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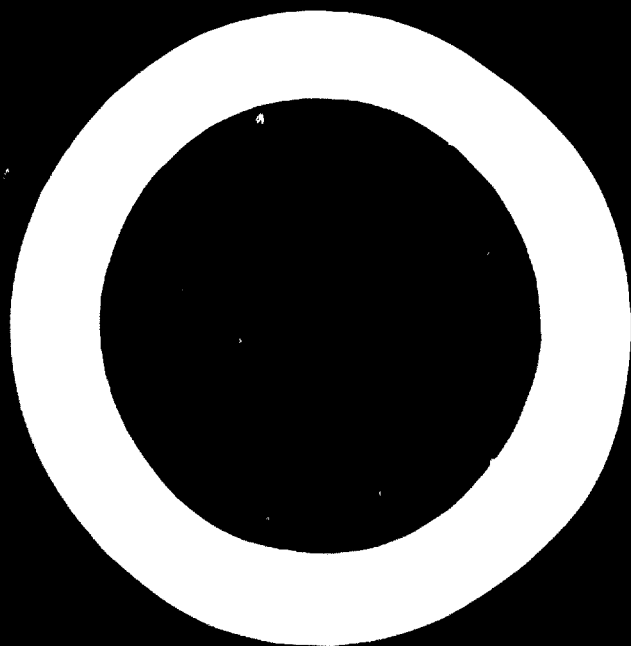
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UNITS
IN
SMALL
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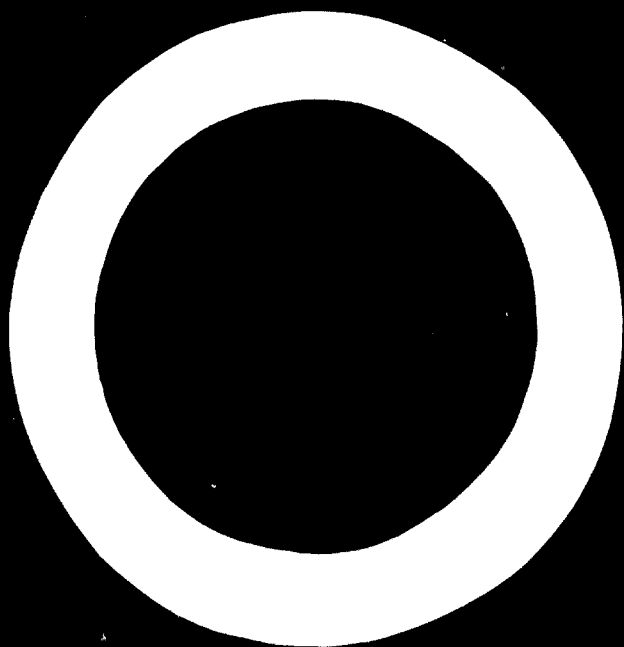
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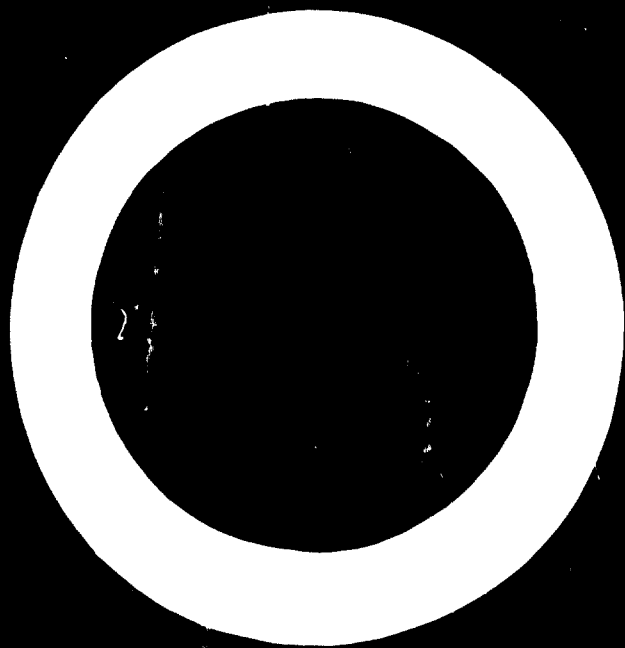
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INFORMATION UNITS IN SMALL PLANTS



**UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
VIENNA**

INFORMATION UNITS IN SMALL PLANTS



**UNITED NATIONS
New York, 1973**

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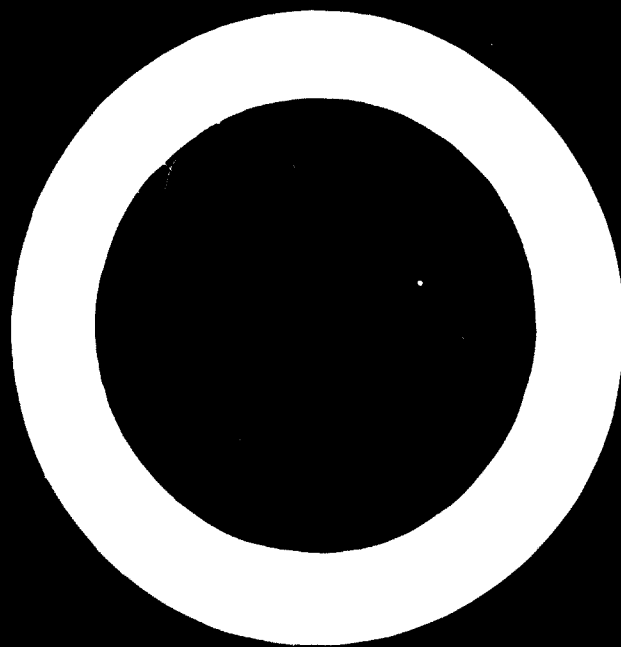
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PREFACE

This publication describes, step by step, what any small firm or organization should do to set up a workable and manageable industrial information unit suited to its own needs. It pays particular attention to the requirements of such firms in developing countries, taking into account the possible lack of material, personnel and informational resources available to them. The author gives more examples of operative systems and has appended a useful list of international information sources which the information manager may tap for additional help in gearing his information unit to his own organization and in tilling his new and empty shelves with up-to-date and useful material. An extensive bibliography of works dealing with library sciences is also provided.

This volume was prepared for the United Nations Industrial Development Organization by L. W. Stevens-Wilson of Enfield, Middlesex, England, a specialist in industrial information systems, as a consultant to the United Nations.

The views and opinions expressed are those of the consultant and do not necessarily reflect the views of the United Nations.



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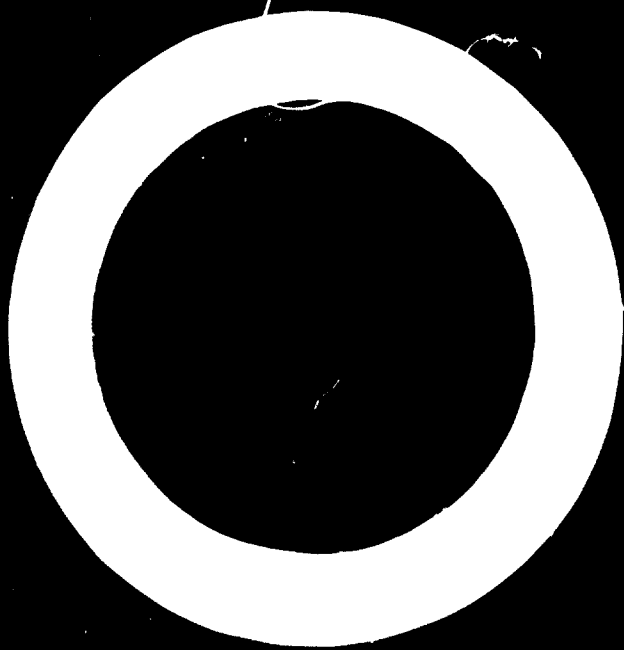
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DEFINITIONS

Some of the more frequently used expressions in the terminology of information, especially those that occur in this publication, are defined below.

Information

Information may be broadly defined as the oral, written, numerical or graphical representation of any event, activity or condition—past, present or future. Industrial information includes those items of scientific, technical and economic intelligence that can be communicated or applied in order to facilitate and accelerate the operation and growth of an enterprise. The “lifeline” of industrial information comprises the following:

(a) Sources of information on industrial techniques, processes, know-how and management data (e.g., handbooks, reference books, periodicals, manuals, guides to information sources, and directories of professional organizations);

(b) Sources of information on industrial equipment, products and companies (e.g., directories, export guides, special reports, market surveys, trade and company literature, catalogues, chamber of commerce journals, and handbooks);

(c) Publications of a general nature;

(d) Research and progress reports, published or otherwise, from laboratories and manufacturing enterprises;

(e) Audio-visual material;

(f) Sources of information on scientific and technical developments and experience.

