisions. Another example is the dichotomy between the domestic operations of a company and the foreign operations where U. S. Department of Commerce regulations would affect the "closed" information supplied to the foreign arm of the company. Still another dichotomy can be between the parent and its subsidiary organizations on matters of information. Military security regulations are imposed from the outside and their observance is an obligation of contractual relationships. Access to a very large body of "uneven" material can be secured with the possession of suitable military security "need to know."

The above is not a catalog of all the limitations that can exist on the flow of information in a firm, but they are indications that aggressive policies must be exercised to insure that all information be made available to those having a need of it to perform their assignment. The passive acceptance of unwarranted denial of access to particular classes of information has no place in a company information service.

By an understanding of the earlier quote, "Knowledge is a commodity . . . and information service is the marketing of that knowledge," we see the functions of an information service include the exploitation of the material that has been acquired by the organization. To perform its functions has entailed *acquiring* informational material by using its particular competencies and such expediting facilities as leased phone lines, leased cables, company mail service, or even company airplanes; after which the material has been *processed* (listed, analyzed, and indexed); then its existence has been made known through *dissemination* media within the company, following which it has been effectively *used*, thus completing the information cycle within the company.

In carrying out all these functions, it is important to avoid the common weakness: inertia and losses within the system can lead to the situation where all the material acquired is not effectively used. It is not represented that the development of the optimum information system that will make the needed information fully available to your firm is an easy task. However consulting and planning bodies have issued proprietary reports on information systems and see a definite trend toward active information centers succeeding the passive custodial services of the libraries of the past.

To pursue the area of dissemination or announcement of newly available information as an example, there have been listings of the "what's new in the library" type for years, but now there are many instances of "selected dissemination of information" (SDI) in existence. This is a procedure whereby individual items of information are called to the attention of persons or groups periodically on the basis of their previously declared fields of interest. In my former company, there are several hundred engineers who receive announcements on

punched cards containing abstracts of articles that have been machine-selected on the basis of just such profiles of interest. Some writers in the information science field have been concerned about the cost of such service and advocate the distribution of announcements to project *groups* or subdepartment levels rather than to individuals. Such listings could be called "narrowly defined announcement bulletins."⁷

A rare attempt to express the value of such announcement services in management terms was the statement by Dr. N. B. Hannay, Chairman of the American Chemical Society's Sub-Committee on Economics of Chemical Information, that properly handled announcement services could save a firm 217 hours per week per person. At \$20 an hour, a firm employing one hundred chemists would save approximately \$250,000 a year, less some portion of the cost of maintaining this service.

Utilization of information can be aided by machine methods, and the legal profession has long been actively at work in this field. Under the Great Society program, efforts in the field of medical information received great impetus, and a system called MEDLARS was developed by the National Library of Medicine which employs regional information services. That library has a whole family of on-line information retrieval services now (MEDLINE, TOXLINE, and so forth) available at modest cost to medical scientists and practitioners.⁸ The field of chemistry has services focusing around the Chemical Abstracts service familiar to some of you. (Note that these two pioneering "families" of services are among the 76 data bases available on-line through commercial jobbers in 1977.)

The field of engineering suffers from a fractionalization of efforts, although there was a tripartite effort going forward under the Engineers' Joint Council, United Engineering Trustees, and the Engineering Index, Inc., to study the feasibility of a national system for engineering information. One concept of what this national system for engineering might look like showed a switching and referral level. "Switching" means receiving a request that is not in your information service and sending it to a location having it for fulfillment via your center; "referral" is informing the requester of the location of the information but not securing it for him. The system envisioned by the tripartite efforts was never funded.

The next level of complexity is the even more sophisticated system to be used by the National Scientific and Technical Information System about 1978, according to a group at Battelle Memorial Institute. A significant quote from their article is, "while techniques for handling information will be gradually improved in the years to come, the basic methods have been established, and at this point no revolutionary methods appear to be emerging. The really important changes for the future appear to lie in management functions and standardization of format."⁹ The very last point has to do with the facilitating of switching and interchanging among information systems when the bibliographic elements of information follow a recognizable order and are identified