Information system

An information system is a method, or a combination of methods, of acquiring, classifying, recording and disseminating information.

Information unit

An information unit is a complex, however small, which makes use of the information system.

Information service

The information system and the information unit, when spoken of together, are referred to as "the information service". Two recent developments in the conception of this service are worth mentioning here: first, greater emphasis is being placed on anticipating the user's needs; secondly, there is much more appreciation of the value of speed, accuracy, depth and economy in finding the information required. This represents a radical departure from the outmoded "reference service" which was used mainly to hoard material and to investigate specific requests only. It brings into prominence more than ever before the need for close and constant contact between the supplier and the user of information, and recognizes that a higher calibre of staff is required today for this type of work.

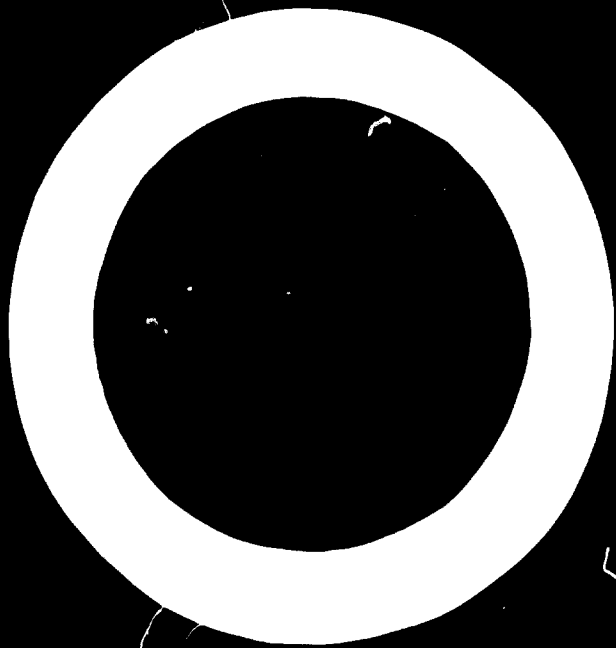
Data

"Data" and "information" are frequently confused in that they are often used as synonyms. The term "data", however, is used for a specific subgroup of the information complex. It includes, for example, statistics, physical constants of materials, and production in numerical terms.

INTRODUCTION

Communication has been called the life-blood of industry. Far too often, however, this life-blood is in short supply and only a few of the people involved in an industry really know why certain steps are taken or are allowed to suggest what steps might be taken. Management neglects communication down the line with the result that subordinates feel they know too little about what is going on to discuss the various factors involved in making their business efficient and profitable. Indeed, it often happens that the enterprise for which he works is a complete mystery to the employee, whether he be a manual or a clerical worker.

Industry in developed countries is just beginning to realize the mistakes that have been made, the time wasted and the money lost because of insufficient in-plant and interplant communication. There is no reason, however, why new industries in developing countries should make this same mistake. Naturally, the degree to which communication may be effected in a plant depends on the educational and intellectual attainments of the employees. The degree and nature of communication in a plant is thus a matter of management judgement. It is however one of the most vital judgements to be made, in terms of labour relations and general efficiency.



I. COMMUNICATION IN INDUSTRY

Many enterprises, when they begin, have only two or three employees concerned with the technological aspects of their activities. There may be a few concerned with the buying of components and equipment to be used in the manufacture of the product and, perhaps, a few sales personnel. The remaining staff is likely to be composed of skilled, semi-skilled and/or unskilled workers, and office personnel.

At the outset, many of these functions may be combined and it will probably be sufficient for a person performing a particular function to have access to the information needed for its successful fulfillment. When that person believes that the information he has acquired may be useful to his colleagues, he may transmit it to them by memorandum or by word of mouth, or he may draw their attention to an article relevant to the work in a newspaper or magazine.

As the business progresses, however, and staff begin to specialize in certain functions, it becomes increasingly difficult to continue with this method of imparting information with any degree of accuracy. This is the stage when, for example, as sales grow, sales staff become more hard pressed and have less time to indicate interesting items to their colleagues in the sales field. In fact, they will probably reach the point where, in scanning literature of any kind, they become blind to items that do not directly concern their own activities. This is the critical stage when much valuable information is frequently passed over and when a firm should realize that it is time to install an information unit.

The information unit

It is essential that an information unit be designed to meet the specific requirements of a firm. Hundreds of examples could be cited of firms and organizations that have installed complex computer systems for information storage and retrieval when a much simpler system would have served the purpose just as well. The simple card index is frequently sufficient for storing and retrieving the kind of information required.

The information unit described in this publication is designed for small (100 employees or less) to medium-sized (up to 500 employees) manufacturing enterprises. It is assumed that the enterprise will employ a certain number of "technically literate" staff, that is, staff who are capable of reading technical literature and applying the information it contains to their own work. This group, which includes engineers, technicians, managers, supervisors and foremen, would number about 50 in a plant employing 500 and manufacturing a product with a reasonably high technical content. Products with a higher technical content would, of course, require more staff of this kind and simple products would need even less. Nevertheless, even a small group requires regular servicing from an information unit.

It is not only the technical staff who need this kind of service; skilled and semi-skilled production workers, office staff and others also need information in connexion with their work and should be encouraged to ask for it. Some will need non-technical information such as dates and places of meetings, names and addresses of bodies providing training courses, how to obtain supplies of non-technical materials, and travel information. The service should be able to provide all this.

There is yet another category of information-seekers: persons who need technical information but who are unable to read or understand the relevant literature. The ideal information unit will be prepared to translate this information into terms they can understand. The manager of the unit can also help in this regard by spending time in the workshop, talking to the operatives, finding out what they are doing, foreseeing their needs, and taking the initiative in offering help. The executive staff should also keep the manager of the unit fully conversant with the requirements of their functions. If he is to be really effective, the unit manager must also be kept fully informed of decisions taken at the executive level concerning the current and future activities of the firm.

The basic aim of the information unit is to keep the staff informed on scientific and technical developments relative to their work and to help them find solutions to specific problems as they arise. It should also be within the capability of the unit to provide information on such non-technical matters as sales outlets, sources of supply, government regulations, standards, and training facilities. In order to achieve these objectives, the unit should have:

- (a) An intimate knowledge of the interests and current operations of the firm and of each member of the technical staff;
- (b) A library of its own and access to other libraries;
- (c) Contact with other sources of information, e.g., firms, institutions and individuals;
- (d) The ability to exploit these resources effectively.

The first requirement, familiarity with the firm's interests, is easier to achieve in a small firm than in a large one, but if the familiarity is to be deep rather than superficial, the manager of the information unit must have some technical knowledge. Without this, the service he provides will be severely limited. This and other aspects touched upon above will be dealt with in the chapters that follow.

II. A BASIC INFORMATION UNIT

Dimensions and equipment

Once management has decided to set up an information unit, space, equipment and staff requirements must be determined. However small the unit is, or however infrequently it is used, depends on books and documents and these must be properly accommodated.

Two assumptions are made here regarding the firm that will be used as an example in this exercise: (a) it manufactures a limited range of machine tools, which means that a considerable quantity of technical literature will be required; (b) it has about 20 staff members at the management and other levels who will need the services of the information unit regularly, in addition to about 250 others who will use it intermittently.

The main part, or library, of such a unit should be not smaller than 5 m X 4 m. Initial furnishing should include a desk and chair for the manager, a table and at least two chairs for the use of people consulting reference material, a filing cabinet, a copying machine (unless one is available elsewhere in the firm), boxes to contain loose documents and material awaiting binding, and shelves. It is sufficient, at this stage, to have shelving on two walls, but in any case the system chosen should be one that can be added to or rearranged as necessary.

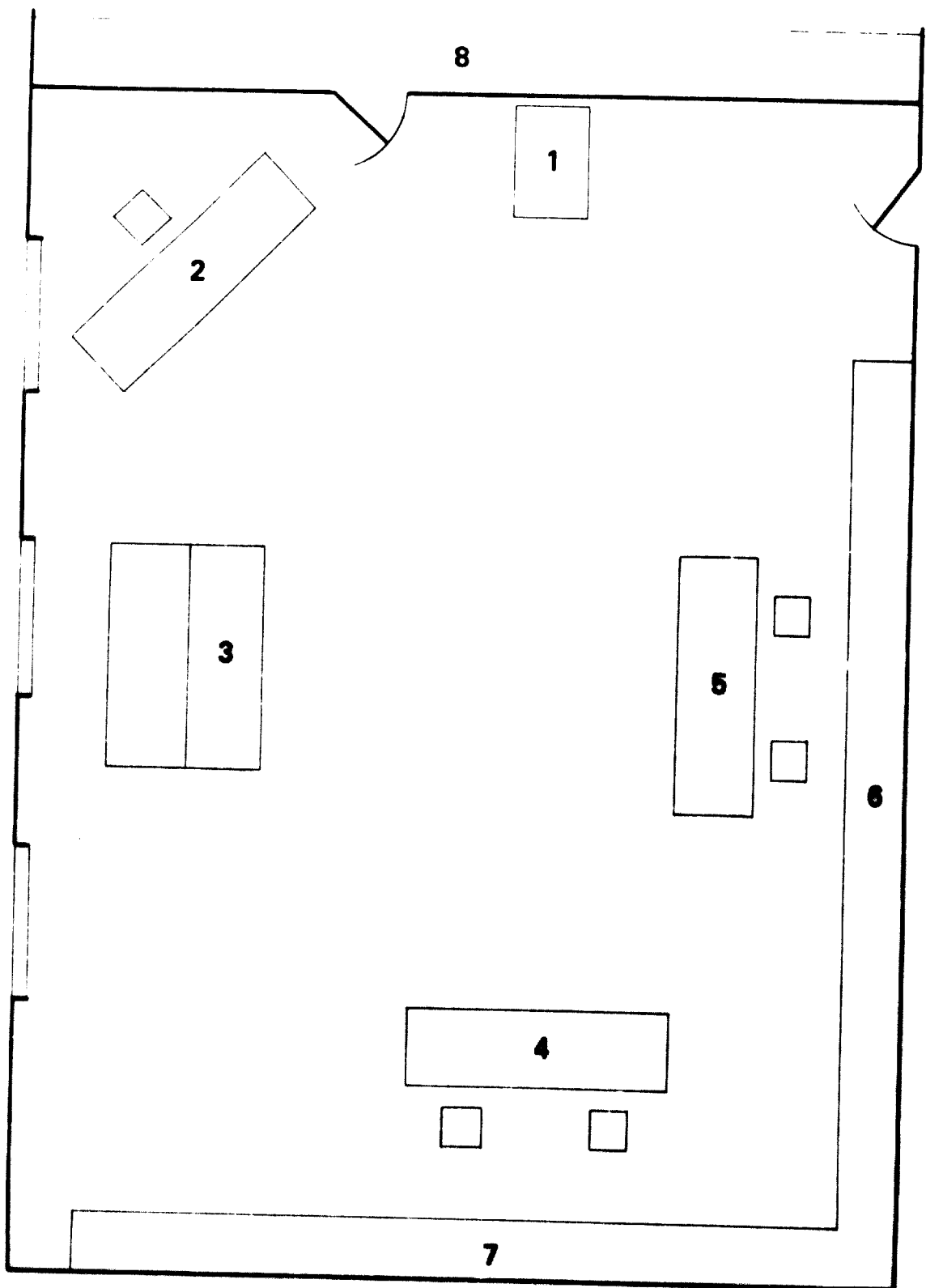
If a good deal of typing is required, a separate small office for a typist, adjoining the library, should be available. The clatter of a typewriter in the library itself would be very disturbing to anyone engaged in researching material. At the outset, of course, this may not be possible and the unit manager may even have to do any typing that is necessary himself. Figure I shows a layout for a typical, basic unit.

Staff

The staff of the unit consists of the information manager and a part-time typist. If the firm grows in size, or diversity of product, or the information service improves, it will be necessary to hire a full-time typist. Later still, the manager may need an assistant. The time to consider this, however, is when the technical staff has doubled, with a corresponding increase in the workload of the unit.

Information manager

The information manager should be considered from the outset to be a senior member of the management and should be paid accordingly. He should have had some training in the field of information, and though he need not have had a formal education in technology or engineering, he should at least be capable of appreciating the main technical points involved in the production process.



1. Filing cabinet
2. Manager's desk
3. Display stand

- 4 and 5. Tables
- 6 and 7. Ceiling-high shelves
8. Typist's room

Figure 1. Layout of basic information unit

A person from within the firm, with a sound technical background, may be trained for the job. As it will be mainly up to him to gather the material necessary to stock the unit, he should be a person with an inquisitive mind, prepared to undertake the often tedious task of searching through or perusing a large number of possible sources of information. It will be his task to organize the contents of the library, to classify the material and index it in whatever kind of information storage system is decided upon. He must be able to retrieve this information with equal facility. He should also have the imagination and drive necessary to convince potential users of the service of its value and to make the service itself a vital part of the firm's operations.

Provided that the information manager observes the rules and guidelines laid down in this publication and others listed in the accompanying bibliography, he should succeed in running a small unit without the benefit of formal training in the science of information. Such training is, however, extremely valuable. In any case, if the firm expands rapidly, and if there is a corresponding increase in the need for information, he may require additional training. There are several possibilities open to him:

(a) University libraries are usually prepared to train a limited number of people in the rudiments of librarianship;

(b) If such facilities are not available locally, and if the firm is prepared to send him abroad, training courses are available in many countries. The local library associations or central information services will advise on such courses. In the United Kingdom of Great Britain and Northern Ireland, for example, the Association for Special Libraries and Information Bureaux (ASLIB), which is located in London, provides or arranges courses for information personnel. Several universities in the United Kingdom also offer training courses for librarians.

On-the-job training

When a suitable person has been appointed and has taken up his position, he must be allowed time to familiarize himself with the requirements of management and of the technical staff. He will also need to learn about the current and proposed activities of the firm, which sources to tap for information, and what material to order. He should be given time to visit other small libraries or information units, if they exist, in other firms, and locate any central information units sponsored by the Government, by UNIDO, or jointly by both.

The object of assessing the various sources of information that are available locally, or within the country, is to ensure that unnecessary duplication is avoided and to know where various kinds of information can be obtained when needed. For example, if once a year the sales manager likes to look at the national trading statistics, or those of other countries, it would be pointless to buy the volumes needed if they could be obtained on loan from, say, a central repository such as the Ministry of Trade, whenever they are needed. If, on the other hand, these statistics were required for frequent reference, it would be preferable to acquire them for permanent retention.

Contact with other firms (especially non-competitive ones) is extremely valuable as it leads to mutual arrangements to borrow or otherwise have access to useful material. This saves expense and leaves the shelves free for material that is not so readily available. When a number of firms in one locality all require certain standard.

but expensive volumes, such as trade directories, it should be possible to arrange that each firm acquire the volume it would use most frequently and make it available to the others when they need it. Such co-operation, on either a local or a national level, is essential to the building of a viable information service.

After two or three months the new information manager should be able to recommend material he feels ought to be acquired and know at least some of the sources from which he can obtain additional information when he needs it. He should also be ready to put into practice a suitable classification system for the material that is accumulating. By this time, also, he should know the needs of the staff who require servicing.

III. CONTENTS AND ORGANIZATION OF THE LIBRARY

The contents of the library, the hub of the information unit, may be classified under the headings "Books", "Periodicals", "Trade literature", and "Miscellaneous".

Books

Every information unit should have a small, permanent collection of reference books for dealing with day-to-day inquiries and difficulties. This collection should include:

An encyclopaedia

A comprehensive dictionary

At least one technical dictionary

A general trades directory

At least one directory to the trade in which the firm is engaged

A compendium of facts and figures of the trade (generally issued yearly by the local trade association or appropriate government ministry)

A yearbook or similar volume of the trade

A complete set of local and national telephone directories

An atlas

A gazetteer

A selected list of directories will be found in the bibliography that follows this study, but most good booksellers in the industrialized countries will be able to advise on the best standard works available.

Good textbooks dealing with the firm's technological activities should also be obtained. The advice of the technical staff should be sought in this connexion. It may well be that they already have some of these books which they would be prepared to have located in the library. If such books are used frequently by the owner, they are better kept in his office, but in any case they should be entered in the library catalogue and their location noted so that they may still be consulted by others should the need arise.

To keep the library up to date, it is necessary to have the latest information on new works as they are published. The information manager should therefore contact publishers of specialized literature and ask to be put on their mailing lists.

Periodicals

Periodicals, which include magazines, house organs, newspapers and the like, are an invaluable source of information on legislation, new developments, personnel changes, new companies, and new products and services in an industry.

It is not recommended that any serious attempt be made to collect house organs, the magazines produced by many big companies for internal (and sometimes external) circulation. If the firm orders goods from these companies, it will probably be placed on their mailing lists as a matter of routine. If the magazines contain useful or interesting information they may be circulated or filed away otherwise they should be destroyed.

Scientific and technical periodicals fall into three broad categories: journals of professional societies; trade, technical, engineering and commercial journals; and abstracts, reviews and digests.

Journals of professional societies

These include scientific periodicals of international standing published by professional societies and institutes. They are mainly devoted to the results of research and work in science and may be of little interest to small firms, unless of course these firms are producing a commodity with a high technological content.

Trade, technical, engineering and commercial journals

These journals comprise, in the main, reports on pilot and plant-scale development in industry, and notes on new machines, equipment and processes. They also carry commercial news of the trade and jottings on trade personalities. The small firm will often find the well-illustrated and descriptive advertisements they contain as valuable as the actual literary content.

Abstracts, reviews and digests

Abstracts, which usually appear monthly or quarterly, offer short summaries of articles that have appeared in the world's scientific and technical press.

Periodic reviews give a good over-all picture of the more important technical advances that have been made in industry and generally come with a good index for quick reference. For the small firm they are a boon: the subscription rates are often much less than those for leading periodicals while the actual information they contain is often well in advance of most other publications in the field.

Technical digests cover almost every aspect of industry and small firms subscribing to them for the purpose of keeping abreast of developments in their own field often discover in their content new and important information on ancillary matters.

A good means of keeping up to date on all such material available is to subscribe to one of the index card services of bibliographies and abstracts that are organized and issued by the research departments of various universities and specialist institutes. (See annex.)

Trade literature

Trade literature includes controlled circulation journals, buyers' guides, and other trade association publications.

Controlled circulation journals, each covering a specific industry or group of allied industries, are issued by publishing houses in a number of industrialized countries. For the most part they are free to people in industry, their operating costs being covered by advertising. Much valuable information can be obtained from these advertisements since they usually promote new developments, books, meetings, seminars and the like.

Miscellaneous literature

Under this heading are classified industrial reports of all kinds, statistical data, patent specifications and so on.

Reports on specific branches of industry are put out by most governments or government-sponsored organizations and are often available to firms engaged in the particular industry. Similar reports, also frequently available on request, are produced by research associations and universities. Information regarding the sources of such reports may be obtained from a number of organizations, which include ASLIB, the European Productivity Agency (EPA), the Organisation for Economic Cooperation and Development (OECD) and UNIDO. Though this area is certainly worth investigating, the majority of such reports are of little interest to small or medium-sized firms unless they are growing or diversifying rapidly or are in a highly technological field.

Data of all kinds, statistical information, local, national and international production figures etc. are very useful for reference purposes. Similarly, national trade figures are of interest to the sales side of the enterprise.

Patent specifications, which most industrialized countries publish when patents have been granted, are frequently a source of information on new developments in a particular field. Most patent offices will provide specification information on request and patent publications listing the number, title, inventor or patentee of the patent are issued frequently. They also contain information on new applications that have been lodged. (See annex.)

The retention and destruction of material

How long material should be retained is a question that concerns mainly the stock of periodicals, which builds up rapidly and which must be pruned back from time to time. From among the periodicals subscribed to by the firm there will probably be a few in which the technical staff find much that is of permanent or semi-permanent interest. Such periodicals should be kept and each year's run bound. When the periodicals contain only occasional items of interest, these items should be retained and the rest of the journal destroyed. It is general practice to collect a year's run of such periodicals, leave them unbound, and at the end of the following year to destroy them. Other more "newsy" literature such as digests and controlled circulation journals need only be kept for two or three issues.

Such measures keep the library shelves uncluttered and free for material that is really useful.

With regard to directories, there are some which should be renewed annually; this applies particularly to buyers' guides, which go out of date very quickly as new firms open up and others close down. More comprehensive directories, though they suffer from the same drawbacks, are too expensive to be renewed frequently and are normally retained for about two years.

Textbooks and other volumes should be replaced periodically by the latest editions or by more comprehensive works dealing with the same subject.

IV. METHODS OF CLASSIFYING THE MATERIAL AND DISSEMINATING THE INFORMATION

A simple classification system

There are various methods of classifying the material that is accumulating in the library and of seeing that the information it contains reaches the people who need it. The books, magazines and other periodicals should be arranged on the shelves under a series of very broad headings. Catalogues and reports are best kept in boxes, clearly labelled for easy identification. Each report should bear a number which will be recorded on a classification card (discussed later).

A library catalogue comprising a series of index cards, one for each item, should be established. These cards should be divided into batches in the appropriate cabinet, alphabetically or otherwise. The standard size for these cards is the continental A-5, or 12.5 cm X 7.5 cm, which gives sufficient space for the information to be recorded. The catalogue will consist of two sections, an author index and a subject index.

The author index contains a separate card for each article or publication produced by the same author. Figure II shows an example of such a card.

| | |
|----------------------|--|
| COPECK, J. R. | |
| Source: | J. Inst. Fuel Vol. 9. No. 7 12-4-64 |
| Title: | Review of roller hearth furnace design |
| Pages: | 16-32 |

Figure II. Author index card

There are many methods of classifying material for the subject index: the simplest one is to make a careful study of the firm's activities and the various technical and commercial subjects associated with them and to arrange them under a number of broad headings. For example, this part of the catalogue for the hypothetical firm which, it will be remembered, manufactures a range of machine tools, would be divided into sections under the following headings:

- Control
- Engineering processes
- Engineering techniques
- Machine tools
 - Lathes
 - Milling machines etc.
- Mathematics
- Materials

When the classification system is decided upon, a card should be completed within the subject index for each publication concerned (see figure III). In addition, a simple alphabetical index of articles, books etc. should be kept for quick reference.

| | |
|---|--|
| Review of roller hearth furnace design | |
| Author: | COPECK, J. R. |
| Source: | J. Inst. Fuel Vol. 9. No. 7. 12-4-64 Pages: 16-32 |

Figure III. Subject index card

Sophisticated methods of classification

The system described above is adequate for classifying the material in a small information unit with comparatively few cards to be searched through when information is needed. If the firm grows, however, and the library stock becomes more extensive, something rather more sophisticated will be needed. There are a number of good classification systems available commercially. Two of the most commonly used are the Dewey Decimal System and the Universal Decimal Classification, both of which employ printed tables.

The Dewey system, which is used widely in public libraries, divides all information into ten parts, and each part into ten subparts, and so on. The parts of most value to scientific and technical libraries are classed as follows:

- 000 General
- 500 Pure science
- 600 Useful arts
- 700 Fine arts

Further division is set off by a decimal point:

- 500 Pure science
- 530 Physics
- 536 Heat
- 536.5 Temperature and temperature measurement
- 536.53 Electrical methods of measuring temperature

With the aid of a printed index, which comes with the system, even a comparatively inexperienced user or cataloguer can quickly locate the correct number of any subject.

The Universal Decimal Classification, usually referred to by its initials UDC, is rather similar to the Dewey system but is much more complex: it subdivides the parts even further. This system, which has been translated into, and published in, a number of languages, has nine main parts:

- 0 Generalities
- 1 Philosophy, metaphysics, psychology, ethics and morals
- 2 Religion, theology
- 3 Social science, economics, law, government, education
- 4 Philology, linguistics, languages
- 5 Pure sciences
- 6 Applied sciences, medicine, technology
- 7 The arts, entertainment, sport
- 8 Literature
- 9 Geography, biography, history

To give an example, the classification for television receivers would be:

| | |
|-----------|---------------------------------------|
| 6 | Applied sciences |
| 62 | Engineering |
| 621 | Mechanical and electrical engineering |
| 621.3 | Electrical engineering |
| 621.39 | Telecommunications |
| 621.397 | Television |
| 621.39762 | Receivers |

Although such a system is far too complex for the needs of a small information unit, the classification is worth studying as it provides an excellent example of how to break down one main heading into a number of subsidiary ones.

The dissemination of information

Once a classification system has been adopted and is working smoothly, the information manager should turn his attention to the problem of communicating the information that is flowing into his unit to the technical and other staff who need it.

To begin, he should compile a list of all the material on hand and either circulate it among the staff or post it in a prominent position in the library. Likewise, every month or so, depending on the quantity of material coming in, a list of new acquisitions should be either circulated or posted.

This is also the time to take a fresh look at the periodicals the firm has subscribed to and to decide whether they are worth while or whether they should be discontinued in favour of something more suitable.

All incoming periodicals should be circulated as soon as possible after they are received, but to not more than ten people at a time. By limiting the circulation in this way, bottlenecks caused by recipients putting the periodicals aside for later reading can be identified and cleared up. Each periodical should have a circulation sheet attached to it (see figure IV). This sheet should contain a list of those to whom the periodical is to be circulated, a column for their comments or where they may indicate items they wish to bring to the attention of later recipients, the name of a first reader and two other columns headed, respectively, "Articles for indexing" and "Key-words". (The terms "first reader" and "key-words" will be explained in the following chapter.)

A card index system—ruled cards bearing the name of the journal and the dates when it was sent out and returned—should be employed for keeping track of these periodicals. Different sets of cards may be used for weeklies, monthlies, quarterlies etc. Each card should record a year's issue.

A simple method of checking the regularity of delivery of periodicals on order is to arrange the cards relating to each kind in separate sets by alphabetical order of titles. Each periodical, when it is received, is entered on its own card, which is then placed in alphabetical order behind a divider. Cards remaining in front of the divider after a set date represent periodicals overdue and about which inquiries should be made. Allowance should be made for delays in receiving printed matter from abroad.

| <p>Name of journal:</p> <p>Date of publication:</p> <p>Circulate to:</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Date</th> <th>Name</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> | | | Name | Date | Name | Date | | | | |
|---|------------------|--|------|------|------|------|--|--|--|--|
| Name | Date | Name | Date | | | | | | | |
| | | | | | | | | | | |
| Page refs. of articles | For attention of | If article is to be indexed indicate at least three key-words* | | | | | | | | |
| | | | | | | | | | | |
| <p>*Subsidiary key-words should be underlined in red in the article</p> | | | | | | | | | | |

Figure IV. Circulation sheet for journals

There are, of course, journals which, while of some interest generally, need not be circulated. These should be kept on the library display stand for a week or two. New acquisitions, apart from periodicals, should also be displayed for inspection before they are put on the shelves, but nothing should be left on display for longer than 21 days.

Many international booksellers and publishers send books on approval provided return postage is paid. This is a good means of acquiring new material for the technical staff to inspect (it can be purchased if there is sufficient agreement as to its value) and is the kind of service that makes the staff appreciate the library and that helps to keep it alive.

V. INFORMATION STORAGE AND RETRIEVAL

The classification systems thus far described will usually provide, when searched, whatever information is desired, or at least a guide to where it can be found. There is a form of inquiry, however, which is very frequently put to an information unit but which is not so easy to answer: someone remembers having seen, in a back issue of a magazine, an item of information that could be applied to a current activity of the firm and which, if it could be located, would be very useful. Unfortunately, however, the name, date and number of the magazine have been long forgotten. Not only that, but the item in question was only part of an article embracing a variety of subjects and thus did not even figure in the title. If the firm subscribes to 20 monthly magazines and has collected a three-year run of each, locating the information in question may mean a tedious search through 700 magazines. Obviously, a better system of indexing is required for dealing with this problem.

Indexing for easy retrieval

Staff involvement is part of the solution. When magazines are circulated among the technical staff they should be encouraged to indicate to the information manager items which they consider to be of particular interest and which they feel should be readily accessible. The information manager himself, will, of course, be scanning the material as it comes into the unit with the same purpose in mind.

Information index

There are a number of ways of indexing this information for easy retrieval. A simple subject card index, an extension of the library catalogue, perhaps, might be employed. This would comprise (a) an author index of articles of interest and (b) a series of broad classifications in another card index which would include the title of the article, its source, and an abstract of the article. Such an arrangement would go a long way towards reducing the retrieval problem: 20 or 30 references to the item in question might have been collected, so that instead of having to search through 700 magazines it would only be necessary to search through 30 at the most.

The system of headings and subheadings adopted for the library catalogue (chapter IV) may be used for this information index.

Key-words

If it is desired to index an article in some depth in order that, for example, certain portions of it will be immediately accessible, even the systems described

above will be found to be too clumsy. Much attention has been devoted in recent years to refining systems of recording and retrieving information. Many of them involve the use of computers, which are, of course, uneconomical and impractical for firms or organizations needing to record less than ten thousand items a year.

Many systems allied to the card index have been developed, however. One of the most useful is a form of co-ordinate indexing that is based on giving each item of information an identity of its own, according to the actual words that characterize it. These words are called "key-words".

Each language contains hundreds of thousands of words of which perhaps ten thousand are used in ordinary communication. Of these, many have similar or related meanings; therefore, only a few thousand of them need be used to express ideas in a given field and, from these, certain descriptive or characteristic words may be extracted. The key-word system uses these words as the tools with which to file and retrieve information. They are neither coded nor decoded but are brought together in a vocabulary which also contains their synonyms and other related words. In the terminology of information, key-words are called "descriptors" and the synonyms and associated words "acceptors". Acceptors are sometimes called "lead-in" words and in a key-word list are usually printed in smaller type than the descriptor.

Using key-words to file information

In order to illustrate the use of the key-word method it will be assumed that a technical article from a magazine is to be indexed. Two indexes are used: one is called the "Information Store", the other is the "Key".

The Information Store consists of ordinary index cards, similar to those used in the library catalogue. Upon each card is typed or written all the information necessary to locate the article concerned, a summary of the article, and usually a list of the key-words under which it has been indexed in the Key. The cards, which are each given a serial number, are filed in numerical order. Figure V shows a typical store card.

The Key consists of a number of translucent sheets which are divided into large squares, each square being subdivided into a hundred small squares. All the squares are numbered. At the top of each sheet is a key-word and the sheets are filed alphabetically according to these key-words.

In summarizing the article for the store card it is essential to identify accurately the ideas or concepts that it expresses. The words embodying these ideas, the key-words, should be underlined. Alternatively, it is sufficient to merely underline the key-words in the article itself and to list these on the store card. Reference to the key-word list will identify these words or their synonyms.

Generally speaking, eight to fifteen key-words will be sufficient to index an article in considerable depth and it is seldom necessary to use more than four in the subsequent search for information. Consistency in the choice of words during key-wording is essential.

Having selected the key-words that will be used to record the article, the next step is to punch each key-word sheet with the number of the store card corresponding to the key-words underlined in the summary. The position is determined by first locating and punching the transparent numbered grid at the desired number. This punching should be done as precisely as possible, making sure that the hole is positioned exactly in the space reserved for that number.

Punching tables may be obtained from a number of manufacturers around the world. Details of these manufacturers are available from most of the information bureaux listed in the annex.

| | Serial number |
|-------------------|---------------|
| Title: | 21 |
| Author: | |
| Source: | |
| Abstract | |
| Key-words: | |

Figure V. Store card

Using key-words to retrieve information

When a question is asked or an item of information sought, the questioner will, unless otherwise trained, frame the question in everyday language. The information manager should work with the technical staff to make them aware of the words that appear in the key-word list and encourage them to frame their questions, as far as possible, in these words. The more precisely a question is framed, the easier it is to answer it. If the question is put generally, the likelihood is that several answers will be retrieved.

The key-word sheets corresponding to the key-words contained in the question are taken from the alphabetical file and superimposed, in any order, on a viewing board. This viewing board is a sheet of ground glass with a strong light behind it. When the pile of key-word sheets is on the viewing board, the number of coinciding bright lights can easily be read. These numbers are then located in the serial-numbered card storage and the cards containing the summarized information can then be extracted.

The viewing boards are available from the same manufacturers as the translucent cards. A variation on this system employs opaque key-word sheets and a translucent grid, but the principle is the same.

Scanning for key-words

The information manager will normally scan all material coming into the unit and decide on a number of items that may be of use at a later date and which he will, therefore, index himself, selecting the appropriate key-words. He may, if he has a good technical background, do all of the scanning, key-wording, abstracting and recording of technical articles. However, if he lacks the time or the technical knowledge to satisfactorily key-word or abstract an article, a different procedure may be adopted.

It will be remembered that the circulation sheet described in the last chapter had a column headed "Key-words". It is possible to arrange the circulation in such a way that the technical staff themselves select articles which should be stored, and indicate the key-words under which they should be indexed. An extension of this method is to introduce a "first reader" system. Each member of the technical staff is made responsible for scanning and key-wording one or two magazines before they are released for general circulation.

If a reasonably simple key-word system is used, these first readers will soon become accustomed to underlining the words which they consider embody the ideas of the article and which would enable that article to be retrieved when required.

The key-word system may also be applied to the contents of abstract journals, useful items being key-worded for future reference even before the article itself becomes available. It may also be desirable for the information manager to scan internal reports, letters or memoranda for information that may be of future value and for possible recording in the information store.

Thesauri

Many key-word lists, or thesauri, as they are called, have been produced by various bodies such as the American Society of Metals and the Engineering Joint Council in the United States of America, and by the Institution of Chemical Engineers in the United Kingdom of Great Britain and Northern Ireland. (Some of these thesauri are listed in the annex.) In many cases a great deal of trouble can be saved if a thesaurus appropriate to the firm's activities is obtained and a selection of the key-words likely to be necessary for recording information relevant to the firm's activities selected so that, in effect, a key-word system specifically composed to fit the activities of the firm is ultimately obtained.

One of the most useful thesauri available is that formulated by the Institution of Chemical Engineers. Any firm manufacturing products with an engineering bias and some chemical content will find it extremely useful. A page from this thesaurus is reproduced in figure VI.

| | | |
|----------------------------------|---------------------------------------|------------------|
| | hybrid | |
| | on-line, off-line | |
| CONCENTRATE, | -ion | |
| | (meaning to strengthen) | |
| | enrich | |
| | master batch | |
| concentric | | see CENTRE |
| CONCRETE | | |
| | cement (as concrete component) | |
| | reinforced concrete + STRENGTH | |
| condense, | -ate, -ation | see CONDENSATION |
| CONDENSATION | | |
| | condense, -ate, -ation | |
| | entrain, -ment | |
| | non-condensable | |
| CONDENSER | | |
| | plant unit | |
| condition | | see TREAT |
| CONDUCTION, -ance, -ivity | | |
| | convection | |
| | (electrical) resistance, -ant, -ivity | |
| conduit | | see PIPE |
| cone, -ical | | see ANGLE |
| congeal | | see FREEZE |
| connect, -ion | | see JOIN |
| consolidate | | see STRENGTH |
| constant (unchanging) | | see CONTINUITY |
| constant (numerical) | | see NUMBER |
| constituent | | see COMPONENT |
| construction | | see STRUCTURE |
| consumed | | see EXHAUST |
| consumer | | see CONSUMPTION |
| CONSUMPTION | | |
| consumer | | |
| CONTACT, or | | |

Figure VI. Page from Institution of Chemical Engineers thesaurus

VI. CURRENT AWARENESS

The information manager, when he has identified the needs of the staff, will, in addition to scanning all material reaching his department, note changes in personnel and follow the activities of other companies and organizations with which the firm has relations. He will also watch for the appearance on the market of products similar, or allied, to those produced by his company.

Current Awareness Bulletin

Once a week this intelligence should be assembled in a "Current Awareness Bulletin" and circulated to all likely to be interested. This Bulletin would bring to the notice of the staff articles or other items of information which they should study when the relevant journal is intercirculated to them, or, if an article is extracted from a journal which they do not normally receive, it will make them aware of the need to obtain that particular journal from the library.

If requested to do so, the information manager should be prepared to provide an abstract of an article mentioned in the Bulletin which has aroused a staff member's interest. However, though this service would be of considerable benefit to the busy technical man, the Bulletin should never be looked upon as replacing in its entirety the need for staff to do at least a certain amount of their own reading or delving for information. It can, however, make sure that most items of significance are seen.

Individual notification

An alternative to the issue of a periodical Bulletin is individual notification of items of interest. This very personal service enables more items to be fed to a particular member of the staff than he would be likely to extract from the Bulletin. When a Bulletin is being compiled, care must be taken that it is not too voluminous to read, which means that some information of less than general interest has to be omitted. Such would not be the case were a system of individual notification employed. This system is time-consuming for the information unit, however, and its feasibility may well depend upon the number of staff at the unit's disposal. Frequently it is the custom to use the Current Awareness Bulletin for technical staff and the individual notification method for managerial staff.

Selective Dissemination of Information

Individual notification, as described above, is the basis of a Selective Dissemination of Information (SDI) system. It is a system that may be extended as

much as desired, being limited only by the number of staff available to service it. A feature of the ideal SDI system is the issue, to individual members of the staff, of abstracts of articles likely to be of interest to them.

Abstracting, however, is a lengthy task and it is unlikely that the manager of a small information unit will have time to do much of it. Large companies frequently use this type of service and find that it does, in fact, increase the efficiency of the technical staff, increase their dependence on the information unit and their involvement with it, and leads to economy in the company's operations. The same is undoubtedly true for the small and medium-sized firm, however, and a study of the situation may well show it to be more economical to employ an extra staff member in the information unit than to have the technical staff spend too much time keeping themselves up to date with their particular field of activity.

Searching

It frequently happens that a member of the technical staff needs to prepare a list of references, e.g. a bibliography, relating to a particular subject with which he is concerned. There are two ways of doing this: (a) the staff member may be taught to use the information storage system so as to make up the list himself, or (b) the information manager may undertake the search for him. Ideally, it is the information manager who should do the searching as the technical staff member would only have time to search the company's indexes.

If, on the other hand, the information unit does the searching, it will not only search its own resources but will contact external sources of information for other relevant information to augment what is available from within. The usual solution is to settle for a compromise between the two methods: the technical staff member searches the company's indexes and, if he does not find sufficient information, the unit will obtain it from the "outside".

Outside sources

Outside sources of information are extremely valuable in so far as reports from government and other official sources are concerned. Details of such report-issuing bodies are obtainable from central information services, such as that operated by UNIDO.

The importance of contacting outside sources for information cannot be overemphasized. Such contact has two useful aspects: first, it encourages the outside source, say a national information centre, to increase its collection of information material and to improve its service; secondly, the time of the information manager and the technical staff is not wasted on searching for information and assembling bibliographies that can be obtained, ready-made, from these outside sources.

Patents

Searching for information in the field of patent specifications is difficult. Patent offices throughout the world do not follow a uniform system of classification and

any attempt to acquire and search through volumes of patent abstracts is therefore an extremely time-wasting and expensive exercise. Patent specifications that have been acquired by the firm will be stored and classified in the library; information regarding other patents is best obtained by asking for patent searches to be made in or by the patent offices concerned.

If the company is seriously involved with the question of patents, e.g. if it operates under more than one licence or has patented inventions, then it may carry out searches through the patent agents it employed for the prosecution of its patent applications.

The names and addresses of patent offices throughout the world are obtainable from any central information centre or from bodies such as the Chartered Institute of Patent Agents in London, England, and the Roster of Patent Attorneys of New York State in the United States.

VII. RECORD KEEPING

Many departments in a firm, quite apart from the information unit, need to maintain records. If the information manager has been successful in involving technical and administrative staff in the running of his own unit, he will find that his advice will be asked when record systems are being established in other departments. At all events, the information manager should try to ensure that he shall have some say in the formulation of such systems in order that he may be able to use them himself, when necessary. He should also try to ensure that a uniform system is used which will render it simple to transfer the data to a computerized system should one be established at a later date.

It is impossible to discuss here all the different types of records that are kept or the systems available for keeping them, but one method of keeping track of sales contacts is worth illustrating as it could easily be used for recording contacts with other firms or for orders given or received. Figure VI shows the card that is used for this purpose. It is a dual-purpose card and the front of it (shown in the figure) is perforated along the top edge with holes corresponding to all the letters of the alphabet and a further five holes corresponding to the vowels. The left-hand side has a series of holes numbered 1 to 17 and an additional hole at either end for special classification purposes. The right-hand series of holes is similarly numbered. Further subdivisions show the letters A, B, C, D on the right and E, F, G, H on the left. The bottom edge is perforated with holes numbered 1 to 31, again with a spare one at either end for classification purposes. If this card were to be used to keep track of a sales contact in another company, and perhaps to record written contact with the company on various subjects, it would be used as described below.

The alphabet along the top of the card is punched at the letter corresponding to the name of the company. The name, address, telephone number and other relevant details of the company are written in the ruled space below, together with the name of the contact and his position in the company concerned. The numbers on the left-hand side of the card may be used to relate to areas of the country in which the firm is located or to other countries with which it has dealings. The right-hand column is similarly used.

The numbers along the bottom of the card are used for categories of business or industry, as follows:

1. Contractors
2. Petroleum manufacturers
3. Chemical manufacturers
4. Plastics manufacturers
5. Gas and other fuel products
6. Pharmaceuticals
7. Food

8. Paint, dyestuffs and colour
9. Distillers, breweries, beverages
10. Rubber, synthetic rubber, adhesives
11. Storage, equipment manufacturers
12. Vehicles, heaters, boilers, fabricators etc.
13. Goods manufacturers, papers, carpets, textiles etc.
14. Services water, electricity etc.
15. Consultants, architects
16. Ministries, embassies
17. Tools and engineering equipment
18. Agents
19. Metals
- 20.-31. Allocated to any special areas of interest related to the firm's activities

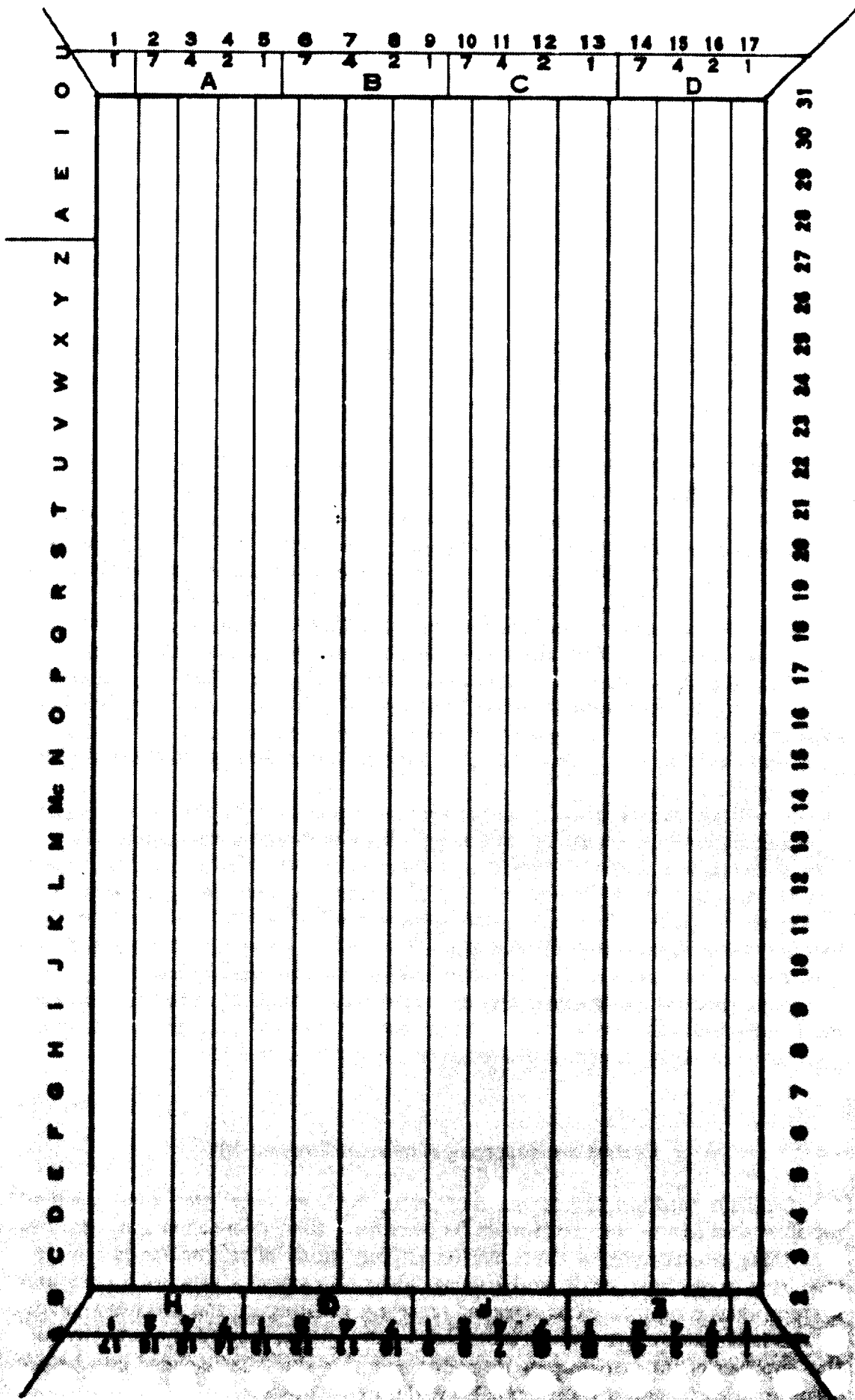
The five vowels and their corresponding holes at the top right corner of the card could, for example, be used to indicate inquiries received from, or sent to, the firm in question, or companies and individuals on mailing lists.

The reverse side of the card is used for recording other kinds of data and may be useful to the buying or accounts departments or to others needing a reference index to their activities. It is also marked numerically along the sides, starting with 1 in the top left-hand corner and working around to 102, also in the top left-hand corner.

The cards are stacked in a filing drawer with the cut-off portion on the right-hand side uppermost, as shown in figure VII. They may be filed alphabetically or in any number of orders.

To use the card, the appropriate holes are punched out in a triangular formation with a special punching tool. If information is required on, for example, firms beginning with the letter "K", the cards indexed under this letter are removed and aligned carefully at the base and at the side, and a long rod, rather like a thin knitting needle, is passed through the "K" hole. The needle is then lifted, with the cards dangling from it, and those that have been punched out at "K" will drop off while the rest will remain on the needle. The cards that have dropped clear are then used to prepare the list of firms.

The use of a standardized card system such as this throughout a firm is a great convenience as it means that all personnel can quickly become familiar with the operation of an index and will be able to search for their own information. Before introducing such a system, however, the information manager should inquire about other, similar, systems so that the one most appropriate to the firm's activities may be selected. Punched card systems are produced by a multitude of companies in most of the industrialized countries. Their names and addresses will probably be found in one or more of the directories on the library shelves, or, alternatively, may be had from one of the central sources of information.



Reproduced by courtesy of the Copeland Chatterson Co. Ltd.

Figure VII. Perforated record card

VIII. DATA PROCESSING AND THE USE OF COMPUTERS

The vocabulary of data

It is important to remember the distinction between information and data. Information, at least in so far as this study is concerned, relates generally to qualitative concepts and ideas whereas data are numerical. Data fall into many classes: economic data, for example, include costs, production figures, sales figures and share values. By far the largest realm of data lies in the values of various properties of materials: melting points, freezing points, tensile strength, and so on.

The first step in organizing data is to formulate a vocabulary of the kinds of data it is wished to store. Generally speaking, this vocabulary will consist of the names of properties, materials tested, temperatures, pressures, sources of supply, and so on. It will also include simple, specific items such as dimensions and product yields.

Once the vocabulary has been decided upon, there are many ways in which data can be assembled and filed for future use. For example, files relating to different materials might be kept, each containing the essential physical data on the material. Alternatively, a simple series headed "temperature", "tensile strength" etc. could be kept if technical staff were accustomed to asking for data in this way. Or, a simple card index could be used. In the end, the filing method used depends entirely on the activities of the firm.

The library shelves should contain a section devoted to books of data reference. It is not likely that a small or medium-sized firm will need a continuous supply of data from outside sources, as would, say a research or test centre. Most of its needs in this respect will be provided from within. However, should it ever become necessary to obtain or organize data on a more sophisticated scale, many of the references listed in the accompanying bibliography will provide a guide. Alternatively, the data centres listed in the annex may be contacted when special data are required.

Data represents a comparatively easy input to a computer, in fact, much easier than information of other kinds, which brings this study to the point where computers, in relation to the information unit, must be considered.

Computer processing of information and data

Generally speaking, it is not economical, or even convenient, for a small or medium-sized firm to use computers for processing their information and data. For one thing, programming a computer for varying kinds of information is a matter requiring considerable skill and training. When, however, a firm has a computer system which is capable of storing and retrieving information and which is available to the information unit, its use should be considered. Training is frequently given by the suppliers of the computers themselves and this should be inquired into before steps are taken to train a member of the staff for this purpose.

The following annex lists a number of books on the use of computer systems in information storage and retrieval.

It is worth noting here that the classification systems involving the use of thesauri, discussed in chapter V, lend themselves very well to computer storage and retrieval should this be required in future.

Annex

SOURCES OF INFORMATION

Standardizing bodies

International

International Organization for Standardization (ISO)
1 rue de Varembe
1211 Geneva 20
Switzerland
(Founded in 1946. Members are national standards bodies in 59 countries.)

National

| | |
|------------------|--|
| Argentina | Instituto Argentino de Racionalización de Materiales Chile No. 1192 Buenos Aires |
| Austria | Österreichischer Normenausschuss Bauernmarkt 13 Vienna 1 |
| Australia | Standards Association of Australia Science House Gloucester and Essex Streets Sydney |
| Belgium | Institut belge de normalisation 29, avenue de la Bradanconne Brussels 4 |
| Brazil | Associação Brasileira de Normas Técnicas Caixa Postal No. 1680 Rio de Janeiro |
| Canada | Canadian Standards Association 235 Montreal Road Ottawa 2 |
| Denmark | Dansk Standardiseringstraad Vesterbrogade 1 Copenhagen |

| | |
|------------------------------------|---|
| Federal Republic of Germany | Deutscher Normenausschuss Uhlandstrasse 175 Berlin W15 |
| France | Association française de normalisation 23, rue Notre-Dame-des-Victoires Paris 2e |
| India | Indian Standards Institution Manak Bhaven 9 Mathura Road New Delhi 1 |
| Italy | Ente Nazionale Italiano de Unificazione Piazza Armando Diaz 2 Milan |
| Japan | Japanese Industrial Standards Committee Agency of Industrial Science and Technology 3-1 Kasumigaseki Chiyoda-Ku Tokyo |
| Netherlands | Stichting Nederlands Normalisatie-Instituut Duinweg 20/22 Postbus 70 The Hague |
| Norway | Norges Standardiserings-Forbund Haakon VII's gt 2 Oslo |
| South Africa | South African Bureau of Standards Private Bag 191 Pretoria |
| Spain | Instituto Nacional de Racionalización del Trabajo Serrano 150 Madrid 6 |
| Sweden | Sveriges Standardiseringskommission Box 3295 Stockholm 3 |
| USSR | Komitet Standartov, Mer i Izmeritel'nyh Priborov Pri Sovete Ministrov SSSR Leninskij Prospekt No. 9b Moscow V 49 |
| United States of America | American National Standards Institute (ANSI) (Formerly American Standards Association, ASA) 1430 Broadway New York, N.Y. 10019 |

Data centres*National data centres*

British Cast Iron Research Association
Alvechurch
Birmingham, England
(Engineering data on cast iron)

Cement and Concrete Association
Wexham Springs
Slough
Bucks., England
(Cement and concrete design data)

Ceramics and Graphite Information Center
AFML (MAAM), Wright-Patterson Air Force Base
Ohio, United States of America

Computer Index Neutron Data (CINDA)
P.O. Box 62, USAEC
Oak Ridge
Tennessee 37830, United States of America

DASA Data Center
General Electric Company
735 State Street
Santa Barbara
California, United States of America

Defense Metals Information Center
Battelle Memorial Institute
505 Kings Avenue
Columbus
Ohio 43201, United States of America

Department of Applied Mathematics and Theoretical Physics
Queen's University
Belfast, Northern Ireland
(Data on atomic and molecular physics)

Development and Research Laboratory
International Nickel Ltd.
Wiggin Street
Birmingham 16, England
(Properties of nickel and the platinum group metals)

Electronic Properties Information Center
Mail Station E 175
Hughes Aircraft Company
Culver City
California, United States of America

Engineering Sciences Data Unit (ESDU)
251-259 Regent Street
London W.1., England
(Chemical engineering data; publishes data sheets on specialized topics for the Institution of Chemical Engineers)

Forest Products Research Laboratory
Princes Risborough
Bucks., England
(Technical properties of commercial timbers)

Human Engineering Information and Analysis Service
Tufts University
Bolles House
Bedford
Massachusetts 02155, United States of America

Isotopes Information Center
P.O. Box X
Oak Ridge National Laboratory
Oak Ridge
Tennessee 37830, United States of America

Materials Data Limited
1927 South Street
Farnham
Surrey, England
(Comprehensive sets of data sheets giving physical properties of selected classes of material)

Mechanical Properties Data Center
Belfour-Stulen Company
13919 West Bay Shore Drive
Traverse City
Michigan 49684, United States of America

Non-destructive testing Information Center
U.S. Army Materials Research Agency
Watertown
Massachusetts 02172, United States of America

Radiation Chemistry Data Center
Radiation Laboratory, University of Notre Dame
Notre Dame
Indiana 46556, United States of America

Scientific Documentation Centre Ltd.
Halbeath House
Dunfermline
Fife, Scotland

Scientific Information Systems Group
Box 808
Lawrence Radiation Laboratory
Livermore
California 94550, United States of America

Tin Research Institute
Fraser Road, Perivale
Greenford
Middlesex, England
(Properties of tin)

Zinc and Lead Development Association
34 Berkeley Square
London W.1., England
(Properties of zinc and lead)

International data centres

Central American Research Institute for Industry (ICAITI)
Avenida la Reforma 4-47
Zona 10
Guatemala, Guatemala
(Operates a service geared to the requirements of its particular region)

European Productivity Agency (EPA)
2, rue André-Pascal
Paris 16e, France
(A branch of OECD; provides data and information on European activities; is also a useful source of information on European organizations)

Organisation for Economic Co-operation and Development (OECD)
94, rue Chardon-Lagache
75-Paris 16e, France
(Clearing house for information for developing countries)

Scandinavian Council for Applied Research (NORDFORSK)
P.O. Box 5103
S-10243 Stockholm 5, Sweden
(Clearing house for information for all countries)

United Nations Industrial Development Organization (UNIDO)

P.O. Box 707

A 1011 Vienna, Austria

(Operates an information centre especially for the developing countries)

United Nations Educational, Scientific and Cultural Organization (UNESCO)

Place de Fontenoy

75-Paris 7e, France

(Clearing house for information for all countries)

Information centres

The following information and documentation centres around the world provide documentation services on request. *Worldwide directory of national technical information services*, produced by the Fédération internationale de documentation (FID), 7 Hofweg, The Hague, Netherlands, contains a much more complete selection.

Belgium

Société royale belge des ingénieurs et des industriels (S.R.B.I.I.)

3, rue Ravenstein

Bruxelles 1

(The "Royal Belgian Society of Engineers and Industrialists" carries out research and collects information on applied sciences, including civil, mechanical and electrical engineering, industrial chemistry, industrial economics etc. A library is available and documents can be reproduced)

Bolivia

Centro Nacional Boliviano de Documentación Científica y Técnica

Mail Box 3283

La Paz

(Documentation services including preparation of bibliographies and technical consultation are available)

Canada

Technical Information Service (TIS)

National Research Council of Canada

Ottawa 7, Ontario

(Deals with technical subjects and productivity. Disseminates information and issues publications. Library provides documentation services, including preparation of bibliographies)

Denmark

Dansk Teknisk Oplysningstjeneste
Ornevej 30
Kobenhavn NV

("Danish Technical Information Service" is affiliated to the Danish Council for Scientific and Industrial Research. It offers reference services, undertakes literature searches, and supplies photocopying and information services)

Egypt

National Information and Documentation Centre
National Research Centre Building
Dokki, Cairo

(Provides documentation services including preparation of bibliographies and translations. Technical consultant services. Prepares abstracts and issues publications)

France

Association française pour l'accroissement de la productivité (AFAP)
11, rue du Faubourg-St-Honoré
Paris 8e

(The "French Association for Increased Productivity" provides various information and technical assistance programmes)

Centre national de la recherche scientifique – Centre de documentation
15, Quai Anatole-France
Paris 8e

(The "Documentation Centre of the National Centre for Scientific Research" supplies laboratories, institutes, researchers, doctors, scientists and technicians with scientific and technical documentation)

India

Indian National Scientific Documentation Centre (INSDOC)
Hillside Road
New Delhi 12

(Provides bibliographies, translations, technical consulting services. Disseminates information and issues publications. Acts as channel for international contacts)

Israel

Center of Scientific and Technological Information
P.O. Box 20125
Tel Aviv

(Clearing house for technical information; provides selective dissemination of information; trains professional personnel)

Netherlands

Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (TNO)
12 Koningskade
's-Gravenhage

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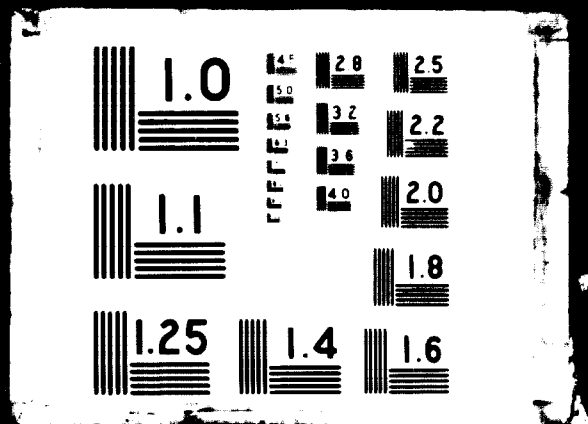


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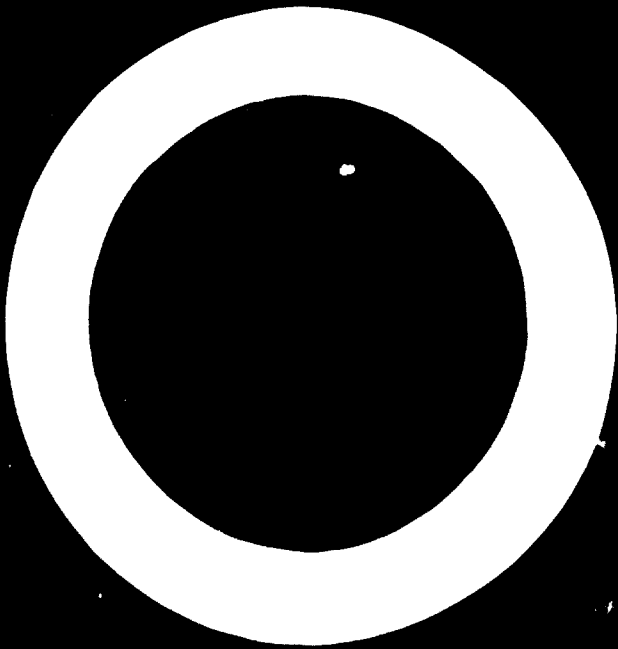
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